Dell EMC Networking N-Series N1100-ON, N1500, N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON Switches

CLI Reference Guide

Version 6.7

Regulatory Models: E17W/E18W/E15W/E16W/E05W/
E04W/E06W/E07W/E41W

Notes

NOTE: A NOTE indicates important information that helps you make better use of your computer.

CAUTION: A CAUTION indicates potential damage to hardware or loss of data if instructions are not followed.

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Regulatory Models E17W/E18W/E15W/E16W/E05W/E04W/E06W/E07W/E41W

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Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Introduction

The Command Line Interface (CLI) is a network management application operated through an ASCII terminal without the use of a Graphic User Interface (GUI) driven software application. By directly entering commands, the user has greater configuration flexibility. The CLI is a basic command-line interpreter with command-line completion, in-line syntax help, and prior command recall.

A switch can be configured and maintained by entering commands from the CLI, which is based solely on textual input and output with commands being entered by a terminal keyboard and the output displayed as text via a terminal monitor. The CLI can be accessed from a console terminal connected to an RS-232 port or through a Telnet/SSH session. Serial communication via a dedicated USB port is available on the N1100-ON Series switch.

This guide describes how the CLI is structured, describes the command syntax, and describes the command functionality.

This guide also provides guidelines for configuring the Dell® EMC™ Networking switch, and provides limited configuration examples. Basic installation is described in the *User's Guide* and must be completed before using this document.

This document applies to the following switch firmware versions:

- Version 6.7—N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series switches

Command Groups

The system commands can be broken down into three sets of functional groups: Layer 2, Layer 3, and Utility.

Table 1-1. System Command Groups

Command Group	Description
Layer 2 Commands	
ACL	Configures and displays ACL information.
Auto-VoIP	Configures auto VoIP for IP phones on a switch.
CDP Interoperability	Configures Cisco® Discovery Protocol (CDP).
DHCP L2 Relay	Enables the Layer 2 DHCP relay agent for an interface.
DHCP Snooping	Configures DHCP snooping and displays DHCP snooping information.
Dynamic ARP Inspection	Configures for rejection of invalid and malicious ARP packets.
Ethernet Configuration	Configures all port configuration options for example ports, storm control, port speed and auto-negotiation.
Ethernet CFM	Configures and displays GVRP configuration and information.
Ethernet Ring Protection Commands	Configures and displays Ethernet Ring Protection switching mechanism and a protocol for Ethernet layer network rings.
Green Ethernet	Configures Green Ethernet and displays Green Ethernet information.
GVRP	Configures GVRP snooping and displays GVRP information.
IGMP Snooping	Configures IGMP snooping and displays IGMP configuration and IGMP information.
IGMP Snooping Querier	Configures IGMP Snooping Querier and displays IGMP Snooping Querier information.
Interface Error Disable and Auto Recovery	Automatically disables an interface when an error is detected. Auto recovery re-enables the interface after the configured time interval expires.
IP Addressing	Configures and manages IP addresses on the switch.
IPv6 ACL	Configures and displays ACL information for IPv6.
IPv6 MLD Snooping	Configures IPv6 MLD Snooping.

Table 1-1. System Command Groups *(continued)*

Command Group	Description
IPv6 MLD Snooping Querier	Configures IPv6 Snooping Querier and displays IPv6 Snooping Querier information.
IP Source Guard	Configures IP source guard and displays IP source guard information.
iSCSI Optimization	Configures special QoS treatment for traffic between iSCSI initiators and target systems.
Link Dependency	Configures and displays link dependency information.
LLDP	Configures and displays LLDP information.
Loop Protection	Configures keep alive.
MAC Address Table	Configures bridging address tables.
MAC Notification	Enables and configures MAC address notifications and traps.
MLAG	Configures MLAG and displays MLAG information.
Multicast VLAN Registration	Configures MVLAN and displays MVLAN information.
Port Channel	Configures and displays port channel information.
Port Monitor	Monitors activity on specific target ports.
QoS	Configures and displays QoS information.
Spanning Tree	Configures and reports on spanning tree protocol.
UDLD	Configures UDLD and displays UDLD information.
VLAN	Configures VLANs and displays VLAN information.
Switchport Voice VLAN	Configures voice VLANs and displays voice VLAN information.
Multiple MAC Registration Protocol	MMRP is an implementation of IEEE 802.1ak. MMRP supports registration of MAC address/VLAN pairs in support of Audio-Visual Bridging.
Multiple VLAN Registration Protocol	MVRP is an implementation of IEEE 802.1ak in support of Audio-Video Bridging. Dell EMC Networking MVRP supports registration (dynamic VLAN creation) and propagation of VLAN membership information.

Table 1-1. System Command Groups *(continued)*

Command Group	Description
Security Commands	
AAA	Configures connection security including authorization and passwords.
Administrative Profiles Commands	Group commands into a profile and assign a profile to a user upon authentication.
E-mail Alerting	Configures e-mail capabilities.
RADIUS	Configures and displays RADIUS information.
TACACS+	Configures and displays TACACS+ information.
802.1x	Configures and displays commands related to 802.1x security protocol.
Captive Portal	Blocks clients from accessing network until user verification is established.
Denial of Service	Provides several Denial of Service options.
Management ACL	Configures and displays management access-list information.
Password Management	Provides password management.
SSH	Configures SSH authentication.
Data Center Commands	
OpenFlow	Configures the switch to be managed by a centralized OpenFlow Controller using the OpenFlow protocol.
Layer 3 Routing Commands	
ARP (IPv4)	Manages Address Resolution Protocol functions.
BFD	Configures BFD and displays BFD information.
BGP	Configures BGP and displays BGP information.
BGP Routing Policy	Configures BGP routing policy and displays BGP routing policy information.
DHCP Server and Relay Agent (IPv4)	Manages DHCP/BOOTP operations on the system.
DHCPv6	Configures IPv6 DHCP functions.

Table 1-1. System Command Groups *(continued)*

Command Group	Description
DHCPv6 Snooping	Configures DHCP v6 snooping and whether an interface is trusted or untrusted.
DVMRP (Mcast)	Configures DVMRP operations.
GMRP	Configures GMRP and displays GMRP information.
IGMP (Mcast)	Configures IGMP operations.
IGMP Proxy (Mcast)	Manages IGMP Proxy on the system.
IP Helper/DHCP Relay	Configures relay of UDP packets.
IP Routing (IPv4)	Configures IP routing and addressing.
IPv6 Routing	Configures IPv6 routing and addressing.
IP Service Level Agreement	Monitors network performance between routers or from a router to a remote IP device.
Loopback Interface (IPv6)	Manages loopback configurations.
Multicast(Mcast)	Manages multicasting on the system.
IPv6 Multicast	Manages IPv6 multicasting on the system.
OSPF (IPv4)	Manages shortest path operations.
OSPFv3 (IPv6)	Manages IPv6 shortest path operations.
IPv6 Policy-Based Routing	Configure and view policy-based routing for IPv6.
Router Discovery Protocol	Manages router discovery operations.
Routing Information Protocol (IPv4)	Configures RIP activities.
Tunnel Interface (IPv6)	Managing tunneling operations.
Unicast Reverse Path Forwarding	Helps limit the problems that are caused by malformed or spoofed IP source addresses by discarding IP packets that lack a verifiable IP source address.
Virtual Router	Manages a virtual router.
Virtual Router Redundancy (IPv4)	Controls virtual LAN routing.

Table 1-1. System Command Groups *(continued)*

Command Group	Description
Virtual Router Redundancy Protocol version 3 Commands	Provides address redundancy for both IPv4 and IPv6 router addresses.
Switch Management Commands	
Application Deployment	Manages Dell-supplied applications.
Auto-Install	Automatically configures switch when a configuration file is not found.
CLI Macro	Configures CLI Macro and displays CLI Macro information.
Clock	Configures the system clock.
Command Line Configuration Scripting	Manages the switch configuration files.
Configuration and Image Files	Manages file system and Command Line Interface scripting commands.
DHCP Client	Configures an interface to obtain an IP address via DHCP.
HiveAgent	Enables configuration of the Dell HiveAgent
Line	Configures the console, SSH, and remote Telnet connection.
MACsec	Provides secure communications between stations that are attached to the same LAN.
PHY Diagnostics	Diagnoses and displays the interface status.
Power Over Ethernet (PoE)	Configures PoE and displays PoE information.
RMON	Can be configured through the CLI and displays RMON information.
Serviceability Tracing	Controls display of debug output to serial port or telnet console.
sFlow	Configures sFlow monitoring.
SNMP	Configures SNMP communities, traps and displays SNMP information.
Support Assist	Configures SupportAssist.

Table 1-1. System Command Groups *(continued)*

Command Group	Description
SYSLOG	Manages and displays SYSLOG messages.
System Management	Configures the switch clock, name and authorized users.
Telnet Server	Configures telnet service on the switch and displays telnet information.
Time Ranges	Configures time ranges and displays time range information.
USB Flash Drive	Configures USB flash drive and displays USB flash drive information.
User Interface	Describes user commands used for entering CLI commands.
Web Server	Configures web-based access to the switch.

Mode Types

The tables on the following pages use these abbreviations for Command Mode names.

- AAA — IAS User Configuration
- APC — Administrative Profile Configuration
- ARPA — ARP ACL Configuration
- BR—BGP Router Configuration
- CC — Crypto Configuration
- CP — Captive Portal Configuration
- CPI — Captive Portal Instance
- CMC — Class-Map Configuration
- CR — Crypto Certificate
- DCB—Datacenter-Bridging Configuration
- DP — IP DHCP Pool Configuration
- DRC–Dynamic RADIUS Configuration
- ERP—Ethernet Ring Profile Configuration

- ERC—Ethernet Ring Configuration
- ERI—Ethernet Ring Instance Configuration
- ERIA—Ethernet Ring Instance APS-Channel Configuration
- ERIC—Ethernet Ring Instance Configuration APM
- ESDSEC — ERSPAN Destination Session Configuration (config-erspan-dst)
- ESDSOC— ERSPAN Destination Source Configuration (config-erspan-src-dst)
- ESSC — ERSPAN Source Configuration (config-erspan-src)
- ESSDC — ERSPAN Source Destination Configuration (config-erspan-dst-src)
- ESSSC— ERSPAN Source Session Configuration (config-erspan-source)
- GC — Global Configuration
- HAC—Hive Agent Sever Configuration
- IC — Interface Configuration
- IP — IP Access List Configuration
- IPAF4—IPv4 Address Family Configuration
- IPAF—IPv6 Address Family Configuration
- IPSLA—IP SLA Configuration
- IPSLAE—IP SLA ICMP Echo Configuration
- IR — Interface Range
- KC — Key Chain
- KE — Key
- KK — Keychain Key Configuration
- L — Logging
- LC — Line Configuration
- LD — Link Dependency
- MA — Management Access-level
- MC — MST Configuration
- MD —MLAG Domain Configuration

- MDC — Maintenance Domain Configuration
- ML — MAC-List Configuration
- MP — MACsec Policy Configuration
- MSC — Mail Server Configuration
- MT — MAC-acl
- OFC—OpenFlow Configuration
- OG — OSPFv2 Global Configuration
- OR—OSPFv2 Router Configuration
- PE — Privileged Exec
- PM — Policy Map Configuration
- PCGC — Policy Map Global Configuration
- PCMC — Policy Class Map Configuration
- PTC—Peer Template Configuration
- R — RADIUS Server Configuration
- RIP — Router RIP Configuration
- RC — Router Configuration
- RM—Route Map Configuration
- ROSPF — Router Open Shortest Path First
- ROSV3 — Router Open Shortest Path First Version 3
- S—Support
- SAC—Support Assist Configuration
- SC — Stack Configuration
- SP — SSH Public Key
- SK — SSH Public Key-chain
- TC — TACACS Configuration
- TKC—Track Configuration
- TRC — Time Range Configuration
- UB—U-boot
- UE — User Exec

- VC — VLAN Configuration (reached via vlan command)
- VRC—VRF Configuration
- VR—Virtual Router Configuration
- VRRP—VRRPv3 Group Configuration
- v6ACL — IPv6 Access List Configuration
- v6CMC — IPv6 Class-Map Configuration
- v6DP — IPv6 DHCP Pool Configuration

Layer 2 Commands

ACL

Command	Description	Mode[a]
ip access-list	Creates an Access Control List (ACL) that is identified by the parameter *accesslistnumber.*	GC
deny | permit (IP ACL)	The **deny** command denies traffic if the conditions defined in the deny statement are matched. The **permit** command allows traffic if the conditions defined in the permit statement are matched.	ML
deny | permit (Mac-Access-List-Configuration)	The **deny** command denies traffic if the conditions defined in the deny statement are matched. The **permit** command allows traffic if the conditions defined in the permit statement are matched.	ML
ip access-group	Attaches a specified access-control list to an interface.	GC or IC
mac access-group	Attaches a specific MAC Access Control List (ACL) to an interface in the in-bound direction.	GC or IC
mac access-list extended	Creates the MAC Access Control List (ACL) identified by the *name* parameter.	GC
mac access-list extended rename	Renames the existing MAC Access Control List (ACL) name.	GC

Command	Description	Mode[a]
remark	Adds a comment to an ACL rule.	IPAF4, IPAF, ML, ARPA
service-acl input	Blocks Link Local Protocol Filtering (LLPF) protocol(s) on a given port.	IC
show access-lists interface	Displays interface ACLs.	PE
show service-acl interface	Displays the status of LLPF rules configured on a particular port or on all the ports.	PE
show ip access-lists	Displays an Access Control List (ACL) and all of the rules that are defined for the ACL.	PE
show mac access-lists	Displays a MAC access list and all of the rules that are defined for the ACL.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

MAC Address Table

Command	Description	Mode[a]
clear mac address-table	Removes any learned entries from the forwarding database.	PE
mac address-table aging-time	Sets the address table aging time.	GC
mac address-table multicast forbidden address	Forbids adding a specific multicast address to specific ports.	GC
mac address-table static	Registers MAC-layer multicast addresses to the bridge forwarding table, and adds static ports to the group.	GC
switchport port-security (Global Configuration)	Enables port security globally.	GC
switchport port-security (Interface Configuration)	Disables new address learning on an interface.	IC
show mac address-table	Displays dynamically created entries in the bridge-forwarding database.	PE

Command	Description	Mode[a]
show mac address-table address	Displays all entries in the bridge-forwarding database for the specified MAC address.	UE or PE
show mac address-table count	Displays the number of addresses present in the Forwarding Database.	PE
show mac address-table dynamic	Displays all entries in the bridge-forwarding database.	UE or PE
show mac address-table interface	Displays the mac forwarding table entries for a specific interface.	UE or PE
show mac address-table multicast	Displays multicast MAC address table information.	PE
show mac address-table static	Displays statically created entries in the bridge-forwarding database.	PE
show mac address-table vlan	Displays all entries in the bridge-forwarding database for the specified VLAN.	UE or PE
show port-security	Displays the port-lock status.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

MAC Notification

Command	Description	Mode[a]
mac address-table notification change	Enables and configures MAC address change notification.	GC
snmp trap mac-notification change	Enables MAC notification traps to be sent for an interface.	IC
show mac address-table notification change	Displays the MAC notification configuration and contents of the MAC notification history buffer.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Auto-VoIP

Command	Description	Mode[a]
switchport voice detect auto	Enables the VoIP Profile on all the interfaces of the switch.	GC or IC
show switchport voice	Displays the status of auto-voip on an interface or all interfaces.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

CDP Interoperability

Command	Description	Mode[a]
clear isdp counters	Clears the ISDP counters.	PE
clear isdp table	Clears entries in the ISDP table.	PE
isdp advertise-v2	Enables the sending of ISDP version 2 packets from the device.	GC
isdp enable	Enables ISDP on the switch.	GC or IC
isdp holdtime	Configures the hold time for ISDP packets that the switch transmits.	GC
isdp timer	Sets period of time between sending new ISDP packets.	GC
show isdp	Displays global ISDP settings.	PE
show isdp entry	Displays ISDP entries.	PE
show isdp interface	Displays ISDP settings for the specified interface.	PE
show isdp neighbors	Displays the list of neighboring devices.	PE
show isdp traffic	Displays ISDP statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCP L2 Relay

Command	Description	Mode[a]
dhcp l2relay (Global Configuration)	Enables the Layer 2 DHCP Relay agent for an interface or globally.	GC or IC
dhcp l2relay (Interface Configuration)	Enables DHCP L2 Relay for an interface.	IC
dhcp l2relay circuit-id	Enables user to set the DHCP Option 82 Circuit ID for a VLAN.	GC
dhcp l2relay remote-id	Enables user to set the DHCP Option 82 Remote ID for a VLAN.	GC
dhcp l2relay trust	Configures an interface to trust a received DHCP Option 82.	IC
dhcp l2relay vlan	Enables the L2 DHCP Relay agent for a set of VLANs.	GC
show dhcp l2relay all	Displays the summary of DHCP L2 Relay configuration.	PE or GC
show dhcp l2relay interface	Displays DHCP L2 Relay configuration specific to interfaces.	PE
show dhcp l2relay stats interface	Displays DHCP L2 Relay statistics specific to interfaces.	PE or GC
show dhcp l2relay agent-option vlan	Displays DHCP L2 Relay Option-82 configuration specific to VLANs.	PE or GC
show dhcp l2relay vlan	Displays whether DHCP L2 Relay is globally enabled on the specified VLAN or VLAN range.	PE or GC
show dhcp l2relay circuit-id vlan	Displays whether DHCP L2 Relay is globally enabled and whether the DHCP Circuit-ID option is enabled on the specified VLAN or VLAN range.	PE or GC
show dhcp l2relay remote-id vlan	Displays whether DHCP L2 Relay is globally enabled and shows the remote ID configured on the specified VLAN or VLAN range.	PE or GC
clear dhcp l2relay statistics interface	Resets the DHCP L2 Relay counters to zero.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCP Snooping

Command	Description	Mode[a]
clear ip dhcp snooping binding	Clears all DHCP Snooping entries.	PE
clear ip dhcp snooping statistics	Clears all DHCP Snooping statistics.	PE
ip dhcp snooping	Enables DHCP snooping globally or on a specific VLAN.	GC or IC
ip dhcp snooping binding	Configures a static DHCP Snooping binding.	GC
ip dhcp snooping database	Configures the persistent location of the DHCP snooping database.	GC
ip dhcp snooping database write-delay	Configures the interval in seconds at which the DHCP Snooping database will be stored in persistent storage.	GC
ip dhcp snooping limit	Controls the maximum rate of DHCP messages.	IC
ip dhcp snooping log-invalid	Enables logging of DHCP messages filtered by the DHCP Snooping application.	IC
ip dhcp snooping trust	Configure a port as trusted for DHCP snooping.	IC
ip dhcp snooping verify mac-address	Enables the verification of the source MAC address with the client MAC address in the received DHCP message.	GC
show ip dhcp snooping	Displays the DHCP snooping global and per port configuration.	PE
show ip dhcp snooping binding	Displays the DHCP snooping binding entries.	PE
show ip dhcp snooping database	Displays the DHCP snooping configuration related to the database persistence.	PE
show ip dhcp snooping interfaces	Displays the DHCP Snooping status of the interfaces.	PE
show ip dhcp snooping statistics	Displays the DHCP snooping filtration statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Dynamic ARP Inspection

Command	Description	Mode[a]
arp ip access-list	Creates an ARP ACL.	GC
clear ip arp inspection statistics	Resets the statistics for Dynamic ARP Inspection on all VLANs.	PE
ip arp inspection filter	Configures the ARP ACL to be used for a single VLAN or a range of VLANs to filter invalid ARP packets.	GC
ip arp inspection limit	Configures the rate limit and burst interval values for an interface.	IC
ip arp inspection trust	Configures an interface as trusted for Dynamic ARP Inspection.	IC
ip arp inspection validate	Enables additional validation checks like source MAC address validation, destination MAC address validation or IP address validation on the received ARP packets.	GC
ip arp inspection vlan	Enables Dynamic ARP Inspection on a single VLAN or a range of VLANs.	GC
permit ip host mac host	Configures a rule for a valid IP address and MAC address combination used in ARP packet validation.	ARPA
show arp access-list	Displays the configured ARP ACLs with the rules.	PE
show ip arp inspection	Displays the Dynamic ARP Inspection configuration.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Ethernet Configuration

Command	Description	Mode[a]
clear counters	Clears statistics on an interface or globally.	PE
description	Adds a description to an interface.	IC
default (interface)	Configures the interface to the defaults.	GC

Command	Description	Mode[a]
duplex	Configures the duplex operation of a given Ethernet interface	IC
flowcontrol	Configures the flow control on a given interface.	GC or IC
forward-error-correction	Configures the forward error correction for 25G/50G/100G Ethernet interfaces	IC
interface	Enters the interface configuration mode to configure parameters for an interface.	GC or IC
interface range	Enters the interface configuration mode to execute a command on multiple ports at the same time.	GC or IC or IR
link debounce time	Configures the debounce timer for one or multiple interfaces.	IC or IR
rate-limit cpu	Reduces the amount of unknown unicast/multicast packets forwarded to the CPU.	GC
show interfaces	Lists the traffic statistics for one or multiple interfaces.	PE
show interfaces advertise	Displays information about auto negotiation advertisement.	PE
show interfaces configuration	Displays the configuration for all configured interfaces.	UE
show interfaces counters	Displays traffic seen by the Ethernet interface.	UE
show interfaces debounce	Lists the debounce information for one or multiple interfaces.	PE or GC
show interfaces description	Displays the description for all configured interfaces.	UE
show interfaces detail	Displays the detail for all configured interfaces.	UE
show interfaces status	Displays the status for all configured interfaces.	UE
show interfaces transceiver	Display the optic static parameters as well as the Dell EMC qualification.	PE
show interfaces trunk	Display active trunk interface information.	PE or GC

Command	Description	Mode[a]
show statistics	Displays statistics for one port or for the entire switch.	PE
show statistics switchport	Displays detailed statistics for a specific port or for the entire switch.	PE
show storm-control	Displays the storm control configuration.	PE
show storm-control action	Displays the storm control action configuration for one or all interfaces.	PE
shutdown	Disables interfaces.	IC
speed	Configures the speed of a given Ethernet interface when not using auto-negotiation.	IC
switchport protected	Sets the port to Protected mode.	IC
switchport protected name	Configures a name for a protected group.	GC
show switchport protected	Displays protected group/port information.	PE
show system mtu	Displays the configured MTU.	PE
system jumbo mtu	Globally configures the Maximum Transmission Unit (MTU) on all interfaces for forwarded and system-generated frames.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Ethernet CFM

Command	Description	Mode[a]
ethernet cfm domain	Enters into maintenance domain Configuration mode for an existing domain. Use the optional **level** parameter to create a domain and enter into maintenance domain Configuration mode.	GC
service	Associates a VLAN with a maintenance domain.	MDC
ethernet cfm cc level	Initiates sending continuity checks (CCMs) at the specified interval and level on a VLAN monitored by an existing domain.	GC
ethernet cfm mep level	Creates a Maintenance End Point (MEP) on an interface at the specified level and direction.	IC

Command	Description	Mode[a]
ethernet cfm mep enable	Enables a MEP at the specified level and direction.	IC
ethernet cfm mep active	Activates a MEP at the specified level and direction.	IC
ethernet cfm mep archive-hold-time	Maintains internal information on a missing MEP.	IC
ethernet cfm mip level	Creates a Maintenance Intermediate Point (MIP) at the specified level.	IC
ping ethernet cfm	Generates a loopback message (LBM) from the configured MEP.	PE
traceroute ethernet cfm	Generates a link trace message (LTM) from the configured MEP.	PE
show ethernet cfm errors	Displays the cfm errors.	PE
show ethernet cfm domain	Displays the configured parameters in a maintenance domain.	PE
show ethernet cfm maintenance-points local	Displays the configured local maintenance points.	PE
show ethernet cfm maintenance-points remote	Displays the configured remote maintenance points.	PE
show ethernet cfm statistics	Displays the CFM statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Ethernet Ring Protection

Command	Description	Mode[a]
ethernet ring g8032 profile	Creates Ethernet ring profile and enters Ethernet ring profile configuration mode	GC
timer	Configures the timer expiry values for an Ethernet ring profile.	ERP
non-revertive	Enables non-revertive mode for an Ethernet ring profile.	ERP
ethernet ring g8032	Creates an Ethernet ring and enters Ethernet Ring Configuration mode	GC
port0	Configures a link to participate in Ethernet ring protection as an East ring link.	ERC
port1	Configures a link to participate in Ethernet ring protection as a West ring link.	ERC
open-ring	Configures a protection ring as a sub-ring.	ERC
instance	Configures an Ethernet ring instance and enter Ethernet Ring Instance Configuration mode.	ERC
profile	Associates an Ethernet ring protection profile with an Ethernet Ring Instance Configuration mode.	ERI
rpl	Configures the Ethernet Ring Protection Link (RPL) and role of the associated ring node.	ERI
inclusion-list	Selects the VLANs protected by the Ethernet ring protection instance.	ERI
ethernet tcn-propagation	Enables topology change notification from a sub-ring to the major ring.	IC
aps-channel	Enters into Ethernet Ring Protection APS-channel Configuration mode.	ERI
level	Selects the maintenance level of Continuity Check Messages (CCMs) to be monitored.	ERIC
raps-vlan	Associates the VLAN to be used for R-APS messages for the ERP instance.	ERIA
g8032	Controls protection switching transitions and faults manually.	PE

Command	Description	Mode[a]
show ethernet ring g8032 configuration	Shows the Ethernet Ring Protection configuration.	PE, GC
show ethernet ring g8032 brief	Shows the operational overview of Ethernet ring protection.	PE, GC
show ethernet ring g8032 status	Shows the status of Ethernet ring protection.	PE, GC
show ethernet ring g8032 port status	Shows the status of Ethernet ring protection for the selected interface.	PE, GC
show ethernet ring g8032 profile	Displays the configuration for the named profile.	PE, GC
show ethernet ring g8032 statistics	Shows the status of Ethernet ring protection.	PE, GC
show ethernet ring g8032 summary	Shows the status of Ethernet ring protection.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Green Ethernet

Command	Description	Mode[a]
clear counters	Enables a Dell EMC proprietary mode of power reduction on ports that are not connected to another interface.	IC
green-mode eee	Enables EEE low power idle mode on an interface or all the interfaces.	IC
description	Clears: • The EEE LPI event count, and LPI duration • The EEE LPI history table entries • The Cumulative Power savings estimates for a specified interface or for all the interfaces based upon the argument.	PE
green-mode eee-lpi-history	Configures the Global EEE LPI history collection interval and buffer size. This value is applied globally on all interfaces on the stack.	GC

Command	Description	Mode[a]
show green-mode interface-id	Displays the green-mode configuration and operational status of the port. This command is also used to display the per port configuration and operational status of the green-mode. The status is shown only for the modes supported on the corresponding hardware platform whether enabled or disabled.	PE
show green-mode	Displays the green-mode configuration for the whole system. The status is shown only for the modes supported on the corresponding hardware platform whether enabled or disabled.	PE
show green-mode eee-lpi-history interface	Displays the interface green-mode EEE LPI history.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

GVRP

Command	Description	Mode[a]
clear gvrp statistics	Clears all the GVRP statistics information.	PE
garp timer	Adjusts the GARP application join, leave, and leaveall GARP timer values.	IC
gvrp enable (Global Configuration)	Enables GVRP globally.	GC
gvrp enable (Interface Configuration)	Enables GVRP on an interface.	IC
gvrp registration-forbid	Deregisters all VLANs, and prevents dynamic VLAN registration on the port.	IC
gvrp vlan-creation-forbid	Enables or disables dynamic VLAN creation.	IC
show gvrp configuration	Displays GVRP configuration information, including timer values, whether GVRP and dynamic VLAN creation is enabled, and which ports are running GVRP.	PE
show gvrp error-statistics	Displays GVRP error statistics.	UE
show gvrp statistics	Displays GVRP statistics.	UE

a. For the meaning of each Mode abbreviation, see Mode Types.

IGMP Snooping

Command	Description	Mode[a]
ip igmp snooping	In Global Configuration mode, Enables Internet Group Management Protocol (IGMP) snooping.	GC
show ip igmp snooping groups	Displays multicast groups learned by IGMP snooping.	UE
show ip igmp snooping mrouter	Displays information on dynamically learned multicast router interfaces.	PE
show ip igmp snooping	In VLAN Configuration mode, enables IGMP snooping on a particular VLAN or on all interfaces participating in a VLAN.	VC
ip igmp snooping vlan immediate-leave	Enables or disables IGMP Snooping fast-leave mode on a selected VLAN.	VC
ip igmp snooping vlan groupmembership-interval	Sets the IGMP Group Membership Interval time on a VLAN.	VC
ip igmp snooping vlan last-member-query-interval	Sets the IGMP Maximum Response time on a particular VLAN.	VC
ip igmp snooping vlan mcrtrexpiretime	Sets the multicast router present expiration time.	VC
ip igmp snooping report-suppression	Enables IGMP report suppression on a specific VLAN.	GC
ip igmp snooping unregistered floodall	Enables flooding of unregistered multicast traffic to all ports in the VLAN.	GC
ip igmp snooping vlan mrouter	Statically configures a port as connected to a multicast router for a specified VLAN.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

IGMP Snooping Querier

Command	Description	Mode[a]
ip igmp snooping	Enables/disables IGMP Snooping Querier on the system (Global Configuration mode) or on a VLAN.	GC or VC
ip igmp snooping querier election participate	Enables the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN.	VC
ip igmp snooping querier query-interval	Sets the IGMP Querier Query Interval time.	GC
ip igmp snooping querier timer expiry	Sets the IGMP Querier timer expiration period.	GC
ip igmp snooping querier version	Sets the IGMP version of the query that the snooping switch is going to send periodically.	GC
show ip igmp snooping querier	Displays IGMP Snooping Querier information.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Interface Error Disable and Auto Recovery

Command	Description	Mode[a]
errdisable recovery cause	Enables automatic recovery of any interface when disabled from the listed cause	GC
errdisable recovery interval	Configures the interval for error recovery of interfaces disabled due to any cause.	GC
show errdisable recovery	Displays the error disable configuration for each possible cause.	GC
show interfaces status err-disabled	Displays the interfaces that are error disabled by the system.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IP Addressing

Command	Description	Mode[a]
clear host	Deletes entries from the host name-to-address cache.	PE
clear ip address-conflict-detect	Clears the address conflict detection status in the switch.	PE
interface out-of-band	Enters into OOB interface configuration mode.	GC
ip address	Configures an IP address on an in-band interface.	IC
ip address (Out-of-Band)	Sets an IP address for the out-of-band interface.	IC
ip address-conflict-detect run	Triggers the switch to run active address conflict detection by sending gratuitous ARP packets for IPv4 addresses on the switch.	GC
ip address dhcp (Interface Configuration)	Acquires an IP address on an interface from the DHCP server.	IC
ip default-gateway	Defines a default gateway (router).	GC
ip domain-lookup	Enables IP DNS-based host name-to-address translation.	GC
ip domain-name	Defines a default domain name to complete unqualified host names.	GC
ip host	Configures static host name-to-address mapping in the host cache.	GC
ip name-server	Defines available IPv4 or IPv6 name servers.	GC
ip name-server source-interface	Configures available name servers.	GC
ipv6 address (Interface Configuration)	Sets the IPv6 address of the management interface.	IC
ipv6 address (OOB Port)	Sets the IPv6 prefix on the out-of-band port.	IC
ipv6 address dhcp	Enables the DHCPv6 client on an IPv6 interface.	IC
ipv6 enable (Interface Configuration)	Enables IPv6 on an interface.	IC

Command	Description	Mode[a]
ipv6 enable (OOB Configuration)	Enables IPv6 operation on the out-of-band interface.	IC
ipv6 gateway (OOB Configuration)	Configures the address of the IPv6 gateway.	IC
show hosts	Displays the default domain name, a list of name server hosts, static and cached list of host names and addresses.	UE
show ip address-conflict	Displays the status information corresponding to the last detected address conflict.	UE or PE
show ip helper-address	Displays the ip helper addresses configuration.	PE
show ipv6 dhcp interface out-of-band statistics	Displays IPv6 DHCP statistics for the out-of-band interface.	PE
show ipv6 interface out-of-band	Displays the IPv6 out-of-band port configuration.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 ACL

Command	Description	Mode[a]
deny | permit (IPv6 ACL)	Creates a new rule for the current IPv6 access list.	v6ACL
ipv6 access-list	Creates an IPv6 Access Control List (ACL) consisting of classification fields defined for the IP header of an IPv6 frame.	GC
ipv6 access-list rename	Changes the name of an IPv6 ACL.	GC
ipv6 traffic-filter	Attaches a specific IPv6 ACL to an interface or associates it with a VLAN ID in a given direction.	GC IC
show ipv6 access-lists	Displays an IPv6 access list (and the rules defined for it).	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 MLD Snooping

Command	Description	Mode[a]
ipv6 mld snooping vlan groupmembership-interval	Sets the MLD Group Membership Interval time on a VLAN or interface.	VC
ipv6 mld snooping vlan immediate-leave	Enables or disables MLD Snooping immediate-leave admin mode on a selected interface or VLAN.	VC
ipv6 mld snooping vlan last-listener-query-interval	Sets the MLD Maximum Response time for an interface or VLAN.	IC or VC
ipv6 mld snooping listener-message-suppression	Enables MLD listener message suppression on a specific VLAN.	GC
ipv6 mld snooping vlan mcrtrexpiretime	Sets the multicast router present expiration time.	GC
ipv6 mld snooping vlan mrouter	Statically configures a port as connected to a multicast router for a specified VLAN.	GC
ipv6 mld snooping (Global)	Enables MLD Snooping on the system (Global Configuration mode).	GC
show ipv6 mld snooping	Displays MLD snooping information.	PE
show ipv6 mld snooping groups	Displays the MLD snooping entries in the MFDB table.	PE
show ipv6 mld snooping mrouter	Displays information on dynamically learned multicast router interfaces.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 MLD Snooping Querier

Command	Description	Mode[a]
ipv6 mld snooping querier	Enables MLD Snooping Querier on the system.	GC
ipv6 mld snooping querier (VLAN mode)	Enables MLD Snooping Querier on a VLAN.	VC
ipv6 mld snooping querier address	Sets the global MLD Snooping Querier address on the system or on a VLAN.	GC or VC

Command	Description	Mode[a]
ipv6 mld snooping querier election participate	Enables the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN.	VC
ipv6 mld snooping querier query-interval	Sets the MLD Querier Query Interval time.	GC
ipv6 mld snooping querier timer expiry	Sets the MLD Querier timer expiration period.	GC
show ipv6 mld snooping querier	Displays MLD Snooping Querier information.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IP Source Guard

Command	Description	Mode[a]
ip verify source	Enables IP Source Guard on an interface.	IC
ip verify binding	Configures IPSG static bindings.	GC
show ip verify	Displays IPSG interface configuration.	PE
show ip verify source	Displays the bindings configured on a particular interface.	PE
show ip source binding	Displays all bindings (static and dynamic).	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

iSCSI Optimization

Command	Description	Mode[a]
iscsi cos	Sets the quality of service profile that will be applied to iSCSI flows.	GC
iscsi enable	Enables Global Configuration mode command globally enables iSCSI awareness.	GC
show iscsi	Displays the iSCSI settings.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Link Dependency

Command	Description	Mode[a]
action	Indicates if the link-dependency group should mirror or invert the status of the depended on interfaces.	LD
link-dependency group	Enters the link-dependency mode to configure a link-dependency group.	GC
add	Adds member gigabit Ethernet port(s) to the dependency list.	LD
depends-on	Adds the dependent Ethernet ports or port channels list.	LD
show link-dependency	Shows the link dependencies configured on a particular group.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

LLDP

Command	Description	Mode[a]
clear lldp remote-data	Deletes all data from the remote data table.	PE
clear lldp statistics	Resets all LLDP statistics.	PE
debug lldp	Displays LLDP debug information.	PE
lldp med	Enables/disables LLDP-MED on an interface.	IC
lldp med confignotification	Enables sending the topology change notification.	IC
lldp med faststartrepeatcount	Sets the value of the fast start repeat count.	GC
lldp med-tlv-select	Specifies which optional TLVs in the LLDP MED set are transmitted in the LLDPDUs.	IC
lldp notification	Enables remote data change notifications.	IC
lldp notification-interval	Limits how frequently remote data change notifications are sent.	GC

Command	Description	Mode[a]
lldp receive	Enables the LLDP receive capability.	IC
lldp timers	Sets the timing parameters for local data transmission on ports enabled for LLDP.	GC
lldp transmit	Enables the LLDP advertise capability.	IC
lldp tlv-select	Specifies which optional TLVs in the 802.1AB basic management set will be transmitted in the LLDPDUs.	IC
show lldp	Displays the current LLDP configuration summary.	PE
show lldp interface	Displays the current LLDP interface state.	PE
show lldp local-device	Displays the LLDP local data.	PE
show lldp med	Displays a summary of the current LLDP MED configuration.	PE
show lldp med interface	Displays a summary of the current LLDP MED configuration for a specific interface.	PE
show lldp med local-device detail	Displays the advertised LLDP local data in detail.	PE
show lldp med remote-device	Displays the current LLDP MED remote data.	PE
show lldp remote-device	Displays the current LLDP remote data.	PE
show lldp statistics	Displays the current LLDP traffic statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Loop Protection

Command	Description	Mode[a]
keepalive (Interface Config)	Enables loop protection on an interface.	IC
keepalive (Global Config)	Globally enable loop protection and optionally configure the loop protection timer and packet count.	GC
keepalive action	Configure the action taken when a loop is detected on an interface.	IC

Command	Description	Mode[a]
show keepalive	Displays the global loop protect configuration.	PE
show keepalive statistics	Displays the loop protect status for one or all interfaces.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

MLAG

Command	Description	Mode[a]
clear vpc statistics	Clears the counters for the keepalive messages transmitted and received by the MLAG switch.	PE
feature vpc	Enables debug traces for the specified protocols.	GC
feature vpc	Globally enables MLAG.	GC
peer detection enable	Enables the Dual Control Plane Detection Protocol.	MD
peer detection interval	Configures the peer detection transmission interval and the detection interval.	MD
peer-keepalive destination	Enables the Dual Control Plane Detection Protocol with the configured IP address of the peer MLAG, the local source address and the peer timeout value.	MD
peer-keepalive enable	Enables the peer keepalive protocol.	MD
peer-keepalive timeout	Configures the peer keepalive timeout value, in seconds.	MD
role priority	Configures the priority value used on a switch for primary/secondary role selection.	MD
show vpc	Displays information about an MLAG.	PE
show vpc brief	Displays the MLAG global status.	PE

Command	Description	Mode[a]
show vpc consistency-parameters	Displays MLAG-related configuration information in a format suitable for comparison with the other MLAG peer.	PE
show vpc consistency-features	Displays MLAG-related configuration information in a format suitable for comparison with the other MLAG peer.	PE
show vpc peer-keepalive	Displays the peer MLAG switch's IP address used by the dual control plane detection protocol.	PE
show vpc role	Displays information about the keepalive status, keepalive parameters, role of the MLAG switch, and the system MAC and priority.	PE
show vpc statistics	Displays counters for the keepalive messages transmitted and received by the MLAG switch	PE
system-mac	Manually configures the MAC address for the VPC domain.	MD
system-priority	Manually configures the priority for the VPC domain.	MD
vpc	Configures a port-channel (LAG) as part of the MLAG domain.	IC
vpc domain	Enters into MLAG Configuration mode.	GC
vpc peer-link	Configures a port channel as the MLAG peer link for a domain and enables the peer link protocol.	IC

a. For the meaning of each Mode abbreviation, see Mode Types.

Multicast VLAN Registration

Command	Description	Mode[a]
mvr	Enables MVR.	GC or IC
mvr group	Adds an MVR membership group.	GC

Command	Description	Mode[a]
mvr mode	Changes the MVR mode type.	GC
mvr querytime	Sets the MVR query response time.	GC
mvr vlan	Sets the MVR multicast VLAN.	GC
mvr immediate	Enables MVR Immediate Leave mode.	IC
mvr type	Sets the MVR port type.	IC
mvr vlan group	Use to participate in the specific MVR group.	IC
show mvr	Displays global MVR settings.	PE
show mvr members	Displays the MVR membership groups allocated.	PE
show mvr interface	Displays the MVR enabled interface configuration.	PE
show mvr traffic	Displays global MVR statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Port Channel

Command	Description	Mode[a]
channel-group	Associates a port with a port-channel.	IC
feature vpc	Enables debug traces for the specified protocols.	GC
interface range port-channel	Enters the interface configuration mode to configure multiple port-channels.	GC
hashing-mode	Sets the hashing algorithm on trunk ports.	IC (port-channel)
lacp port-priority	Configures the priority value for Ethernet ports.	IC
lacp system-priority	Configures the system LACP priority.	GC
lacp timeout	Assigns an administrative LACP timeout.	IC
port-channel min-links	Sets the minimum number of links that must be up in order for the port channel interface to be declared up.	IC

Command	Description	Mode[a]
show interfaces port-channel	Displays port-channel information.	PE
show lacp	Displays LACP information for ports.	PE
show statistics port-channel	Displays port-channel statistics.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Port Monitor

Command	Description	Mode[a]
destination	Enters destination configuration mode on the source switch.	ESSC
destination interface	Configures the destination interface on a destination switch.	ESSDC
erspan-id	Configures an ERSPAN flow identifier.	ESDSOC, ESSDC
ip address	Configures an ERSPAN destination on the source and destination switches.	ESDSOC, ESSDC
ip dscp	Configures the DSCP value for the GRE packet on the source switch.	ESSDC
ip prec	Configures the IP precedence value for the GRE packet on the source switch.	ESSDC
ip ttl	Configures the time-to-live for the GRE packet on the source switch.	ESSDC
monitor capture (Global Configuration)	Captures packets transmitted or received from the CPU.	GC
monitor capture (Privileged Exec)	Capture packets transmitted or received from the CPU	PE
monitor capture mode	Selects the destination for captured packets transmitted or received from the CPU.	GC
monitor session	Configures a port monitoring session.	GC
monitor session type erspan-source	Configures an ERSPAN source session.	GC

Command	Description	Mode[a]
origin ip address	Configures the ERSPAN GRE packet source IP address on the source switch.	ESSDC
source	Configures the port on the source switch over which the GRE encapsulated packets are transmitted.	ESSC
remote-span	Configures a VLAN as an RSPAN VLAN.	VC
source	Enters ERSPAN Destination Session Source Configuration mode on the destination switch.	ESSC
source interface	Selects the interface on the source switch from which packets are mirrored to the reflector port.	ESSC
show monitor capture	Displays captured packets transmitted or received from the CPU.	PE
show monitor session	Displays the port monitoring status.	PE
show vlan remote-span	Displays the RSPAN VLAN IDs.	UE or PE

a. For the meaning of each Mode abbreviation, see Mode Types.

QoS

Command	Description	Mode[a]
assign-queue	Modifies the queue ID to which the associated traffic stream is assigned.	PCMC
class	Creates an instance of a class definition within the specified policy for the purpose of defining treatment of the traffic class through subsequent policy attribute statements.	PMC
class-map	Defines a new DiffServ class of type *match-all*.	GC
class-map rename	Changes the name of a DiffServ class.	GC
classofservice dot1p-mapping	Maps an 802.1p priority to an internal traffic class for a switch.	GC or IC
classofservice ip-dscp-mapping	Maps an IP DSCP value to an internal traffic class.	GC

Command	Description	Mode[a]
classofservice trust	Sets the class of service trust mode of an interface.	GC or IC
conform-color	Specifies the precoloring of packets conforming to or exceeding the specified rate(s). The possible actions are drop, setdscp-transmit, set-prec-transmit, or transmit.	PCMC
cos-queue min-bandwidth	Specifies the minimum transmission bandwidth for each interface queue.	GC or IC
cos-queue random-detect	Configures WRED packet drop policy on an interface CoS queue.	GC or IC
cos-queue strict	Activates the strict priority scheduler mode for each specified queue.	GC or IC
diffserv	Sets the DiffServ operational mode to active.	GC
drop	Use the **drop policy-class-map configuration** command to specify that all packets for the associated traffic stream are to be dropped at ingress.	PCMC
mark cos	Marks all packets for the associated traffic stream with the specified class of service value in the priority field of the 802.1p header.	PCMC
mark ip-dscp	Marks all packets for the associated traffic stream with the specified IP DSCP value.	PCMC
mark ip-precedence	Marks all packets for the associated traffic stream with the specified IP precedence value.	PCMC
match access-group	Adds ACL match criteria to a class map.	CMC
match class-map	Adds add to the specified class definition the set of match conditions defined for another class.	CMC
match cos	Adds to the specified class definition a match condition for the Class of Service value.	CMC
match destination-address mac	Adds to the specified class definition a match condition based on the destination MAC address of a packet.	CMC

Command	Description	Mode[a]
match any	Allows matching on any of the specified match conditions.	CMC
match dstip	Adds to the specified class definition a match condition based on the destination IP address of a packet.	CMC
match dstip6	Adds to the specified class definition a match condition based on the destination IPv6 address of a packet.	v6CMC
match dstl4port	Adds to the specified class definition a match condition based on the destination layer 4 port of a packet using a single keyword, or a numeric notation.	CMC
match ethertype	Adds to the specified class definition a match condition based on the value of the ethertype.	CMC
match ip6flowlbl	Adds to the specified class definition a match condition based on the IPv6 flow label of a packet.	v6CMC
match ip dscp	Adds to the specified class definition a match condition based on the value of the IP DiffServ Code Point (DSCP) field in a packet.	CMC
match ip precedence	Adds to the specified class definition a match condition based on the value of the IP.	CMC
match ip tos	Adds to the specified class definition a match condition based on the value of the IP TOS field in a packet.	CMC
match protocol	Adds to the specified class definition a match condition based on the value of the IP Protocol field in a packet using a single keyword notation or a numeric value notation.	CMC
match source-address mac	Adds to the specified class definition a match condition based on the source MAC address of the packet.	CMC
match srcip	Adds to the specified class definition a match condition based on the source IP address of a packet.	CMC

Command	Description	Mode[a]
match srcip6	Adds to the specified class definition a match condition based on the source IPv6 address of a packet.	v6CMC
match srcl4port	Adds to the specified class definition a match condition based on the source layer 4 port of a packet using a single keyword, a numeric notation, or a numeric range notation.	CMC
match vlan	Adds to the specified class definition a match condition based on the value of the layer 2 VLAN Identifier field.	CMC
mirror	Mirrors all the data that matches the class defined to the destination port specified.	PCMC
police-simple	Implements simple color aware marking for the specified class.	PCMC
police-single-rate	Implements a single-rate Three Color Marker (trTCM) per RFC 2698	PCMC
police-two-rate	Implements a two-rate Three Color Marker (trTCM) per RFC 2698.	PCMC
policy-map	Establishes a new DiffServ policy or enters policy map configuration mode.	GC
random-detect queue-parms	Configures the green, yellow and red TCP and non-TCP packet minimum and maximum thresholds and corresponding drop probabilities on an interface or all interfaces.	GC, IC, or IR
random-detect exponential-weighting-constant	Configures the decay in the calculation of the average queue size user for WRED on an interface or all interfaces.	GC, IC, or IR
redirect	Specifies that all incoming packets for the associated traffic stream are redirected to a specific egress interface (Ethernet port or port-channel).	PCMC
service-policy	Attaches a policy to an interface in a particular direction.	GC or IC
show class-map	Displays all configuration information for the specified class.	PE

Command	Description	Mode[a]
show classofservice dot1p-mapping	Displays the current 802.1p priority mapping to internal traffic classes for a specific interface.	PE
show classofservice ip-dscp-mapping	Displays the current IP DSCP mapping to internal traffic classes for a specific interface.	PE
show classofservice trust	Displays the current trust mode setting for a specific interface.	PE
show diffserv	Displays the DiffServ General Status information.	PE
show diffserv service interface	Displays policy service information for the specified interface and direction.	PE
show diffserv service brief	Displays all interfaces in the system to which a DiffServ policy has been attached.	PE
show interfaces cos-queue	Displays the class-of-service queue configuration for the specified interface.	PE
show interfaces random-detect	Displays the WRED policy on an interface.	PE
show interfaces traffic	Displays traffic information.	PE
show interfaces utilization	Displays the interface utilization.	PE
show policy-map	Displays all configuration information for the specified policy.	PE
show policy-map interface	Displays policy-oriented statistics information for the specified interface and direction.	PE
show service-policy	Displays a summary of policy-oriented statistics information for all interfaces.	PE
traffic-shape	Specifies the maximum transmission bandwidth limit for the interface as a whole.	GC or IC
vlan priority	Assigns a default VLAN priority tag for untagged frames ingressing an interface.	IC

a. For the meaning of each Mode abbreviation, see Mode Types.

Spanning Tree

Command	Description	Mode[a]
clear spanning-tree detected-protocols	Restarts the protocol migration process on all interfaces or on the specified interface.	PE
exit (mst)	Exits the MST configuration mode and applies configuration changes.	MC
instance (mst)	Maps VLANs to an MST instance.	MC
name (MST)	Defines the MST configuration name.	MC
revision (mst)	Defines the configuration revision number.	MC
show spanning-tree	Displays spanning tree configuration.	PE
show spanning-tree summary	Displays spanning tree settings and parameters for the switch.	PE
show spanning-tree vlan	Displays spanning tree information per VLAN and also lists the port roles and states as well as the port cost.	PE
spanning-tree	Enables spanning-tree functionality.	GC
spanning-tree auto-portfast	Sets the port to auto portfast mode.	IC
spanning-tree backbonefast	Enables the detection of indirect link failures and accelerate spanning tree convergence on STP-PV/RSTP-PV configured switches using Indirect Link Rapid Convergence (IRC).	GC
spanning-tree bpdu flooding	Allows flooding of BPDUs received on nonspanning-tree ports to all other non-spanning-tree ports.	GC
spanning-tree bpdu-protection	Enables BPDU protection on a switch.	GC
spanning-tree cost	Configures the spanning tree path cost for a port.	IC
spanning-tree disable	Disables spanning tree on a specific port.	IC
spanning-tree forward-time	Configures the spanning tree bridge forward time.	GC
spanning-tree guard	Selects whether loop guard or root guard is enabled on an interface.	IC

Command	Description	Mode[a]
spanning-tree loopguard	Enables loop guard on all ports.	GC
spanning-tree max-age	Configures the spanning tree bridge maximum age.	GC
spanning-tree max-hops	Sets the MSTP Max Hops parameter to a new value for the common and internal spanning tree.	GC
spanning-tree mode	Configures the spanning tree protocol.	GC
spanning-tree mst configuration	Enables configuring an MST region by entering the multiple spanning-tree (MST) mode.	GC
spanning-tree mst cost	Configures the path cost for multiple spanning tree (MST) calculations.	IC
spanning-tree mst port-priority	Configures port priority.	IC
spanning-tree mst priority	Configures the switch priority for the specified spanning tree instance.	GC
spanning-tree portfast	Enables portfast mode.	IC
spanning-tree portfast bpdufilter default	Discards BPDUs received on spanningtree ports in portfast mode.	GC
spanning-tree portfast default	Enables portfast mode on all ports.	GC
spanning-tree port-priority (Interface Configuration)	Configures port priority.	IC
spanning-tree priority	Configures the spanning tree priority.	GC
spanning-tree tcnguard	Prevents a port from propagating topology change notifications.	IC
spanning-tree transmit hold-count	Set the maximum number of BPDUs that a bridge is allowed to send within a hello time window (2 seconds).	GC
spanning-tree uplinkfast	Configures the rate at which gratuitous frames are sent after a switchover to an alternate port and enables Direct Link Rapid Convergence.	GC
spanning-tree vlan	Enables per VLAN spanning tree on a VLAN.	GC

Command	Description	Mode[a]
spanning-tree vlan forward-time	Configures the spanning tree forward delay time for a specified VLAN or a range of VLANs.	GC
spanning-tree vlan hello-time	Configures the spanning tree hello time for a specified VLAN or a range of VLANs.	GC
spanning-tree vlan max-age	Configures the spanning tree maximum age time for a set of VLANs.	GC
spanning-tree vlan root	Configures the switch to become the root bridge or standby root bridge.	GC
spanning-tree vlan priority	Configures the bridge priority of a VLAN.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

UDLD

Command	Description	Mode[a]
udld enable (Global Configuration)	Globally enable UDLD. UDLD must be globally enabled and enabled on an interface to operate.	GC
udld reset	Resets (enable) all interfaces disabled by UDLD.	PE
udld message time	Configures the interval between the transmission of UDLD probe messages on ports that are in the advertisement phase.	GC
udld timeout interval	Configures the interval for the receipt of ECHO replies.	GC
udld enable (Interface Configuration)	Enables UDLD on a specific interface.	IC
udld port	Selects the UDLD operating mode on a specific interface.	IC
show udld	Displays the global settings for UDLD.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

VLAN

Command	Description	Mode[a]
interface vlan	Enters the VLAN interface configuration mode.	GC
interface range vlan	Enters the interface configuration mode to configure multiple VLANs.	GC
name (VLAN Configuration)	Configures a name to a VLAN.	IC
private-vlan	Defines a private VLAN association between the primary and secondary VLANs.	VC
protocol group	Attaches a *vlan-id* to the protocol-based VLAN identified by *groupid*.	VC
protocol vlan group	Adds the Ethernet interface to the protocol-based VLAN identified by *groupid*.	IC
protocol vlan group all	Adds all Ethernet interfaces to the protocol-based VLAN identified by *groupid*.	GC
show dot1q-tunnel	Displays the QinQ status for each interface.	PE
show interfaces switchport	Displays switchport configuration.	PE or GC
show port protocol	Displays the Protocol-Based VLAN information for either the entire system or for the indicated group.	PE
show switchport ethertype	Displays the configured Ethertype for each interface.	PE
show vlan	Displays detailed information, including interface information and dynamic vlan type, for a specific VLAN.	PE
show vlan association mac	Displays the VLAN associated with a specific configured MAC address.	PE
show vlan association subnet	Displays the VLAN associated with a specific configured IP subnet.	PE
show vlan private-vlan	Displays information about the configured private VLANs.	PE

Command	Description	Mode[a]
switchport access vlan	Configures the PVID VLAN ID when the interface is in access mode.	IC
switchport dot1q ethertype (Global Configuration)	Defines additional QinQ tunneling TPIDs for matching in the outer VLAN tag of received frames.	GC
switchport general forbidden vlan	Forbids adding specific VLANs to a port.	IC
switchport general acceptable-frame-type tagged-only	Discards untagged frames at ingress.	IC
switchport general allowed vlan	Adds or removes VLANs from a port in General mode.	IC
switchport general ingress-filtering disable	Disables port ingress filtering.	IC
switchport general pvid	Configures the PVID when the interface is in general mode.	IC
switchport mode	Configures the VLAN membership mode of a port.	IC
switchport mode private-vlan	Defines a private VLAN association for an isolated or community interface or a mapping for a promiscuous interface.	IC
switchport mode dot1q-tunnel	Enables QinQ tunneling on customer edge (CE) interfaces.	IC
switchport private-vlan	Defines a private VLAN association for an isolated or community port or a mapping for a promiscuous port.	IC
switchport trunk	Adds or removes VLANs from a trunk port.	IC
switchport trunk encapsulation dot1q	Use this command for compatibility. This command performs no action.	IC or IR
vlan	Configures a VLAN.	GC
vlan association mac	Associates a MAC address to a VLAN.	VC
vlan association subnet	Associates an IP subnet to a VLAN.	VC

Command	Description	Mode[a]
vlan makestatic	Changes a GVRP dynamically created VLAN to a static VLAN.	GC
vlan protocol group	Adds protocol-based VLAN groups to the system.	GC
vlan protocol group add protocol	Adds a protocol to the protocol-based VLAN identified by *groupid*.	GC
vlan protocol group name	Adds a group name to the protocol-based VLAN identified by *groupid*.	GC
vlan protocol group remove	Removes the protocol-base VLAN group identified by *groupid*.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Switchport Voice VLAN

Command	Description	Mode[a]
switchport voice vlan	Enables the voice VLAN capability on the switch.	GG
switchport voice vlan (Interface)	Assigns the voice VLAN ID on the interface.	IC
switchport voice vlan priority	Trusts or not trusts the data traffic arriving on the voice VLAN port.	IC
switchport voice vlan dot1p	Configure voice VLAN 802.1p priority tagging for voice traffic.	IC
switchport voice vlan dscp	Configure dscp value for voice traffic on the voice VLAN port.	IC
switchport voice vlan none	Allow the IP phone to use its own configuration to send untagged voice traffic.	IC
switchport voice vlan override-authentication	Allow voice traffic on unauthorized voice VLAN port.	IC
switchport voice vlan untagged	Configure the phone to send untagged voice traffic.	IC
authentication event server dead action authorize voice	Allows voice VLAN access when no AAA server can be contacted.	IC

Command	Description	Mode[a]
show voice vlan	Displays various properties of the voice VLAN.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Multiple MAC Registration Protocol

Command	Description	Mode[a]
clear mmrp statistics	Clears the MMRP statistics for an interface or all interfaces.	PE
mmrp	Enables MMRP on a specific interface.	IC, IR
mmrp global	Globally enables MMRP.	GC
mmrp periodic state machine	Globally enables the MMRP periodic state machine.	GC
show mmrp	Displays the MMRP configuration for an interface or globally.	PE, GC
show mmrp statistics	Displays the MMRP statistics for an interface or globally.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Multiple VLAN Registration Protocol

Command	Description	Mode[a]
clear mvrp statistics	Clears the MVRP statistics for an interface or all interfaces.	PE
mvrp	Enables MVRP on a specific interface.	IC, IR
mvrp global	Globally enables MVRP.	GC
mvrp periodic state machine	Globally enables the MVRP periodic state machine.	GC
show mvrp	Displays the MVRP configuration for an interface or globally.	PE, GC
show mvrp statistics	Displays the MVRP statistics for an interface or globally.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Security Commands

AAA

Command	Description	Mode[a]
aaa accounting	Creates an accounting method list	GC
aaa accounting delay-start	Delays the sending of Acct-Start packets to RADIUS accounting server(s)	GC
aaa accounting update	Enables the sending of interim accounting packets to RADIUS accounting server(s).	GC
aaa authentication dot1x default	Specifies an authentication method for 802.1x clients.	GC
aaa authentication enable	Defines authentication method lists for accessing higher privilege levels.	GC
aaa authentication login	Defines login authentication.	GC
aaa authorization	Creates an authorization method list.	GC
aaa authorization network default radius	Enables the switch to accept VLAN assignment by the RADIUS server.	GC
aaa ias-user username	Configures IAS users and their attributes. Also changes the mode to aa user Configuration mode.	GC
aaa new-model	This command is a no-op command. It is present only for compatibility purposes.	GC
aaa server radius dynamic-author	Enters radius dynamic authorization mode.	GC
authentication command	Disables processing of RADIUS CoA requests to bounce the host port.	GC
authentication control-direction	Controls traffic flow for 801.2X unauthenticated interfaces.	IC
authentication critical recovery	Controls the load placed on RADIUS servers.	GC
authentication dynamic-vlan enable	Enables the switch to create VLANs dynamically when a RADIUS–assigned VLAN does not exist in the switch.	GC

Command	Description	Mode[a]
authentication enable	Globally enables the Authentication Manager.	GC
authentication event server dead action	Configures the actions to take when no authentication server is reachable.	IC
authentication event server alive action	Configures the actions to take when at least one authentication server is reachable.	IC
authentication open	Allows unauthenticated devices on 802.1X enabled interfaces access to network resources prior to authorization.	IC
authentication order	Sets the order of authentication methods used on a port.	IC
authentication priority	Sets the priority for the re-authentication methods used on a port.	IC
authentication timer restart	Sets the interval after which reauthentication starts.	IC
authentication violation	Configures the actions to take when more than the AAA-configured number of hosts attempts to authenticate on an interface.	IC
clear (IAS)	Deletes all IAS users.	PE
clear authentication statistics	Clears the authentication statistics.	PE
clear authentication authentication-history	Clears the authentication history logs.	PE
enable password	Sets a local password to control access to the normal level.	GC
ip admission proxy http redirect-url	Configures a URL to which HTTP or HTTPS requests are directed.	GC
ip admission proxy http redirect-tgt	Configures the address to which HTTP or HTTPS requests are redirected.	GC
ip dns domain-list	Configures a DNS hijack.	GC
ip http authentication	Specifies authentication methods for http.	GC
ip https authentication	Specifies authentication methods for https.	GC

Command	Description	Mode[a]
mab	Configures the switch to enable MAC Authentication Bypass (MAB) authentication for devices connected to the interface.	IC
password (AAA IAS User Configuration)	Configures a password for a user.	AAA
password (User Exec)	Specifies a user password	UE
show aaa ias-users	Displays configured IAS users and their attributes.	PE
show aaa statistics	Displays accounting statistics	PE
show accounting methods	Displays the configured accounting method lists.	PE
show accounting update	Shows the configuration of accounting updates.	PE, GC
show authentication	Shows information about authentication methods.	PE
show authentication authentication-history	Displays the authentication history on one or more interfaces.	PE
show authentication methods	Displays information about the authentication methods.	PE
show authentication statistics	Displays the Authentication Manager statistics on one or more interfaces.	PE
show authorization methods	Displays the configured authorization method lists.	PE
show mab	Displays the authenticated MAB clients.	PE, GC
show users accounts	Displays information about the local user database.	PE
show users login-history	Displays information about login histories of users.	PE
username	Establishes a username-based authentication system. Optionally allows the specification of an Administrative Profile for a local user.	GC

Command	Description	Mode[a]
username unlock	Transfers local user passwords between devices without having to know the passwords.	GC

a. For the meaning of each Mode abbreviation, see Mode Types

Administrative Profiles

Command	Description	Mode[a]
admin-profile	Creates an administrative profile.	GC
description (Administrative Profile Configuration)	Adds a description to an administrative profile.	APC
rule	Adds a rule to an administrative profile.	APC
show admin-profiles	Displays the administrative profiles.	PE
show admin-profiles brief	Lists the names of the administrative profiles defined on the switch.	PE
show cli modes	Lists the names of all the CLI modes.	PE
show users	Shows which administrative profiles have been assigned to local user accounts and to show which profiles are active for logged-in users.	PE
username	Optionally allows the specification of an Administrative Profile for a local user.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

E-mail Alerting

Command	Description	Mode[a]
logging email	Enables e-mail alerting and sets the lowest severity level for which log messages are e-mailed.	GC
logging email urgent	Sets the lowest severity level at which log messages are e-mailed in an urgent manner.	GC
logging email message-type to-addr	Sets the lowest severity level at which SNMP traps are logged.	GC
logging email message-type to-addr	Configures the To address field of the e-mail.	GC

Command	Description	Mode[a]
logging email from-addr	Configures the From address of the e-mail.	GC
logging email message-type subject	Configures the subject.	GC
logging email logtime	Configures the value of how frequently the queued messages are sent.	GC
logging email test message-type	Tests whether or not an e-mail is being sent to an SMTP server.	GC
show logging email statistics	Displays information on how many e-mails are sent, how many e-mails failed, when the last e-mail was sent, how long it has been since the last e-mail was sent, how long it has been since the e-mail changed to disabled mode.	PE
clear logging email statistics	Clears the e-mail alerting statistics.	GC
security	Sets the e-mail alerting security protocol.	MSC
mail-server ip-address | hostname	Configures the SMTP server IP address and changes the mode to Mail Server Configuration Mode.	GC
port (Mail Server Configuration Mode)	Configures the TCP port to use for communication with the SMTP servers.	MSC
username (Mail Server Configuration Mode)	Configures the username required by the authentication.	MSC
password (Mail Server Configuration Mode)	Configures the password required to authenticate to the e-mail server.	MSC
show mail-server	Displays the configuration of all the mail servers or a particular mail server.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

RADIUS

Command	Description	Mode[a]
acct-port	Sets the port that connects to the RADIUS accounting server.	R

Command	Description	Mode[a]
attribute 6	Configures processing of the RADIUS Service-Type attribute.	R
attribute 8	Configures the switch to send the RADIUS Framed-IP-Address attribute in the Access-Request message sent to a specific RADIUS authentication server.	R
attribute 25	Enables the switch to send the RADIUS Class attribute as supplied by the RADIUS server in accounting messages sent to the specific accounting server.	R
attribute mac format	Configures the format of the Original-Called-Number (30), Calling-Station-ID (31), NAS-Identifier (32) attributes sent to the RADIUS server in Access-Request and Acct-Request messages for a RADIUS server.	R
attribute 32	Configures the format of the NAS-Identifier sent to the RADIUS server in Access-Request and Acct-Request messages.	R
attribute 44	Enables sending the Acct-Session-ID in Access-Request messages.	R
attribute 168	Enables the switch to send the RADIUS Framed-IPv6-Address attribute in accounting messages sent to the RADIUS accounting server.	R
authentication event fail retry	Sets the number of times authentication may be reattempted by the user for the RADIUS method for an IEEE 802.1X supplicant.	GC
auth-port	Sets the port number for authentication requests of the designated radius server.	R
automate-tester	Configures liveness checking.	R
deadtime	Improves RADIUS response times when a server is unavailable by causing the unavailable server to be skipped.	R

Command	Description	Mode[a]
key	Sets the authentication and encryption key for all RADIUS communications between the switch and the RADIUS daemon.	R
msgauth	Enables the message authenticator attribute to be used for the RADIUS Authenticating server being configured.	R
name (RADIUS Server)	Assigns a list name to a RADIUS server	R
primary	Specifies that a configured server should be the primary server in the group of authentication servers which have the same server name.	R
priority	Specifies the order in which the servers are to be used, with 0 being the highest priority.	R
radius server attribute 4	Sets the network access server (NAS) IP address for the RADIUS server.	GC
radius server attribute 6	Enables the switch to send the RADIUS Service-Type attribute in authentication messages sent to the authentication server.	GC
radius server attribute 8	Enables the switch to send the RADIUS Framed-IP-Address attribute in authentication messages sent to the authentication server.	GC
radius server attribute 25	Globally enables the switch to send the RADIUS Class attribute as supplied by the RADIUS server in accounting messages sent to the accounting server.	GC
radius server attribute 32	Configures the content of the NAS-Identifier sent to the RADIUS server in Access-Request and Acct-Request messages.	GC
radius server attribute 44	Enables sending the Acct-Session-ID in Access-Request messages.	GC
radius server attribute mac format	Globally enables the switch to send the RADIUS Class attribute as supplied by the RADIUS server in accounting messages sent to the accounting server.	GC

Command	Description	Mode[a]
radius server attribute 168	Enables the switch to send the RADIUS Framed-IPv6-Address attribute in accounting messages sent to the RADIUS accounting server.	GC
radius server dead-criteria	Configures the condition upon which a RADIUS server is considered unreachable (dead).	GC
radius server deadtime	Improves RADIUS response times when servers are unavailable. Causes the unavailable servers to be skipped.	GC
radius server	Specifies a RADIUS server host.	GC
radius server key	Sets the authentication and encryption key for all RADIUS communications between the switch and the RADIUS daemon.	GC
radius server load-balance	Enables load balancing within RADIUS server lists.	GC
radius server retransmit	Specifies the number of times the software searches the list of RADIUS server hosts.	GC
radius server source-ip	Specifies the source IP address used for communication with RADIUS servers.	GC
radius server source-interface	Selects the interface from which to use the IP address in the source IP address field of transmitted RADIUS packets.	GC
radius server timeout	Sets the interval for which a switch waits for a RADIUS server to reply.	GC
radius server vsa send authentication	Enables the switch to process during authentication.	GC
retransmit	Specifies the number of times the software searches the list of RADIUS server hosts before stopping the search.	R
show aaa servers	Displays the list of configured RADIUS servers and the values configured for the global parameters of the RADIUS client.	UE or PE

Command	Description	Mode[a]
show radius statistics	Shows the statistics for an authentication or accounting server.	UE or PE
source-ip	Specifies the source IP address to be used for communication with RADIUS servers.	R
timeout	Sets the timeout value in seconds for the designated RADIUS server.	R
usage authmgr	Specifies the usage type of the server.	R

a. For the meaning of each Mode abbreviation, see Mode Types.

TACACS+

Command	Description	Mode[a]
key	Specifies the authentication and encryption key for all TACACS communications between the device and the TACACS server.	TC
port	Specifies a server port number.	TC
priority	Specifies the order in which servers are used.	TC
show tacacs	Displays TACACS+ server settings and statistics.	PE
tacacs-server host	Specifies a TACACS+ server host.	GC
tacacs-server key	Sets the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon.	GC
tacacs-server source-interface	Selects the interface from which to use the IP address in the source IP address field of transmitted TACACS packets.	GC
tacacs-server timeout	Sets the interval for which the switch waits for a server host to reply.	GC
timeout	Specifies the timeout value in seconds.	TC

a. For the meaning of each Mode abbreviation, see Mode Types.

802.1x

Command	Description	Mode[a]
dot1x eapolflood	Enables the flooding of received IEEE 802.1x frames in the VLAN.	GC
clear authentication sessions	Begins the initialization sequence on the specified port.	PE
mab	Enables MAB on an interface.	IC
default mab	Configures the switch to transmit EAP, PAP, or CHAP credentials to the RADIUS server for MAB-authenticated devices connected to the interface.	IC
mab request format attribute 1	Configures the format of the MAC address sent in the User-Name attribute.	IC, GC
mab request format attribute 2	Overrides the password sent in MAB Access Requests.	GC
dot1x max-reauth-req	Sets the maximum number of times that the switch sends Extensible Authentication Protocol EAP-Request/Identity frames to which no response is received before restarting the authentication process.	IC
dot1x max-req	Sets the maximum number of times the switch sends an EAP-request frame to the client before restarting the authentication process.	IC
dot1x max-start	Configures the number of EAPOL start frames that the switch supplicant sends to initiate authentication before it concludes that there is no authenticator connected.	IC
dot1x pae	Enables 802.1X on an interface and sets the interface role.	IC
authentication host-mode	Configures the host mode of an interface.	IC
authentication max-users	Sets the maximum number of clients supported on the port when multi-auth authentication is enabled on the port.	IC
authentication port-control	Enables manual control of the authorization state of the port.	IC

Command	Description	Mode[a]
authentication periodic	Enables periodic reauthentication of the client.	IC
clear dot1x statistics	Clears the statistics for a specified interface or all interfaces.	PE
dot1x supplicant user	Configures the shared secret used by the supplicant to authenticate.	IC
dot1x system-auth-control	Enables 802.1x globally.	GC
authentication monitor	Enables authentication monitor mode globally.	GC
dot1x timeout	Sets the values of the various 802.1x state machine timers.	IC
authentication timer reauthenticate	Sets the number of seconds between reauthentication attempts.	IC
auth-type	Sets the accepted authorization types for RADIUS CoA clients.	DRC
client	Sets the CoA client parameters.	DRC
ignore	Sets the switch to ignore certain authentication parameters from dynamic RADIUS clients.	DRC
port	Sets the port on which to listen for CoA and disconnect requests from authorized dynamic RADIUS clients.	DRC
server-key	Configures a global shared secret that is used for all dynamic RADIUS clients that do not have an individual shared secret configured.	DRC
show dot1x	Displays 802.1X status for the switch or the specified interface.	PE
show authentication authentication-history	Displays the dot1x authentication events and information during successful and unsuccessful dot1x authentication processes.	PE
show authentication clients	Displays detailed information about the users who have successfully authenticated on the system or on a specified port.	PE
show dot1x interface	Shows the status of MAC Authentication Bypass.	PE

Command	Description	Mode[a]
show dot1x interface statistics	Displays 802.1X statistics for the specified interface.	PE
clear authentication authentication–history	Clears the authentication history table captured during successful and unsuccessful authentication.	PE
authentication event no-response	Sets the guest VLAN on a port.	IC
authentication event fail	Specifies the unauthenticated VLAN on a port.	IC
show dot1x advanced	Displays 802.1X advanced features for the switch or specified interface.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Captive Portal

Command	Description	Mode[a]
authentication timeout	Configures the authentication timeout.	CP
captive-portal	Enables the captive portal configuration mode.	GC
enable	Globally enables captive portal.	CPI
http port	Configures an additional HTTP port for captive portal to monitor.	CP
https port	Configures an additional HTTPS port for captive portal to monitor.	CP
show captive-portal	Displays the status of captive portal.	PE
show captive-portal status	Reports the status of all captive portal instances in the system.	PE
block	Blocks all traffic for a captive portal configuration.	CPI
configuration	Enables the captive portal instance mode.	CP
enable	Enables a captive portal configuration.	CPI
group	Configures the group number for a captive portal configuration.	CPI

Command	Description	Mode[a]
interface	Associates an interface with a captive portal configuration.	CPI
locale	Associates an interface with a captive portal configuration.	CPI
name (Captive Portal)	Configures the name for a captive portal configuration.	CPI
protocol	Configures the protocol mode for a captive portal configuration.	CPI
redirect	Enables the redirect mode for a captive portal configuration.	CPI
redirect-url	Configures the redirect URL for a captive portal configuration.	CPI
session-timeout	Configures the session timeout for a captive portal configuration.	CPI
verification	Configures the verification mode for a captive portal configuration.	CPI
captive-portal client deauthenticate	De-authenticates a specific captive portal client.	PE
show captive-portal client status	Displays client connection details or a connection summary for connected captive portal users.	PE
show captive-portal configuration client status	Displays the clients authenticated to all captive portal configurations or a to specific configuration.	PE
show captive-portal interface client status	Displays information about clients authenticated on all interfaces or a specific interface.	PE
show captive-portal interface configuration status	Displays the clients authenticated to all captive portal configurations or a to specific configuration.	PE
clear captive-portal users	Deletes all captive portal user entries.	PE
no user	Deletes a user from the local user database.	CP

Command	Description	Mode[a]
show captive-portal user	Displays all configured users or a specific user in the captive portal local user database.	PE
user group	Associates a group with a captive portal user.	CP
user-logout	Enables captive portal users to log out of the portal.	CPI
user name	Modifies the user name for a local captive portal user.	CP
user password	Creates a local user or changes the password for an existing user.	CP
user session-timeout	Sets the session timeout value for a captive portal user.	CP
show captive-portal configuration	Displays the operational status of each captive portal configuration.	PE
show captive-portal configuration interface	Displays information about all interfaces assigned to a captive portal configuration or about a specific interface assigned to a captive portal configuration.	PE
show captive-portal configuration locales	Displays locales associated with a specific captive portal configuration.	PE
show captive-portal configuration status	Displays information about all configured captive portal configurations or a specific captive portal configuration.	PE
user group	Creates a user group.	CP
user group moveusers	Moves a group's users to a different group.	CP
user group name	Configures a group name.	CP

a. For the meaning of each Mode abbreviation, see Mode Types.

Denial of Service

Command	Description	Mode[a]
dos-control firstfrag	Enables Minimum TCP Header Size Denial of Service protection.	GC

Command	Description	Mode[a]
dos-control icmp	Enables Maximum ICMP Packet Size Denial of Service protections.	GC
dos-control l4port	Enables L4 Port Denial of Service protection.	GC
dos-control sipdip	Enables Source IP Address = Destination IP Address (SIP=DIP) Denial of Service protection.	GC
dos-control tcpflag	Enables TCP Flag Denial of Service protections.	GC
dos-control tcpfrag	Enables TCP Fragment Denial of Service protection.	GC
rate-limit cpu	Configures the rate in packets-per-second for the number of IPv6 data packets trapped to CPU when the packet fails to be forwarded in the hardware due to unresolved hardware address of the destined IPv6 node.	GC
show dos-control	Displays Denial of Service configuration information.	PE
show system internal pktmgr	Displays the configured CPU rate limit for unknown packets in packets per second.	PE
storm-control broadcast	Enables Broadcast storm control.	IC
storm-control multicast	Enables the switch to count multicast packets together with broadcast packets.	IC
storm-control unicast	Enables unicast storm control.	IC

a. For the meaning of each Mode abbreviation, see Mode Types.

Management ACL

Command	Description	Mode[a]
deny (management)	Defines a deny rule.	MA
management access-class	Defines which management access-list is used.	GC
management access-list	Defines a management access-list, and enters the access-list for configuration.	GC
no priority (management)	Removes a permit or deny condition from a Management Access list.	MA

Command	Description	Mode[a]
permit (management)	Defines a permit rule.	MA
show management access-class	Displays the active management access-list.	PE
show management access-list	Displays management access-lists.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Password Management

Command	Description	Mode[a]
passwords aging	Implements aging on the passwords such that users are required to change passwords when they expire.	GC
passwords history	Enables the administrator to set the number of previous passwords that are stored to ensure that users do not reuse their passwords too frequently.	GC
passwords lock-out	Enables the administrator to strengthen the security of the switch by enabling the user lockout feature. When a lockout count is configured, a user who is logging in must enter the correct password within that count.	GC
passwords min-length	Enables the administrator to enforce a minimum length required for a password.	GC
passwords strength-check	Enables the Password Strength feature.	GC
passwords strength minimum uppercase-letters	Enforces a minimum number of uppercase letters that a password should contain.	GC
passwords strength minimum lowercase-letters	Enforces a minimum number of lowercase letters that a password must contain.	GC
passwords strength minimum numeric-characters	Enforces a minimum number of numeric numbers that a password should contain.	GC
passwords strength minimum special-characters	Enforces a minimum number of special characters that a password may contain.	GC

Command	Description	Mode[a]
passwords strength max-limit consecutive-characters	Enforces a maximum number of consecutive characters that a password can contain.	GC
passwords strength max-limit repeated-characters	Enforces a maximum repeated characters that a password should contain.	GC
passwords strength minimum character-classes	Enforces the minimum number of character classes (uppercase letters, lowercase letters, numeric characters and special characters) that a password must contain.	GC
passwords strength exclude-keyword	Enforces a maximum number of consecutive characters that a password can contain.	GC
enable password encrypted	Used by an Administrator to transfer the enable password between devices without having to know the password.	PE
show passwords configuration	Displays the configuration parameters for password configuration.	PE
show passwords result	Displays the last password set result information.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

SSH

Command	Description	Mode[a]
crypto key generate dsa	Generates DSA key pairs for the switch.	GC
crypto key generate ecdsa	Generates an ECDSA key pair for SSH.	GC
crypto key generate rsa	Generates RSA key pairs for the switch.	GC
crypto key pubkey-chain ssh	Enters SSH Public Key-chain configuration mode.	GC
crypto key zeroize pubkey-chain	Erases all public key chains or the public key chain for a user.	GC
crypto key zeroize {rsa|dsa|ecdsa}	Deletes the RSA, DSA, or ECDSA keys from the switch.	GC
ip scp server enable	Enables SCP server functionality for SCP push operations on the switch.	GC

Command	Description	Mode[a]
ip ssh port	Specifies the port to be used by the SSH server.	GC
ip ssh pubkey-auth	Enables public key authentication for incoming SSH sessions.	GC
ip ssh server	Enables the switch to be configured from a SSH server connection.	GC
key-string	Manually specifies a SSH public key.	SK
ssh	Establishes an outboard connection to a remote SSH server from the switch console.	PE
ssh session-limit	Limits the number of outbound SSH sessions.	GC
ssh time-out	Configures the delay upon which idle SSH sessions are terminated.	GC
show crypto key mypubkey	Displays its own SSH public keys stored on the switch.	PE
show crypto key pubkey-chain ssh	Displays SSH public keys stored on the switch.	PE
show ip ssh	Displays the SSH server configuration.	PE
show ssh	Displays the outbound SSH configuration and session count.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Data Center Commands

OpenFlow

Command	Description	Mode[a]
controller	Configures a connection to an OpenFlow controller	OFC
hardware profile openflow	Selects the forwarding mode for the OpenFlow hybrid capability.	GC
ipv4 address	Assigns the IPv4 source address utilized for controller connections.	OFC

Command	Description	Mode[a]
mode	Configures the selection of interfaces used to assign the IP address utilized for controller connections.	OFC
openflow	Enables OpenFlow on the switch (if disabled) and enters into OpenFlow configuration mode.	GC
passive	Sets the switch to wait for the controller to initiate the connection.	OFC
protocol-version	Selects the version of the protocol in which to operate.	OFC
show openflow	Displays OpenFlow configuration and status.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Layer 3 Routing Commands

ARP (IPv4)

Command	Description	Mode[a]
arp	Creates an Address Resolution Protocol (ARP) entry.	GC
arp cachesize	Configures the maximum number of entries in the ARP cache.	GC
arp dynamicrenew	Enables the ARP component to automatically renew dynamic ARP entries when they age out.	GC
arp purge	Causes the specified IP address to be removed from the ARP cache.	PE
arp resptime	Configures the ARP request response timeout.	GC
arp retries	Configures the ARP count of maximum request for retries.	GC
arp timeout	Configures the ARP entry age-out time.	GC
clear arp-cache	Removes all ARP entries of type dynamic from the ARP cache.	PE

Command	Description	Mode[a]
clear arp-cache management	Removes all entries from the ARP cache learned from the management port.	PE
ip local-proxy-arp	Enables proxying of ARP requests.	IC
ip proxy-arp	Enables proxy ARP on a router interface.	IC
show arp	Displays the Address Resolution Protocol (ARP) cache.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

BFD

Command	Description	Mode[a]
feature bfd	Enables BFD on the router.	GC
bfd echo	Enables BFD echo mode on an interface.	IC
bfd interval	Configures BFD session parameters for a VLAN routing interface.	IC
bfd slow-timer	Configures the BFD periodic slow transmission interval for BFD Control packets.	GC
ip ospf bfd	Enable sending of BFD events to OSPF on a VLAN routing interface.	IC
ipv6 ospf bfd	Enables sending of BFD events to OSPF on a VLAN routing interface.	IC
neighbor fall-over bfd	Enables BFD support for a BGP neighbor.	RBC
show bfd neighbor	Displays the neighbors for which BFD has established adjacencies.	PE or GC

a. For the meaning of each Mode abbreviation, see Mode Types.

BGP

Command	Description	Mode[a]
router bgp	Enables BGP and identify the autonomous system (AS) number for the router.	GC

Command	Description	Mode[a]
address-family	Configures policy parameters within a peer template to be applied to a specific address family	PTC
address-family ipv4 vrf	Enters IPv4 VRF configuration mode for a particular VRF instance to configure the BGP VRF parameters.	BR
address-family ipv6	Specifies IPv6 configuration parameters.	BR
aggregate-address	Configures a summary address for BGP.	BR or IPAF
bgp aggregate-different-meds (BGP Router Configuration)	Controls the aggregation of routes with different multi-exit discriminator (MED) attributes.	BR
bgp aggregate-different-meds (IPv6 Address Family Configuration)	Allows IPv6 routes with different MEDs to be aggregated.	IPAF
bgp always-compare-med	Compares MED values during the decision process in paths received from different autonomous systems.	BR IPAF
bgp client-to-client reflection (BGP Router Configuration)	Enables client-to-client reflection.	BR
bgp client-to-client reflection (IPv6 Address Family Configuration)	Enables client-to-client reflection.	IPAF
bgp cluster-id	Specifies the cluster ID of a route reflector.	BR
bgp default local-preference	Enables the network operator to specify the default local preference.	BR
bgp fast-external-fallover	Configures BGP to immediately reset the adjacency with an external peer if the routing interface to the peer goes down.	BR
bgp fast-internal-fallover	Configures BGP to immediately reset the adjacency with an internal peer when there is a loss of reachability to an internal peer.	BR

Command	Description	Mode[a]
bgp listen	Creates an IPv4 listen range and associates it with the specified peer template.	BR, IPAF
bgp log-neighbor-changes	Enables logging of adjacency state changes.	BR
bgp maxas-limit	Specifies a limit on the length of AS Paths that BGP accepts from its neighbors.	BR
bgp router-id	Sets the BGP router ID.	BR
clear ip bgp	Resets peering sessions with all of a subnet of BGP peers.	PE
clear ip bgp counters	Resets all BGP counters to 0.	PE
default-information originate (BGP Router Configuration)	Enables BGP to originate a default route.	BR
default-information originate (IPv6 Address Family Configuration)	Allows BGP to originate an IPv6 default route.	IPAF
default metric (BGP Router Configuration)	Sets the value of the MED attribute on routes redistributed into BGP when no metric has been specified.	BR
default metric (IPv6 Address Family Configuration)	Sets the metric of redistributed IPv6 routes when a metric is not configured in the redistribute command.	IPAF
distance	Sets the preference of BGP routes to specific destinations.	IPAF
distance bgp (BGP Router Configuration)	Sets the preference of BGP routes.	BR
distance bgp (IPv6 Address Family Configuration)	Sets the preference of BGP routes.	IPAF
distribute-list prefix in	Configures a filter that restricts the routes that BGP accepts from all neighbors based on destination prefix.	BR IPAF
distribute-list prefix out (BGP Router Configuration)	Configures a filter that restricts the advertisement of routes based on destination prefix.	BR

Command	Description	Mode[a]
distribute-list prefix out (IPv6 Address Family Configuration)	Applies an IPv6 prefix list to IPv6 routes advertised via BGP.	IPAF
enable	Globally enables BGP.	BR
ip as-path access-list	Creates an AS path access list.	GC
ip bgp-community new-format	Displays BGP standard communities in AA:NN format.	GC
ip bgp fast-external-fallover	Configures fast external failover behavior for a specific routing interface.	IC
ip community-list	Creates or configures a BGP community list.	GC
ip extcommunity-list	Creates an extended community list to configure VRF route filtering.	GC
match extcommunity	Matches BGP extended community list attributes.	RM
maximum-paths (BGP Router Configuration)	Specifies the maximum number of next hops BGP may include in an Equal Cost Multipath (ECMP) route derived from paths received from neighbors outside the local autonomous system.	BR
maximum-paths (IPv6 Address Family Configuration)	Limits the number of ECMP next hops in IPv6 routes from external peers.	IPAF
maximum-paths ibgp (BGP Router Configuration)	Specifies the maximum number of next hops BGP may include in an Equal Cost Multipath (ECMP) route derived from paths received from neighbors within the local autonomous system.	BR
maximum-paths ibgp (IPv6 Address Family Configuration)	Limits the number of ECMP next hops in IPv6 routes from internal peers.	IPAF
neighbor activate	Enables the exchange of IPv6 routes with a neighbor.	IPAF, IPAF4

Command	Description	Mode[a]
neighbor advertisement-interval (BGP Router Configuration)	Configures the minimum time that must elapse between advertisements of the same route to a given neighbor.	BR
neighbor advertisement-interval (IPv6 Address Family Configuration)	Controls the time between sending Update messages containing IPv6 routes.	IPAF
neighbor allowas-in	Configures BGP to accept prefixes even if the local ASN is part of the AS_PATH.	BR
neighbor connect-retry-interval	Configure the initial connection retry time for a specific neighbor.	BR
neighbor default-originate (BGP Router Configuration)	Configures BGP to originate a default route to a specific neighbor.	BR
neighbor default-originate (IPv6 Address Family Configuration)	Configures BGP to originate a default IPv6 route to a specific neighbor.	IPAF
neighbor description	Records a text description of a neighbor.	BR
neighbor ebgp-multihop	Configures BGP to form neighborship with external peers that are not directly connected.	BR, IPAF
neighbor filter-list (BGP Router Configuration)	Filters advertisements to or from a specific neighbor according to the advertisement's AS Path.	BR
neighbor filter-list (IPv6 Address Family Configuration)	Filters BGP to apply an AS path access list to UPDATE messages received from or sent to a specific neighbor.	IPAF
neighbor inherit peer	Configures a BGP peer to inherit peer configuration parameters from a peer template.	BR
neighbor local-as	Configures BGP to advertise the local-as instead of the router's own AS in the routes advertised to the neighbor.	BR, IPAF
neighbor maximum-prefix (BGP Router Configuration)	Configures the maximum number of IPv4 prefixes that BGP will accept from a specified neighbor.	BR

Command	Description	Mode[a]
neighbor maximum-prefix (IPv6 Address Family Configuration)	Specifies the maximum number of IPv6 prefixes that BGP will accept from a given neighbor.	IPAF
neighbor next-hop-self (BGP Router Configuration)	Configures BGP to set the next hop attribute to a local IP address when advertising a route to an internal peer.	BR
neighbor next-hop-self (IPv6 Address Family Configuration)	Configures BGP to use a local address as the IPv6 next hop when advertising IPv6 routes to a specific peer.	IPAF
neighbor password	Enables MD5 authentication of TCP segments sent to and received from a neighbor, and to configure an authentication key.	BR
neighbor prefix-list (BGP Router Configuration)	Filters advertisements sent to a specific neighbor based on the destination prefix of each route.	BR
neighbor prefix-list (IPv6 Address Family Configuration)	Specifies an IPv6 prefix list to filter routes received from or advertised to a given peer.	IPAF
neighbor remote-as	Configures a neighbor and identify the neighbor's autonomous system.	BR
neighbor remove-private-as	Removes private AS numbers when advertising IPv4 routes to an external peer.	BR
neighbor rfc5549-support	Enables advertisement of IPv4 routes over IPv6 next hops selectively to an external BGP IPv6 peer.	BR
neighbor route-map (BGP Router Configuration)	Applies a route map to incoming or outgoing routes for a specific neighbor.	BR
neighbor route-map (IPv6 Address Family Configuration)	Specifies a route map to be applied to inbound or outbound IPv6 routes.	IPAF
neighbor route-reflector-client (BGP Router Configuration)	Configures an internal peer as an IPv4 route reflector client.	BR

Command	Description	Mode[a]
neighbor route-reflector-client (IPv6 Address Family Configuration)	Configures an internal peer as an IPv4 route reflector client.	IPAF
neighbor send-community (BGP Router Configuration)	Configures the local router to send the BGP communities attribute in UPDATE messages to a specific neighbor.	BR
neighbor send-community (IPv6 Address Family Configuration)	Tells BGP to send the COMMUNITIES attribute with routes advertised to the peer.	IPAF
neighbor shutdown	Administratively disables communications with a specific BGP neighbor.	BR, IPAF
neighbor timers	Overrides the global keepalive and hold timer values as well as set the keepalive and hold timers for a specific neighbor.	BR
neighbor update-source	Configures BGP to use a specific IP address as the source address for the TCP connection with a neighbor.	BR
network (BGP Router Configuration)	Configures BGP to advertise an address prefix.	BR
network (IPv6 Address Family Configuration)	Identifies network IPv6 prefixes that BGP originates in route advertisements to its neighbors.	IPAF
redistribute (BGP)	Configures BGP to advertise routes learned by means outside of BGP. BGP can redistribute local (connected), static, OSPF, and RIP routes.	BR
redistribute (BGP IPv6)	Configures BGP to redistribute non-BGP routes from the IPv6 routing table.	IPAF
route-target	Creates a list of export, import, or both route target (RT) extended communities for the specified VRF instance.	PE
set extcommunity rt	Sets BGP extended community attributes for the route target.	RMC
set extcommunity soo	Sets BGP extended community attributes for the site of origin.	RMC

Command	Description	Mode[a]
show bgp ipv6	Displays IPv6 routes in the BGP routing table.	UE, PE, GC
show bgp ipv6 aggregate-address	Displays the configured IPv6 aggregate addresses and indicates if each address is currently active.	PE
show bgp ipv6 community	Displays the IPv6 routes that belong to the specified set of communities.	PE
show bgp ipv6 community-list	Displays the IPv6 routes that match a specified community list.	PE
show bgp ipv6 listen range	Displays information about IPv6 BGP listen ranges.	PE
show bgp ipv6 neighbors	Displays neighbors with IPv4 or IPv6 peer addresses that are enabled for the exchange of IPv6 prefixes.	PE
show bgp ipv6 neighbors advertised-routes	Displays IPv6 routes advertised to a specific neighbor.	PE
show bgp ipv6 neighbors policy	Displays the inbound and outbound IPv6 policies configured for a specific peer.	PE
show bgp ipv6 neighbors received-routes	Displays a list of IPv6 routes received from a specific neighbor.	PE
show bgp ipv6 statistics	Displays statistics for the IPv6 decision process.	UE, PE, GC
show bgp ipv6 summary	Displays a summary of BGP configuration and status.	UE, PE, GC
show bgp ipv6 update-group	Reports the status of IPv6 outbound groups and their members.	PE
show bgp ipv6 route-reflection	Displays a summary of BGP route reflection.	PE
show ip bgp	Displays BGP routes.	UE

Command	Description	Mode[a]
show ip bgp aggregate-address	Lists the aggregate addresses that have been configured and indicates whether each is currently active.	PE
show ip bgp community	Displays a BGP community.	PE
show ip bgp community-list	Lists the routes that are allowed by the specified community list.	PE
show ip bgp extcommunity-list	Displays all the permit and deny attributes of the given extended community list.	PE, GC
show ip bgp listen range	Displays information about IPv4 BGP listen ranges.	PE
show ip bgp neighbors	Shows details about BGP neighbor configuration and status.	UE
show ip bgp neighbors advertised-routes	Displays the list of routes advertised to a specific neighbor.	PE
show ip bgp neighbors received-routes	Displays the list of routes received from a specific neighbor.	PE
show ip bgp neighbors policy	Displays the inbound and outbound IPv4 policies configured for a specific peer.	PE
show ip bgp route-reflection	Displays all global configuration related to IPv4 route reflection, including the cluster ID and whether client-to-client route reflection is enabled, and lists all the neighbors that are configured as route reflector clients.	PE
show ip bgp statistics	Displays recent decision process history.	UE
show ip bgp summary	Displays a summary of BGP configuration and status.	UE
show ip bgp template	Lists the routes that are allowed by the specified community list.	PE
show ip bgp traffic	Lists the routes that are allowed by the specified community list.	UE
show ip bgp update-group	Reports the status of IPv4 outbound update groups and their members.	PE

Command	Description	Mode[a]
show ip bgp vpn4	Displays the VPNv4 address information from the BGP table.	PE, GC
template peer	Creates a BGP peer template and enters peer template configuration mode.	BR
timers bgp	Configures the default keepalive and hold timers that BGP uses for all neighbors unless specifically overridden by the **neighbor timers** command.	BR
timers policy-apply delay	Configures the delay after which any change to the global or per BGP neighbor inbound/outbound policies are applied.	BR
graceful-restart	Enables the graceful restart and the graceful restart helper capability.	BR
graceful-restart-helper	Enables the graceful restart helper capability.	BR

a. For the meaning of each Mode abbreviation, see Mode Types.

BGP Routing Policy

Command	Description	Mode[a]
ip as-path access-list	Create an AS path access list.	GC
ip bgp-community new-format	Displays BGP standard communities in AA:NN format.	GC
ip community-list	Creates or configures a BGP community list.	GC
ip prefix-list	Creates a prefix list or adds a prefix list entry.	GC
ip prefix-list description	Applies a text description to a prefix list.	GC
ipv6 prefix-list	Creates an IPv6 prefix list or add an IPv6 prefix list entry.	GC
match as-path	Adds criteria that matches BGP autonomous system paths against an AS path access list to a route map.	RM
match community	Configures a route map to match based on a BGP community list.	RM

Command	Description	Mode[a]
match ip address prefix-list	Configures a route map to match based on a destination prefix.	RM
match ipv6 address prefix-list	Configures a route map to match based on an IPv6 destination prefix.	RM
show ip as-path-access-list	Displays the contents of AS path access lists.	PE or GC
show ip community-list	Displays the contents of AS path access lists.	PE or GC
show ip prefix-list	Displays the contents of IPv4 prefix lists.	PE or GC
show ipv6 prefix-list	Displays the contents of IPv6 prefix lists.	PE or GC
clear ip prefix-list	Resets the IPv4 prefix-list counters.	PE
clear ipv6 prefix-list	Resets the IPv6 prefix-list counters.	PE
clear ip community-list	Resets the IPv6 prefix-list counters.	PE
set as-path	Prepends one or more AS numbers to the AS path in a BGP route.	RC
set comm-list delete	Removes BGP communities from an inbound or outbound UPDATE message.	RM
set community	Modifies the communities attribute of matching routes.	RM
set ipv6 next-hop (BGP)	Sets the IPv6 next hop of a route.	RM
set local-preference	Sets the local preference of specific BGP routes.	RM
set metric	Sets the metric of a route.	RM

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCP Server and Relay Agent (IPv4)

Command	Description	Mode[a]
ip dhcp pool	Defines a DHCP address pool that can be used to supply addressing information to DHCP client. This command puts the user into DHCP Pool Configuration mode.	GC
bootfile	Sets the name of the image for the DHCP client to load.	DP
clear ip dhcp binding	Removes automatic DHCP server bindings.	PE
clear ip dhcp conflict	Removes DHCP server address conflicts.	PE
client-identifier	Identifies a a Microsoft® DHCP client to be manually assigned an address.	DP
client-name	Specifies the host name of a DHCP client.	DP
default-router	Sets the IPv4 address of one or more routers for the DHCP client to use.	DP
dns-server (IP DHCP Pool Config)	Sets the IPv4 DNS server address which is provided to a DHCP client by the DHCP server.	DP
domain-name (IP DHCP Pool Config)	Sets the DNS domain name which is provided to a DHCP client by the DHCP server.	DP
hardware-address	Specifies the MAC address of a client to be manually assigned an address.	DP
host	Specifies a manual binding for a DHCP client host.	DP
ip dhcp bootp automatic	Enables automatic BOOTP address assignments.	GC
ip dhcp conflict logging	Enables DHCP address conflict detection.	GC
ip dhcp excluded-address	Excludes one or more DHCP addresses from automatic assignment.	GC
ip dhcp ping packets	Configures the number of pings sent to detect if an address is in use prior to assigning an address from the DHCP pool.	GC
lease	Sets the period for which a dynamically assigned DHCP address is valid.	DP

Command	Description	Mode[a]
netbios-name-server	Configures the IPv4 address of the Windows® Internet Naming Service (WINS) for a Microsoft DHCP client.	DP
netbios-node-type	Sets the NetBIOS node type for a Microsoft DHCP client.	DP
network	Defines a pool of IPv4 addresses for distributing to clients.	DP
next-server	Sets the IPv4 address of the TFTP server to be used during auto-install.	DP
option	Supplies arbitrary configuration information to a DHCP client.	DP
service dhcp	Enables local IPv4 DHCP server on the switch.	GC
sntp	Sets the IPv4 address of the NTP server to be used for time synchronization of the client.	DP
show ip dhcp binding	Displays the configured DHCP bindings.	PE
show ip dhcp conflict	Displays DHCP address conflicts for all relevant interfaces or a specified interface.	PE
show ip dhcp global configuration	Displays the DHCP global configuration.	PE
show ip dhcp pool	Displays the configured DHCP pool or pools.	UE or PE
show ip dhcp server statistics	Displays the DHCP server binding and message counters.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCPv6

Command	Description	Mode[a]
clear ipv6 dhcp	Clears DHCPv6 statistics for all interfaces or for a specific interface.	PE
dns-server (IPv6 DHCP Pool Config)	Sets the IPv6 DNS server address which is provided to a DHCPv6 client by the DHCPv6 server.	v6DP

Command	Description	Mode[a]
domain-name (IPv6 DHCP Pool Config)	Sets the DNS domain name which is provided to a DHCPv6 client by the DHCPv6 server.	v6DP
ipv6 dhcp pool	Enters IPv6 DHCP Pool Configuration mode.	GC
ipv6 dhcp relay	Configures an interface for DHCPv6 Relay functionality.	IC
ipv6 dhcp server	Configures DHCPv6 server functionality on an interface.	IC
prefix-delegation	Defines Multiple IPv6 prefixes within a pool for distributing to specific DHCPv6 Prefix delegation clients.	v6DP
service dhcpv6	Enables DHCPv6 configuration on the router.	GC
show ipv6 dhcp	Displays the DHCPv6 server name and status.	PE
show ipv6 dhcp binding	Displays the configured DHCP pool.	PE
show ipv6 dhcp interface	Displays DHCPv6 information for all relevant interfaces or a specified interface.	UE, PE, GC
show ipv6 dhcp pool	Displays the configured DHCP pool.	PE
show ipv6 dhcp statistics	Displays the DHCPv6 server name and status.	UE

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCPv6 Snooping

Command	Description	Mode[a]
clear ipv6 dhcp snooping binding	Clears all IPv6 DHCP snooping entries.	UE or PE
clear ipv6 dhcp snooping statistics	Clears all IPv6 DHCP snooping statistics.	UE or PE
ipv6 dhcp snooping	Globally enables IPv6 DHCP snooping.	GC
ipv6 dhcp snooping vlan	Enables IPv6 DHCP snooping on a set of VLANs.	GC
ipv6 dhcp snooping binding	Configures a static IPv6 DHCP snooping binding.	GC

Command	Description	Mode[a]
ipv6 dhcp snooping database	Configures the persistent location of the DHCP snooping database.	GC
ipv6 dhcp snooping database write-delay	Configures the time period between successive writes of the binding database.	GC
ipv6 dhcp snooping limit	Configures an interface to disable itself if the rate of received DHCP messages exceeds the configured limit.	IC
ipv6 dhcp snooping log-invalid	Configures the port to log invalid received DHCP messages.	IC
ipv6 dhcp snooping trust	Configures the port as trusted.	IC
ipv6 dhcp snooping verify mac-address	Enables the additional verification of the source MAC address with the client hardware address in the received DHCP message.	GC
ipv6 verify binding	Configures a static IP source guard binding.	GC
ipv6 verify source	Configures an interface to filter incoming traffic from sources that are not present in the DHCP binding database.	IC
show ipv6 dhcp snooping	Displays the IPv6 DHCP snooping configuration.	UE or PE
show ipv6 dhcp snooping binding	Displays the IPv6 DHCP snooping configuration.	UE or PE
show ipv6 dhcp snooping database	Displays IPv6 DHCP snooping configurations related to database persistency.	UE or PE
show ipv6 dhcp snooping statistics	Displays IPv6 DHCP snooping filtration statistics.	UE or PE
show ipv6 source binding	Displays the IPv6 source guard configurations on all ports, an individual port, or on a VLAN.	UE or PE
show ipv6 verify	Displays the IPv6 Source Guard configuration on all interfaces or the specified interface.	UE or PE
show ipv6 verify source	Displays the Ipv6 source guard configurations on all ports.	UE or PE

a. For the meaning of each Mode abbreviation, see Mode Types.

DVMRP

Command	Description	Mode[a]
router bgp	Sets the administrative mode of DVMRP in the router to active.	GC or IC
ip dvmrp metric	Configures the metric for an interface.	IC
show ip dvmrp	Displays the system-wide information for DVMRP.	PE
show ip dvmrp interface	Displays the interface information for DVMRP on the specified interface.	PE
show ip dvmrp neighbor	Displays the neighbor information for DVMRP.	PE
show ip dvmrp nexthop	Displays the next hop information on outgoing interfaces for routing multicast datagrams.	PE
show ip dvmrp prune	Displays the table that lists the router's upstream prune information.	PE
show ip dvmrp route	Displays the multicast routing information for DVMRP.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

GMRP

Command	Description	Mode[a]
gmrp enable	Enables GMRP globally or on a port.	GC or IC
clear gvrp statistics	Clears all the GMRO statistics information.	PE
show gmrp configuration	Displays GMRP configuration.	GC or IC

a. For the meaning of each Mode abbreviation, see Mode Types.

IGMP

Command	Description	Mode[a]
ip igmp last-member-query-count	Sets the number of Group-Specific Queries sent before the router assumes that there are no local members on the interface.	IC
ip igmp last-member-query-interval	Configures the Maximum Response Time inserted in Group-Specific Queries which are sent in response to Leave Group messages.	IC
ip igmp mroute-proxy	Configures downstream IGMP proxy on the selected VLAN interface associated with multicast hosts.	IC
ip igmp query-interval	Configures the query interval for the specified interface. The query interval determines how fast IGMP Host-Query packets are transmitted on this interface.	IC
ip igmp query-max-response-time	Configures the maximum response time interval for the specified interface.	IC
ip igmp robustness	Configures the robustness that allows tuning of the interface.	IC
ip igmp startup-query-count	Sets the number of queries sent out on startup—at intervals equal to the startup query interval for the interface.	IC
ip igmp startup-query-interval	Sets the interval between general queries sent at startup on the interface.	IC
ip igmp version	Configures the version of IGMP for an interface.	IC
show ip igmp	Displays system-wide IGMP information.	PE
show ip igmp groups	Displays the registered multicast groups on the interface.	PE
show ip igmp interface	Displays the IGMP information for the specified interface.	PE
show ip igmp membership	Displays the list of interfaces that have registered in the multicast group.	PE

Command	Description	Mode[a]
show ip igmp interface stats	Displays the IGMP statistical information for the interface.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IGMP Proxy

Command	Description	Mode[a]
arp	Enables the IGMP Proxy on the router.	IC
ip igmp proxy-service reset-status	Resets the host interface status parameters of the IGMP Proxy router.	IC
ip igmp proxy-service unsolicit-rprt-interval	Sets the unsolicited report interval for the IGMP Proxy router.	IC
show ip igmp proxy-service	Displays a summary of the host interface status parameters.	PE
show ip igmp proxy-service interface	Displays a detailed list of the host interface status parameters.	PE
show ip igmp-proxy groups	Displays a table of information about multicast groups that IGMP Proxy reported.	PE
show ip igmp proxy-service groups detail	Displays complete information about multicast groups that IGMP Proxy has reported.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IP Helper/DHCP Relay

Command	Description	Mode[a]
ip dhcp relay maxhopcount	Configures the maximum allowable relay agent hops for BootP/DHCP Relay on the system.	GC
ip dhcp relay minwaittime	Configures the minimum wait time in seconds for BootP/DHCP Relay on the system.	GC
clear ip helper statistics	Resets (to 0) the statistics displayed in show ip helper statistics.	PE

Command	Description	Mode[a]
ip dhcp relay information check	Enables DHCP Relay to check that the relay agent information option in forwarded BOOTREPLY messages is valid.	GC
ip dhcp relay information check-reply	Enables DHCP Relay to check that the relay agent information option in forwarded BOOTREPLY messages is valid.	IC
ip dhcp relay information option	Enables the circuit ID option and remote agent ID mode for BootP/DHCP Relay on the system (also called option 82).	GC
ip dhcp relay information option-insert	Enables the circuit ID option and remote agent ID mode for BootP/DHCP Relay on the circuit ID option and remote agent ID mode for BootP/DHCP Relay on the interface (also called option 82).	GC
ip dhcp relay information option server-override	Enables sending sub-option 5 (link-election) and sub-option 11 (server override) in option 82.	GC, IC
ip dhcp relay source-interface	Configures a DHCP Relay source interface IP address.	GC, IC
ip helper-address (global configuration)	Configures the relay of certain UDP broadcast packets received on any interface.	GC
ip helper-address (interface configuration)	Configures the relay of certain UDP broadcast packets received on a specific interface.	IC
ip helper enable	Enables relay of UDP packets.	GC
show ip helper-address	Displays the IP helper address configuration.	PE
show ip dhcp relay	Displays the BootP/DHCP Relay information.	UE or PE
show ip helper statistics	Displays the number of DHCP and other UDP packets processed and relayed by the UDP relay agent.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IP Routing

Command	Description	Mode[a]
encapsulation	Configures the link layer encapsulation type for the packet.	IC
ip icmp echo-reply	Configures an IP address on an interface.	GC
ip icmp error-interval	Limits the rate at which IPv4 ICMP error messages are sent.	GC
ip load-sharing	Configures the hash algorithm for ECMP routes.	GC
ip directed-broadcast	Enables the forwarding of network-directed broadcasts.	IC
ip policy route-map	Applies a route map on an interface.	IC
ip redirects	Enables the generation of ICMP Redirect messages.	IC
ip route	Configures a static route. Use the no form of the command to delete the static route.	GC
ip route default	Configures the default route. Use the no form of the command to delete the default route.	GC
ip route distance	Sets the default distance (preference) for static routes.	GC
ip routing	Globally enables IPv4 routing on the router.	GC
ip unnumbered	Identifies an interface as an unnumbered interface and specifies the numbered interface providing the borrowed address.	IC
ip unnumbered gratuitous-arp accept	Enables installation of a static interface route to the unnumbered peer upon receiving a gratuitous ARP.	IC
ip unreachables	Enables the generation of ICMP Destination Unreachable messages.	IC
match ip address	Specify IP address match criteria for a route map.	RM
match length	Configures packet length matching criteria for a route map.	RM

Command	Description	Mode[a]
match mac-list	Configures MAC ACL match criteria for a route map.	RM
route-map	Creates a policy based route map.	GC
set interface null0	Routes packets to interface null 0.	RM
set ip default next-hop	Sets a list of default next-hop IP addresses to be used if no explicit route for the packet's destination address appears in the routing table.	RM
set ip next-hop	Specifies the adjacent next-hop router in the path toward the destination to which the packets should be forwarded.	RM
set ip precedence	Sets the IP precedence bits in the IP packet header.	RM
show ip brief	Displays all the summary information of the IP.	PE
show ip interface	Displays all pertinent information about the IP interface.	UE, PE, or GC
show ip policy	Displays the route maps used for policy based routing on the router interfaces.	PE
show ip protocols	Displays the parameters and current state of the active routing protocols.	PE
show ip route	Displays the routing table.	PE
show ip route preferences	Displays detailed information about the route preferences.	PE
show ip route summary	Shows the number of all routes, including best and non-best routes.	PE
show ip traffic	Displays IP statistical information.	UE or PE
show ip vlan	Displays the VLAN routing information for all VLANs with routing enabled.	PE
show route-map	Displays the route maps.	PE
show routing heap summary	Displays a summary of the memory allocation from the routing heap.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 Routing

Command	Description	Mode[a]
arp	Clears all entries in the IPv6 neighbor table or an entry on a specific interface.	PE
clear ipv6 neighbors	Clears all entries in the IPv6 neighbor table or an entry on a specific interface.	PE, VRC
clear ipv6 ospf	Disables and reenables OSPF.	PE, VRC
clear ipv6 ospf configuration	Resets the OSPF configuration to factory defaults.	PE, VRC
clear ipv6 ospf counters	Resets global and interface statistics.	PE, VRC
clear ipv6 ospf neighbor	Drops the adjacency with all OSPF neighbors.	PE, VRC
clear ipv6 ospf redistribution	Flushes all self-originated external LSAs.	PE, VRC
clear ipv6 ospf stub-router	Forces OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation.	PE, VRC
clear ipv6 statistics	Clears IPv6 statistics for all interfaces or for a specific interface, including loopback and tunnel interfaces.	PE
ipv6 address	Configures an IPv6 address on an interface (including tunnel and loopback interfaces).	IC
ipv6 enable	Globally enables IPv6 routing.	GC
ipv6 hop-limit	Configures the hop limit used in IPv6 PDUs originated by the router.	GC, VR
ipv6 host	Defines static host name-to-IPv6 address mapping in the host cache.	GC
ipv6 mld last-member-query-count	Sets the number of listener-specific queries sent before the router assumes that there are no local members on the interface.	IC (VC)

Command	Description	Mode[a]
ipv6 mld last-member-query-interval	Sets the last member query interval for the MLD interface, which is the value of the maximum response time parameter in the group specific queries sent out of this interface.	IC (VC)
ipv6 mld host-proxy	Enables MLD Proxy on the router.	IC
ipv6 mld host-proxy reset-status	Resets the host interface status parameters of the MLD Proxy router.	IC
ipv6 mld host-proxy unsolicit-rprt-interval	Sets the unsolicited report interval for the MLD Proxy router.	IC
ipv6 mld query-interval	Sets the MLD router's query interval for the interface.	IC
ipv6 mld query-max-response-time	Sets MLD querier's maximum response time for the interface.	IC
ipv6 nd dad attempts	Sets the number of duplicate address detection probes transmitted while doing neighbor discovery.	IC
ipv6 nd managed-config-flag	Sets the managed address configuration flag in router advertisements.	IC
ipv6 nd ns-interval	Sets the interval between router advertisements for advertised neighbor solicitations.	IC
ipv6 nud max-multicast-solicits	Configures the maximum number of multicast neighbor solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection).	GC, VR
ipv6 nud max-unicast-solicits	Configures the maximum number of unicast neighbor solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection).	GC, VR

Command	Description	Mode[a]
ipv6 nd nud retry	Configures the exponential backoff multiple to be used in the calculation of the next timeout value for Neighbor Solicitation transmission during NUD (neighbor unreachabililty detection) following the exponential backoff algorithm.	GC
ipv6 nd other-config-flag	Sets the other stateful configuration flag in router advertisements sent from the interface.	IC
ipv6 nd prefix	Sets the IPv6 prefixes to include in the router advertisement.	IC
ipv6 nd raguard attach-policy	Enables RA Guard policy on an interface.	IC
ipv6 nd ra-interval	Sets the transmission interval between router advertisements.	IC
ipv6 nd ra-lifetime	Sets the value that is placed in the Router Lifetime field of the router advertisements sent from the interface.	IC
ipv6 nd reachable-time	Sets the router advertisement time to consider a neighbor reachable after neighbor discovery confirmation.	IC
ipv6 nd suppress-ra	Suppresses router advertisement transmission on an interface.	IC
ipv6 neighbor	Configures a static IPv6 neighbor with the given IPv6 address and MAC address on a routing interface. The optional argument `vrf` is passed to create the neighbor in the VRF instance.	GC
ipv6 redirect	Enables sending IPv6 ICMP redirect messages to peers/hosts when a better first-hop node exists on the path to a destination.	IC
ipv6 route	Configures an IPv6 static route	GC
ip route distance	Sets the default distance (preference) for static routes.	GC

Command	Description	Mode[a]
ipv6 unicast-routing	Enables forwarding of IPv6 unicast datagrams.	VRC
ipv6 unreachables	Enables the generation of ICMPv6 Destination Unreachable messages.	IC
show ipv6 brief	Displays the IPv6 status of forwarding mode and IPv6 unicast routing mode.	PE
show ipv6 interface	Shows the usability status of IPv6 interfaces.	PE
show ipv6 mld groups	Displays information about multicast groups that MLD reported.	PE
show ipv6 mld interface	Displays MLD related information for an interface.	PE
show ipv6 mld host-proxy	Displays a summary of the host interface status parameters.	PE
show ipv6 mld host-proxy groups	Displays information about multicast groups that the MLD Proxy reported.	PE
show ipv6 mld host-proxy groups detail	Displays information about multicast groups that MLD Proxy reported.	PE
show ipv6 mld host-proxy interface	Displays a detailed list of the host interface status parameters.	PE
show ipv6 mld traffic	Displays MLD statistical information for the router.	PE
show ipv6 nd raguard policy	Displays the RA Guard policy on all interfaces for which it is enabled.	PE or GC
show ipv6 neighbors	Displays information about IPv6 neighbors.	PE
show ipv6 protocols	Displays information about the configured IPv6 routing protocols.	PE or GC
show ipv6 route	Displays the IPv6 routing table.	PE
show ipv6 route preferences	Shows the preference value associated with the type of route.	PE
show ipv6 route summary	Displays a summary of the routing table.	PE
show ipv6 snooping counters	Displays the RA guard dropped packet counters.	PE GC

Command	Description	Mode[a]
show ipv6 traffic	Shows traffic and statistics for IPv6 and ICMPv6.	UE
show ipv6 vlan	Displays IPv6 VLAN routing interface addresses.	PE
traceroute ipv6	Discovers the routes that packets actually take when traveling to their destination through the network on a hop-by-hop basis.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

IP Service Level Agreement

Command	Description	Mode[a]
ip sla	Creates and confirms an IP Service Level Agreement (SLAs) operation and enters IP SLA configuration mode.	GC
ip sla schedule	Starts an IP SLA.	GC
track ip sla	Create and configures an IP Service Level Agreement (SLAs) tracking object and enters IP SLA Track Configuration mode.	GC
delay	Configures a delay for acting upon tracking object reachability state changes.	TKC
icmp-echo	Configures an IP Service Level Agreement (SLA) Internet Control Message Protocol (ICMP) echo operation.	TKC
frequency	Configures the rate at which a specified IP Service Level Agreement (SLA) operation repeats.	IPSLAE
timeout	Configures the amount of time an IP Service Level Agreement's (SLA's) operation waits for a response from its request packet.	IPSLAE
threshold	Sets the upper threshold value for calculating network monitoring statistics created by an IP SLA operation.	IPSLAE

Command	Description	Mode[a]
vrf (IP SLA)	Allows reachability monitoring within Virtual Private Networks (VPNs) using IP Service Level Agreements (SLAs).	IPSLAE
clear ip sla statistics	Clears IP SLA statistical information for a given IP SLA operation or for all IP SLAs.	PE
show ip sla configuration	Displays the configuration values (including all defaults) for a specified IP SLA operation or all operations.	UE, PE, GC
show ip sla statistics	Displays the statistics and the current operational status of a specified IP SLA operation or of all operations.	UE, PE, GC
show track	Displays detailed information for all tracking objects or for a specific track-object.	UE, PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Loopback Interface

Command	Description	Mode[a]
interface loopback	Enters the Interface Loopback configuration mode.	GC, VR
show interfaces loopback	Displays information about configured loopback interfaces.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Multicast

Command	Description	Mode[a]
arp	Adds an administrative scope multicast boundary.	IC
ip mroute	Creates a static multicast route for a source range.	GC

Command	Description	Mode[a]
ip multicast-routing	Sets the administrative mode of the IP multicast forwarder in the router to active.	GC
ip multicast ttl-threshold	Applies a *ttlvalue* to a routing interface.	IC
ip pim	Administratively configures PIM mode for IP multicast routing on a VLAN interface.	IC
ip pim bsr-border	Administratively disables bootstrap router (BSR) messages from being sent or received through an interface.	IC
ip pim bsr-candidate	Configures the router to advertise itself as a bootstrap router (BSR).	GC
ip pim dense-mode	Administratively configures PIM dense mode for IP multicast routing.	GC
ip pim dr-priority	Administratively configures the advertised designated router (DR) priority value.	IC
ip pim hello-interval	Administratively configures the PIM Hello messages on the specified interface.	IC
ip pim join-prune-interval	Administratively configures the frequency of join/prune messages on the specified interface.	IC
ip pim rp-address	Defines the address of a PIM RP for a specific multicast group range.	GC
ip pim rp-candidate	Configures the router to advertise itself to the bootstrap router (BSR) as a PIM candidate rendezvous point (RP) for a specific multicast group range.	IC
ip pim sparse-mode	Administratively configures PIM sparse mode for IP multicast routing.	GC
ip pim ssm	Administratively configures PIM Source Specific Multicast (SSM) range of addresses for IP multicast routing.	GC
show ip multicast	Displays the system-wide multicast information.	PE
show ip pim boundary	Displays the system-wide multicast information.	PE

Command	Description	Mode[a]
show ip multicast interface	Displays the multicast information for the specified interface.	PE
show ip mroute	Displays a summary or all the details of the multicast table.	PE
show ip mroute group	Displays the multicast configuration settings of entries in the multicast mroute table.	PE
show ip mroute source	Displays the multicast configuration settings of entries in the multicast mroute table.	PE
show ip mroute static	Displays all the static routes configured in the static mcast table.	PE
show ip pim	Displays information about the interfaces enabled for PIM.	UE or PE
show ip pim bsr-router	Displays the bootstrap router (BSR) information.	PE
show ip pim interface	Displays PIM interface status parameters. If no interface is specified, the command displays the status parameters of all PIM-enabled interfaces.	UE or PE
show ip pim neighbor	Displays PIM neighbors discovered by PIMv2 Hello messages. If no interface is specified, the command displays the neighbors discovered on all PIM-enabled interfaces.	UE or PE
show ip pim rp-hash	Displays the rendezvous point (RP) selected for the specified group address.	UE or PE
show ip pim rp mapping	Displays the mappings for the PIM group to the active rendezvous points (RPs).	UE or PE
show ip pim statistics	Displays the count of PIM sparse mode received control packets per VLAN.	PE or GC

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 Multicast

Command	Description	Mode[a]
clear ipv6 mroute	Selectively clears dynamic IPv6 multicast entries from the cache.	PE

Command	Description	Mode[a]
ipv6 pim (VLAN Interface config)	Administratively enables PIM-SM multicast routing mode on a particular IPv6 router interface.	IC
ipv6 pim bsr-border	Prevents bootstrap router (BSR) messages from being sent or received through an interface.	IC
ipv6 pim bsr-candidate	Configures the router to announce its candidacy as a bootstrap router (BSR).	GC
ipv6 pim dense-mode	Administratively configures PIM dense mode for IPv6 multicast routing.	GC
ipv6 pim dr-priority	Sets the priority value for which a router is elected as the designated router (DR).	IC
ipv6 pim hello-interval	Administratively configures the PIM-SM Hello Interval for the specified interface.	IC
ipv6 pim join-prune-interval	Administratively configures the interface join/prune interval for the PIM-SM router.	IC
ipv6 pim register-threshold	Configures the Register Threshold rate for the RP router to switch to the shortest path.	GC
ipv6 pim rp-address	Statically configures the Rendezvous Point (RP) address for one or more multicast groups.	GC
ipv6 pim rp-candidate	Configures the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR).	GC
ipv6 pim sparse-mode	Administratively configures PIM sparse mode for multicast routing.	GC
ipv6 pim ssm	Defines the Source Specific Multicast (SSM) range of multicast addresses.	GC
show ipv6 pim	Displays global status of IPv6 PIMSM and its IPv6 routing interfaces.	PE or GC
show ipv6 pim bsr-router	Display the bootstrap router (BSR) information.	UE, PE, or GC
show ip mroute group	Displays the multicast configuration settings	PE
show ip mroute source	Displays the multicast configuration settings	PE

Command	Description	Mode[a]
show ipv6 pim interface	Displays interface config parameters.	PE or GC
show ipv6 pim neighbor	Displays IPv6 PIMSM neighbors learned on the routing interfaces.	PE or GC
show ipv6 pim rp-hash	Displays which rendezvous point (RP) is being selected for a specified group.	PE or GC
show ipv6 pim rp mapping	Displays all group-to-RP mappings of which the router is aware (either configured or learned from the bootstrap router (BSR).	PE or GC

a. For the meaning of each Mode abbreviation, see Mode Types.

OSPF

Command	Description	Mode[a]
area default-cost (Router OSPF)	Configures the advertised default cost for the stub area.	ROSPF
area nssa (Router OSPF)	Configures the specified area ID to function as an NSSA.	ROSPF
area nssa default-info-originate (Router OSPF Config)	Configures the metric value and type for the default route advertised into the NSSA.	ROSPF
area nssa no-redistribute	Configures the NSSA Area Border router (ABR) so that learned external routes are not redistributed to the NSSA.	ROSPF
area nssa no-summary	Configures the NSSA so that summary LSAs are not advertised into the NSSA.	ROSPF
area nssa translator-role	Configures the translator role of the NSSA.	ROSPF
area nssa translator-stab-intv	Configures the translator stability interval of the NSSA.	ROSPF
area range (Router OSPF)	Creates a specified area range for a specified NSSA.	ROSPF
area stub	Creates a stub area for the specified area ID.	ROSPF

Command	Description	Mode[a]
area stub no-summary	Prevents Summary LSAs from being advertised into the NSSA.	ROSPF
area virtual-link	Creates the OSPF virtual interface for the specified area-id and neighbor router.	ROSPF
area virtual-link authentication	Configures the authentication type and key for the OSPF virtual interface identified by the area ID and neighbor ID.	ROSPF
area virtual-link dead-interval	Configures the dead interval for the OSPF virtual interface on the virtual interface identified by area-id and neighbor router.	ROSPF
area virtual-link hello-interval	Configures the hello interval for the OSPF virtual interface on the virtual interface identified by the area ID and neighbor ID.	ROSPF
area virtual-link retransmit-interval	Configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by the area ID and neighbor ID.	ROSPF
area virtual-link transmit-delay	Configures the transmit delay for the OSPF virtual interface on the virtual interface identified by the area ID and neighbor ID.	ROSPF
auto-cost	Allows user to change the reference bandwidth used in computing link cost.	ROSPF
bandwidth	Allows user to change the bandwidth used in computing link cost.	IC
bfd	Enables processing of BFD events by OSPF on all interfaces enabled for BFD.	ROSPF, ROSV3
capability opaque	Enables Opaque Capability on the router.	RC
clear ip ospf	Resets specific OSPF states.	PE
compatible rfc1583	Enables OSPF 1583 compatibility.	ROSPF
default-information originate (Router OSPF Configuration)	Controls the advertisement of default routes.	ROSPF
default-metric	Sets a default for the metric of distributed routes.	ROSPF

Command	Description	Mode[a]
distance ospf	Sets the route preference value of OSPF in the router.	ROSPF
distribute-list out	Specifies the access list to filter routes received from the source protocol.	ROSPF
enable	Resets the default administrative mode of OSPF in the router (active).	ROSPF
exit-overflow-interval	Configures the exit overflow interval for OSPF.	ROSPF
external-lsdb-limit	Configures the external LSDB limit for OSPF.	ROSPF
ip ospf area	Enables OSPFv2 and sets the area ID of an interface.	IC
ip ospf authentication	Sets the OSPF Authentication Type and Key for the specified interface.	IC
ip ospf cost	Configures the cost on an OSPF interface.	IC
ip ospf database-filter all out	Prevents the flooding of OSPF LSAs on an interface.	IC
ip ospf dead-intervall	Sets the OSPF dead interval for the specified interface.	IC
ip ospf hello-interval	Sets the OSPF hello interval for the specified interface.	IC
ip ospf mtu-ignore	Disables OSPF maximum transmission unit (MTU) mismatch detection.	IC
ip ospf network	Configure OSPF to treat an interface as a point-to-point, rather than broadcast interface.	IC
ip ospf priority	Sets the OSPF priority for the specified router interface.	IC
ip ospf retransmit-interval	Sets the OSPF retransmit Interval for the specified interface.	IC
ip ospf transmit-delay	Sets the OSPF Transit Delay for the specified interface.	IC
log adjacency-changes	Enables logging of OSPFv2 neighbor state changes.	ROSPF
max-metric router-lsa	Configures OSPF to enable stub router mode.	ROSPF

Command	Description	Mode[a]
maximum-paths	Sets the number of paths that OSPF can report for a given destination.	ROSPF
network area	Enables OSPFv2 on an interface and sets its area ID if the IP address of an interface is covered by this network command.	ROSPF
nsf	Enables OSPF graceful restart.	ROSPF
nsf helper	Allow OSPF to act as a helpful neighbor for a restarting router.	ROSPF
nsf helper strict-lsa-checking	Set an OSPF helpful neighbor exit helper mode whenever a topology change occurs.	ROSPF
nsf restart-interval	Configures the length of the grace period on the restarting router.	ROSPF
passive-interface	Sets the interface or tunnel as passive.	IC
passive-interface default	Enables the global passive mode by default for all interfaces.	ROSPF
passive-interface	Sets the interface or tunnel as passive.	ROSPF
redistribute (BGP)	Configures OSPF protocol to allow redistribution of routes from the specified source protocol/routers.	ROSPF
router-id	Sets a 4-digit dotted-decimal number uniquely identifying the router OSPF ID.	ROSPF
router ospf	Enters Router OSPF mode.	GC
show ip ospf	Displays information relevant to the OSPF router.	PE
show ip ospf abr	Displays the internal OSPF routing table entries to Area Border Routers (ABR).	PE
show ip ospf area	Displays information about the identified OSPF area.	PE
show ip ospf asbr	Displays the internal OSPF routing table entries to Autonomous System Boundary Routes (ASBR).	PE
show ip ospf database	Displays information about the link state database when OSPF is enabled.	PE

Command	Description	Mode[a]
show ip ospf database database-summary	Displays the number of each type of LSA in the database for each area and for the router.	PE
show ip ospf interface	Displays the information for the IFO object or virtual interface tables.	PE
show ip ospf interface brief	Displays brief information for the IFO object or virtual interface tables.	PE
show ip ospf interface stats	Displays the statistics for a specific interface.	PE
show ip ospf lsa-group	Displays the number of self-originated LSAs within each LSA group.	PE, GC
show ip ospf neighbor	Displays information about OSPF neighbors.	PE
show ip ospf range	Displays information about the area ranges for the specified area-id.	PE
show ip ospf statistics	Displays information about recent Shortest Path First (SPF) calculations.	PE
show ip ospf stub table	Displays the OSPF stub table.	PE
show ip ospf virtual-links	Displays the OSPF Virtual Interface information for a specific area and neighbor.	PE
show ip ospf virtual-links brief	Displays the OSPF Virtual Interface information for all areas in the system.	PE
timers pacing flood	Adjusts the rate at which OSPFv2 sends LS Update packets	OG
timers pacing lsa-group	Tunes how OSPF groups LSAs for periodic refresh.	OG
timers spf	Configures the SPF delay and hold time.	ROSPF

a. For the meaning of each Mode abbreviation, see Mode Types.

OSPFv3

Command	Description	Mode[a]
area default-cost (Router OSPFv3)	Configures the monetary default cost for the stub area.	ROSV3

Command	Description	Mode[a]
area nssa (Router OSPFv3)	Configures the specified areaid to function as an NSSA.	ROSV3
area nssa default-info-originate (Router OSPFv3 Config)	Configures the metric value and type for the default route advertised into the NSSA.	ROSV3
area nssa no-redistribute	Configures the NSSA ABR so that learned external routes will not be redistributed to the NSSA.	ROSV3
area nssa no-summary	Configures the NSSA so that summary LSAs are not advertised into the NSSA.	ROSV3
area nssa translator-role	Configures the translator role of the NSSA.	ROSV3
area nssa translator-stab-intv	Configures the translator stability interval of the NSSA.	ROSV3
area range (Router OSPFv3)	Creates an area range for a specified NSSA.	ROSV3
area stub	Creates a stub area for the specified area ID.	ROSV3
area stub no-summary	Disables the import of Summary LSAs for the stub area identified by *areaid*.	ROSV3
area virtual-link	Creates the OSPF virtual interface for the specified *areaid* and *neighbor*.	ROSV3
area virtual-link dead-interval	Configures the dead interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.	ROSV3
area virtual-link hello-interval	Configures the hello interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.	ROSV3
area virtual-link retransmit-interval	Configures the retransmit interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.	ROSV3
area virtual-link transmit-delay	Configures the transmit delay for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.	ROSV3

Command	Description	Mode[a]
default-information originate (Router OSPFv3 Configuration)	Controls the advertisement of default routes.	ROSV3
default-metric	Sets a default for the metric of distributed routes.	ROSV3
distance ospf	Sets the route preference value of OSPF in the router.	ROSV3
enable	Resets the default administrative mode of OSPF in the router (active).	ROSV3
exit-overflow-interval	Configures the exit overflow interval for OSPF.	ROSV3
external-lsdb-limit	Configures the external LSDB limit for OSPF.	ROSV3
arp	Enables OSPF on a router interface or loopback interface.	IC
ipv6 ospf area	Sets the OSPF area to which the specified router interface belongs.	IC
ipv6 ospf cost	Configures the cost on an OSPF interface.	IC
ipv6 ospf dead-interval	Sets the OSPF dead interval for the specified interface.	IC
ipv6 ospf hello-interval	Sets the OSPF hello interval for the specified interface.	IC
ipv6 ospf mtu-ignore	Disables OSPF maximum transmission unit (MTU) mismatch detection.	IC
ipv6 ospf network	Changes the default OSPF network type for the interface.	IC
ipv6 ospf priority	Sets the OSPF priority for the specified router interface.	IC
ipv6 ospf retransmit-interval	Sets the OSPF retransmit interval for the specified interface.	IC
ipv6 ospf transmit-delay	Sets the OSPF Transmit Delay for the specified interface.	IC
ipv6 router ospf	Enters Router OSPFv3 Configuration mode.	GC, VRC

Command	Description	Mode[a]
maximum-paths	Sets the number of paths that OSPF can report for a given destination.	ROSV3
nsf	Enables OSPF graceful restart.	ROSV3
nsf helper	Allows OSPF to act as a helpful neighbor for a restarting router.	ROSV3
nsf helper strict-lsa-checking	Requires that an OSPF helpful neighbor exit helper mode whenever a topology change occurs.	ROSV3
nsf restart-interval	Configures the length of the grace period on the restarting router.	ROSV3
passive-interface	Sets the interface or tunnel as passive.	IC
passive-interface default	Enables the global passive mode by default for all interfaces.	ROSV3
redistribute (OSPFv3)	Configures the OSPFv3 protocol to allow redistribution of routes from the specified source protocol/routers.	ROSV3
router-id	Sets a 4-digit dotted-decimal number uniquely identifying the Router OSPF ID.	ROSV3
show ipv6 ospf	Displays information relevant to the OSPF router.	UE, PE, GC, VRC
show ipv6 ospf abr	Displays the internal OSPFv3 routes to reach Area Border Routers (ABR).	PE, VRC
show ipv6 ospf area	Displays information about the area.	PE, VRC
show ipv6 ospf asbr	Displays the internal OSPFv3 routes to reach Autonomous System Boundary Routes (ASBR).	PE, VRC
show ipv6 ospf border-routers	Displays internal OSPFv3 routers to reach Area Border Routers (ABR) and Autonomous System Boundary Routers (ASBR).	UE or PE, or VRC
show ipv6 ospf database	Displays information about the link state database when OSPFv3 is enabled.	PE, VRC

Command	Description	Mode[a]
show ipv6 ospf database database-summary	Displays the number of each type of LSA in the database and the total number of LSAs in the database.	PE, VRC
show ipv6 ospf interface	Displays the information for the IFO object or virtual interface tables.	PE, VRC
show ipv6 ospf interface brief	Displays brief information for the IFO object or virtual interface tables.	PE, VRC
show ipv6 ospf interface stats	Displays the statistics for a specific interface.	UE, VRC
show ipv6 ospf interface vlan	Displays OSPFv3 configuration and status information for a specific VLAN.	PE, VRC
show ipv6 ospf lsa-group	Displays the number of self-originated LSAs within each LSA group.	UE, PE, VRC
show ipv6 ospf neighbor	Displays information about OSPF neighbors.	PE, VRC
show ipv6 ospf range	Displays information about the area ranges for the specified area identifier.	PE, VRC
show ipv6 ospf statistics	Displays information about the 15 most recent Shortest Path First (SPF) calculations.	UE, PE, VRC
show ipv6 ospf stub table	Displays the OSPF stub table.	PE, VRC
show ipv6 ospf virtual-link	Displays the OSPF Virtual Interface information for a specific area and neighbor.	PE, VRC
show ipv6 ospf virtual-link brief	Displays the OSPFV3 Virtual Interface information for all areas in the system.	PE, VRC
timers throttle spf	Throttles the link-state-packets.	OR

a. For the meaning of each Mode abbreviation, see Mode Types.

IPv6 Policy-Based Routing

Command	Description	Mode[a]
ipv6 policy route-map	Identifies a route map to use for policy-based IPv6 routing on an interface.	IC

Command	Description	Mode[a]
match ipv6 address	Specifies an IPv6 address match criteria for a route map.	RM
set ipv6 next-hop	Specifies an adjacent next-hop router in the path toward the destination to which the packets should be forwarded.	RM
set ipv6 default next-hop	Specifies an adjacent default next-hop router in the path toward the destination to which the packets should be forwarded.	RM
set ipv6 precedence	Specifies the precedence in the IPv6 packet header in the path toward the destination to which the packets should be forwarded.	RM
show ipv6 policy	Shows which IPv6 policy route maps are configured on an interface.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Router Discovery Protocol

Command	Description	Mode[a]
encapsulation	Enables Router Discovery on an interface.	IC
ip irdp holdtime	Configures the value, in seconds, of the hold-time field of the router advertisement sent from this interface.	IC
ip irdp maxadvertinterval	Configures the maximum time, in seconds, allowed between sending router advertisements from the interface.	IC
ip irdp minadvertinterval	Configures the minimum time, in seconds, allowed between sending router advertisements from the interface.	IC
ip irdp multicast	Sends router advertisements as IP multicast packets.	IC
ip irdp preference	Configures the preference of the address as a default router address relative to other router addresses on the same subnet.	IC

Command	Description	Mode[a]
show ip irdp	Displays the router discovery information for all interfaces, or for a specified interface.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Routing Information Protocol

Command	Description	Mode[a]
auto-summary	Enables the RIP auto-summarization mode.	RIP
default-information originate (Router RIP Configuration)	Controls the advertisement of default routes.	RIP
default-metric	Sets a default for the metric of distributed routes.	RIP
distance rip	Sets the route preference value of RIP in the router.	RIP
distribute-list out	Specifies the access list to filter routes received from the source protocol.	RIP
enable	Resets the default administrative mode of RIP in the router (active).	RIP
hostroutesaccept	Enables the RIP hostroutesaccept mode.	RIP
ip rip	Enables RIP on a router interface.	IC
ip rip authentication	Sets the RIP Version 2 Authentication Type and Key for the specified interface.	IC
ip rip receive version	Configures the interface to allow RIP control packets of the specified version(s) to be received.	IC
ip rip send version	Configures the interface to allow RIP control packets of the specified version to be sent.	IC
redistribute (RIP)	Configures OSPF protocol to allow redistribution of routes from the specified source protocol/routers.	PIP
router rip	Enters Router RIP mode.	GC
show ip rip	Displays information relevant to the RIP router.	PE

Command	Description	Mode[a]
show ip rip interface	Displays information related to a particular RIP interface.	PE
show ip rip interface brief	Displays general information for each RIP interface.	PE
split-horizon	Sets the RIP split horizon mode.	RIP

a. For the meaning of each Mode abbreviation, see Mode Types.

Tunnel Interface

Command	Description	Mode[a]
interface tunnel	Enables the interface configuration mode for a tunnel.	GC
show interfaces tunnel	Displays the parameters related to tunnel such as tunnel mode, tunnel source address and tunnel destination address.	PE
tunnel destination	Specifies the destination transport address of the tunnel.	IC
tunnel mode ipv6ip	Specifies the mode of the tunnel.	IC
tunnel source	Specifies the source transport address of the tunnel, either explicitly or by reference to an interface.	IC

a. For the meaning of each Mode abbreviation, see Mode Types.

Unicast Reverse Path Forwarding

Command	Description	Mode[a]
system urpf enable	Globally enables uRPF checking of routes.	GC
ip verify unicast source	Enable loose uRPF checks on an interface.	IC

a. For the meaning of each Mode abbreviation, see Mode Types.

Virtual Router

Command	Description	Mode[a]
description	Assigns descriptive text to the VRF instance.	VR
ip vrf	Creates a virtual router with a specified name and enters Virtual Router Configuration mode.	GC
ip vrf forwarding	Associates an interface with a VRF instance.	IC or IR
maximum routes	Reserves the number of routes allowed and sets the maximum limit on the number of routes for a virtual router instance in the total routing table space for the router.	VR
show ip vrf	Shows the interfaces associated with a VRF instance.	UE, PE
show ipv6 vrf	Shows the interfaces associated with an IPv6 VRF.	UE, PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Virtual Router Redundancy

Command	Description	Mode[a]
ip vrrp	Enables the administrative mode of Virtual Router Redundancy Protocol (VRRP) for the router.	GC
vrrp accept-mode	Enables the VRRP Primary to accept ping packets sent to one of the virtual router’s IP addresses.	IC
vrrp authentication	Sets the authentication details value for the virtual router configured on a specified interface.	IC
vrrp description	Assigns a description to the VRRP group.	IC
vrrp ip	Sets the virtual router IP address value for an interface.	IC

Command	Description	Mode[a]
vrrp mode	Enables the virtual router configured on an interface. Enabling the status field starts a virtual router.	IC
vrrp preempt	Sets the preemption mode value for the virtual router configured on a specified interface.	IC
vrrp priority	Sets the priority value for the virtual router configured on a specified interface.	IC
vrrp timers advertise	Sets the frequency, in seconds, that an interface on the specified virtual router sends a virtual router advertisement.	IC
vrrp timers learn	Configures the router, when it is acting as backup virtual router for a VRRR group, to learn the advertisement interval used by the primary virtual router.	IC
vrrp track interface	Alters the priority of the VRRP router based on the availability of its interfaces.	IC
vrrp track ip route	Tracks route reachability.	IC
show vrrp	Displays the global VRRP configuration and status as well as the brief or detailed status of one or all VRRP groups.	UE or PE
show vrrp interface	Displays all configuration information and VRRP router statistics of a virtual router configured on a specific interface.	UE or PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Virtual Router Redundancy Protocol version 3 Commands

Command	Description	Mode[a]
fhrp version vrrp v3	Enables Virtual Router Redundancy Protocol version 3 (VRRPv3) configuration on the switch.	VRRP
vrrp	Creates a Virtual Router Redundancy Protocol version 3 (VRRPv3) group and enter VRRPv3 Group Configuration mode.	IC
show vrrp	Displays information about the status and configuration details for a given Virtual Router Redundancy Protocol version 3 (VRRPv3) group configured on the specified interface for a specified IP address family.	UE, PE, GC
accept-mode	Controls whether a virtual router in primary state will accept packets addressed to the address owner's Virtual IP address as its own if it is not the Virtual IP address owner.	VRRP
preempt	Configures the virtual router to preemptively take over as primary virtual router for a Virtual Router Redundancy Protocol version 3 (VRRPv3) group if it has higher priority than the current primary virtual router.	VRRP
priority	Sets the priority level of the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group.	VRRP

Command	Description	Mode[a]
timers advertise	Configures the interval between successive advertisements by the primary virtual router in a Virtual Router Redundancy Protocol version 3 (VRRPv3) group.	VRRP
shutdown	Disables a Virtual Router Redundancy Protocol version 3 (VRRPv3) group configuration.	VRRP
address	Sets the primary or secondary IP address of the switch within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group.	VRRP
track interface	Configures tracking of the interface for the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group.	VRRP
track ip route	Configures tracking of the IP route for the device within a Virtual Router Redundancy Protocol (VRRPv3) group.	VRRP
clear vrrp statistics	Clears VRRP statistical information for given interface of the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group and IP address family.	PE
show vrrp statistics	Displays statistics for a selected Virtual Router Redundancy Protocol version 3 (VRRPv3) group or displays the global statistics.	UE, PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Switch Management Commands

Application Deployment

Command	Description	Mode[a]
application install	Installs or removes a Dell-supplied application.	GC

Command	Description	Mode[a]
application start	Schedules a Dell-supplied application for immediate execution on the management unit in the stack.	GC
application stop	Stops a Dell-supplied application if the application is executing on the management unit in the stack.	GC
show application	Displays installed applications and optionally displays application files.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Auto-Install

Command	Description	Mode[a]
boot auto-copy-sw	Enables or disables Stack Firmware Synchronization.	GC
boot auto-copy-sw allow-downgrade	Enables downgrading the firmware version on the stack member if the firmware version on the manager is older than the firmware version on the member.	GC
boot host auto-reboot	Enables rebooting the device (no administrative intervention) when the auto-image is successfully downloaded.	GC
boot host auto-save	Enables/disables automatically saving the downloaded configuration on the switch.	GC
boot host dhcp	Enables/disables Auto Config on the switch.	GC
boot host retry-count	Set the number of attempts to download a configuration.	GC
show auto-copy-sw	Displays Stack Firmware Synchronization configuration status.	PE
show boot	Displays the current status of the Auto Config process.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

CLI Macro

Command	Description	Mode[a]
macro name	Creates a user-defined macro.	GC
macro global apply	Use to apply a macro.	GC
macro global trace	Applies and traces a macro.	GC
macro global description	Appends a line to the global macro description.	GC
macro apply	Use to apply a macro.	IC
macro trace	Applies and traces a macro.	IC
macro description	Appends a line to the macro description.	IC
show parser macro	Displays information about defined macros.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Clock

Command	Description	Mode[a]
show sntp configuration	Displays the SNTP configuration.	PE
show sntp server	Displays the preconfigured SNTP servers.	PE
show sntp status	Displays the SNTP status.	PE
sntp authenticate	Set to require authentication for received NTP traffic from servers.	GC
sntp authentication-key	Defines an authentication key for SNTP.	GC
sntp broadcast client enable	Enables SNTP Broadcast clients.	GC
sntp client poll timer	Defines polling time for the SNTP client.	GC
sntp server	Configures the SNTP server to use SNTP to request and accept NTP traffic from it.	GC
sntp source-interface	Selects the interface from which to use the IP address in the source IP address field of transmitted SNTP packets.	GC
sntp trusted-key	Authenticates the identity of a system to which Simple Network Time Protocol (SNTP) will synchronize.	GC

Command	Description	Mode[a]
sntp unicast client enable	Enables clients to use Simple Network Time Protocol (SNTP) predefined Unicast clients.	GC
clock timezone hours-offset	Sets the offset to Coordinated Universal Time.	GC
no clock timezone	Resets the time zone settings.	GC
clock summer-time recurring	Sets the summertime offset to UTC recursively every year.	GC
clock summer-time date	Sets the summertime offset to UTC.	GC
no clock summer-time	Resets the summertime configuration.	GC
show clock	Displays the time and date from the system clock.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Command Line Configuration Scripting

Command	Description	Mode[a]
script apply	Applies commands in the script to the switch.	PE
script delete	Deletes a specific script.	PE
script list	Lists all scripts present in the switch.	PE
script show	Displays the contents of a script file.	PE
script validate	Validates a script file.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Configuration and Image Files

Command	Description	Mode[a]
boot system	Specifies the system image that the switch loads at startup.	PE
clear config	Restores switch to default configuration.	PE
copy	Copies files from a source to a destination.	PE
delete	Deletes a file from a flash memory.	PE
dir	Prints the contents of the flash file system.	PE

Command	Description	Mode[a]
erase	Erases the startup configuration, the backup configuration, or the backup image.	PE
filedescr	Adds a description to a file.	PE
rename	Renames the file present in flash.	PE
show backup-config	Displays contents of a backup configuration file.	PE
show bootvar	Displays the active system image file that the switch loads at startup.	UE
show running-config	Displays the contents of the currently running configuration file.	PE
show startup-config	Displays the startup configuration file contents.	PE
write	Copies the running configuration image to the startup configuration.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

DHCP Client

Command	Description	Mode[a]
release dhcp	Forces the DHCPv4 client to release a leased address.	PE
renew dhcp	Forces the DHCP client to immediately renew an IPv4 address lane.	PE
show dhcp lease	Displays IPv4 addresses leased from a DHCP server.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

HiveAgent

Command	Description	Mode[a]
eula-consent	Accepts or declines the end-user license agreement (EULA) for the hive agent	GC
hiveagent	Accesses the HiveAgent configuration mode.	GC

Command	Description	Mode[a]
server	Configures a HiveAgent server (HiveManager NG) and enter HiveAgent server configuration mode.	HAC
debug	Enables HiveAgent debug capability.	HAC
enable	Enables a HiveAgent server.	HAC
proxy-ip-address	Configures a proxy server to be used to contact the HiveManager NG.	HAC
source-interface vlan-id	Assigns a source interface which HiveAgent obtains the IP address used as the source IP address in packets addressed to the HiveManager NG	HAC
url	Configures the URL to reach on HiveManager NG.	HAC
show hiveagent debug	Use to view information on HiveAgent debug configuration.	PE, GC
show hiveagent source-interface	Displays the configured HiveAgent source interface.	PE, GC
show hiveagent status	Displays information on the HiveAgent configuration.	PE, GC
show eula-consent hiveagent	Reviews the EULA details.	PE, GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Line

Command	Description	Mode[a]
accounting	Applies an accounting method to a line config.	LC
authorization	Applies a command authorization method to a line config.	LC
enable authentication	Specifies the authentication method list when accessing a higher privilege level from a remote telnet or console.	LC

Command	Description	Mode[a]
exec-banner	Enables exec banner on the console, telnet or SSH connection.	LC
exec-timeout	Configures the interval that the system waits for user input before Privileged Exec mode timeout.	LC
history	Enables the command history function.	LC
history size	Changes the command history buffer size for a particular line.	LC
line	Identifies a specific line for configuration and enters the line configuration command mode.	GC
login authentication	Specifies the login authentication method list for a remote telnet or console.	LC
login-banner	Enables login banner on the console, telnet, or SSH connection.	LC
nsf	Enables display of the message of the day banner on the console, telnet, or SSH connection.	LC
password (Line Configuration)	Specifies a password on a line.	LC
show line	Displays line parameters.	UE
speed	Sets the serial port BAUD rate.	LC
terminal length	Sets the terminal length.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

MACsec

Command	Description	Mode[a]
mka policy (Global Config)	Creates or configures a Media Access Control Security (MACsec) Key Agreement (MKA) Protocol policy and to enter MACsec policy configuration mode (config-macsec-policy).	GC

key-server priority	Configures the preference for an MKA key server.	MP
macsec-cipher-suite	Configures the MACsec cipher suite for an MKA policy.	MP
confidentiality-offset	Configures where to start encrypting the data packet.	MP
key chain	Configures or modifies a key chain and enter Key Chain Configuration mode.	GC
key	Configures a key and enter Keychain Key Configuration mode.	GC
cryptographic-algorithm	Configures the cryptographic algorithm for the key.	KK
key-string	Configures the key.	KK
time-range	Configures the key lifetime.	KK
macsec [network-link]	Enables MACsec on an interface.	IC
mka policy (Interface Config)	Applies a MACsec Key Agreement (MKA) policy to an interface.	IC
mka pre-shared-key key-chain	Applies a MACsec key chain to an interface.	IC
macsec replay-protection	Enables and configures MACsec replay protection on an interface.	IC
authentication linksec policy	Enables and configures MACsec replay protection on an interface.	IC
show macsec	Displays general information about the MACsec configuration or status for an interface.	PE, GC
show mka policy	Displays a summary of all defined MKA protocol policies or to display a summary of a specified policy.	PE, GC
show mka sessions	Displays a summary of all MACsec sessions or to display a session on a specified interface.	PE, GC
show key chain	Displays a summary of all configured MKA key chains or a specific key chain.	PE, GC
show mka statistics	Displays MACsec session operational data.	PE, GC

show macsec secy statistics	Displays MACsec SecY statistics.	PE, GC
clear mka statistics	Clears the MKA protocol statistics for an interface.	PE
clear macsec secy statistics	Clears the MKA protocol statistics for an interface.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

PHY Diagnostics

Command	Description	Mode[a]
show copper-ports tdr	Displays the last TDR (Time Domain Reflectometry) tests on specified ports.	PE
show fiber-ports optical-transceiver	Displays the optical transceiver diagnostics.	PE
test copper-port tdr	Diagnoses with TDR (Time Domain Reflectometry) technology the quality and characteristics of a copper cable attached to a port.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Power Over Ethernet (PoE)

Command	Description	Mode[a]
power inline	Enables/disables the ability of the port to deliver power.	GC
power inline detection	Configures the detection type that tells which types of PD's will be detected and powered by the switch.	IC
power inline four-pair forced	Forces 4-pair power feed on an interface.	IC
power inline limit	Configure the type of power limit.	IC
power inline management	Sets the power management type.	GC
power inline powered-device	Adds a comment or description of the powered device type.	IC (Ethernet)

power inline priority	Configures the port priority level for the delivery of power to an attached device.	IC (Ethernet)
power inline reset	Use to reset the port.	IC
power inline usage-threshold	Configures the system power usage threshold level at which lower priority ports are disconnected.	GC
clear power inline statistics	Clears the PoE statistics.	PE
show power inline	Reports current PoE configuration and status.	PE
show power inline firmware-version	Displays the version of the PoE controller firmware present on the switch file system.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

RMON

Command	**Description**	**Mode**[a]
rmon alarm	Configures alarm conditions.	GC
rmon collection history	Enables a Remote Monitoring (RMON) MIB history statistics group on an interface.	IC
rmon event	Configures an RMON event.	GC
rmon hcalarm	Configures high capacity alarms.	GC
show rmon alarm	Displays alarm configurations.	UE
show rmon alarms	Displays the alarms summary table.	UE and PE
show rmon collection history	Displays the requested group of statistics.	UE
show rmon events	Displays the RMON event table.	UE
show rmon hcalarm	Displays the high capacity alarms.	PE
show rmon history	Displays RMON Ethernet Statistics history.	UE
show rmon log	Displays the RMON logging table.	UE
show rmon statistics	Displays RMON Ethernet Statistics.	UE

a. For the meaning of each Mode abbreviation, see Mode Types.

Serviceability Tracing

Command	Description	Mode[a]
debug aaa	Enables debugging for accounting.	PE
debug arp	Enables tracing of ARP packets.	PE
debug authentication interface	Enables Authentication Manager debug traces for the interface.	PE
debug auto-voip	Enables Auto VOIP debug messages.	PE
debug bfd	Enables the display of BFD events or packets.	PE
debug cfm	Enables CFM debugging.	PE
debug clear	Disables all debug traces.	PE
debug console	Enables the display of debug trace output on the login session in which it is executed.	PE
debug crashlog	Displays the crash log contents on the console.	PE or GC
debug dhcp packet	Displays debug information about DHCPv4 client activities and traces DHCP v4 packets to and from the local DHCPv4 client.	PE
debug dot1x	Enables dot1x packet tracing.	PE
debug igmpsnooping	Enables tracing of IGMP Snooping packets transmitted and/or received by the switch.	PE
debug ip acl	Enables debug of IP Protocol packets matching the ACL criteria.	PE
debug ip bgp	Enables debug tracing of BGP events.	PE
debug ip dvmrp	Traces DVMRP packet reception and transmission.	PE
debug ip igmp	Traces IGMP packet reception and transmission.	PE
debug ip mcache	Traces MDATA packet reception and transmission.	PE
debug ip pimdm packet	Traces PIMDM packet reception and transmission.	PE

Command	Description	Mode[a]
debug ip pimsm packet	Traces PIMSM packet reception and transmission.	PE
debug ip vrrp	Enables debug tracing of VRRP events.	PE
debug ipv6 dhcp	Displays debug information about DHCPv6 client activities and to trace DHCPv6 packets to and from the local DHCPv6 client.	PE
debug ipv6 mcache	Traces MDATAv6 packet reception and transmission.	PE
debug ipv6 mld	Traces MLD packet reception and transmission.	PE
debug ipv6 ospfv3 packet	Enables debug tracing of IPv6 OSPFv3 packets.	PE, VRC
debug ipv6 pimdm	Traces PIMDMv6 packet reception and transmission.	PE
debug ipv6 pimsm	Traces PIMSMv6 packet reception and transmission.	PE
debug ipv6 ping	Enables tracing of ICMPv6 echo requests and responses.	PE
debug isdp	Traces ISDP packet reception and transmission.	PE
debug lacp	Traces of LACP packets received and transmitted by the switch.	PE
debug mldsnooping	Traces MLD snooping packet reception and transmission.	PE
debug ospf	Enables tracing of OSPF packets received and transmitted by the switch.	PE
debug ospfv3 packet	Enables tracing of OSPFv3 packets received and transmitted by the switch.	PE
debug ping	Enables tracing of ICMP echo requests and responses.	PE
debug rip	Enables tracing of RIP requests and responses.	PE
debug sflow	Enables sFlow debug packet trace.	PE
debug spanning-tree	Traces spanning tree BPDU packet reception and transmission.	PE

Command	Description	Mode[a]
debug spanning-tree	Traces spanning tree BPDU packet reception and transmission.	PE
debug tacacs	Enables debug tracing of TACACS+ debugging.	PE
debug transfer	Enables debug tracing of file transfers.	PE
debug udld	Enables the display of UDLD packets or event processing.	PE
debug vpc	Enables debug traces for the specified protocols	GC
debug vrrp	Enables VRRP debug protocol messages.	PE
exception core-file	Configures the core dump file name.	GC
exception dump	Configures the core dump location.	GC
exception protocol	Enables full core dumps.	GC
exception switch-chip-register	Enables the dumping of the switch chip registers in case of an exception.	GC
ip http timeout-policy	Configures the timeout policy for closing HTTP and HTTPS sessions to the local HTTP server.	GC
show debugging	Displays packet tracing configurations.	PE
show exception	Displays the core dump configuration parameters, the current or previous exception log, or the core dump file listing.	PE
show supported mibs	Displays the internal message queue allocations.	PE, GC
show supported mibs	Displays the HTTP server status and configuration.	PE, GC
show supported mibs	Displays the implemented SNMP MIBs.	PE, GC
snapshot bgp	Dumps a set of BGP debug information to capture the current state of BGP.	S
write core	Generates a core file on demand and either, reboots the switch or tests the core file configuration.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

sFlow

Command	Description	Mode[a]
sflow destination	Configures sFlow collector parameters (owner string, receiver timeout, ip address, and port).	GC
sflow polling	Enables a new sflow poller instance for the data source if rcvr_idx is valid.	GC
sflow polling (Interface Mode)	Enable a new sflow poller instance for this data source if rcvr_idx is valid.	IC
sflow sampling	Enables a new sflow sampler instance for this data source if rcvr_idx is valid.	GC
sflow sampling (Interface Mode)	Enables a new sflow sampler instance for this data source if rcvr_idx is valid.	IC
sflow source-interface	Selects the interface from which to use the IP address inserted in the source IP address field of transmitted sFlow packets.	GC
show sflow agent	Displays the sflow agent information.	PE
show sflow destination	Displays all the configuration information related to the sFlow receivers.	PE
show sflow polling	Displays the sFlow polling instances created on the switch.	PE
show sflow sampling	Displays the sFlow sampling instances created on the switch.	PE
show sflow source-interface	Displays the assigned sFlow source interface.	PE or GC

a. For the meaning of each Mode abbreviation, see Mode Types.

SNMP

Command	Description	Mode[a]
show snmp	Displays the SNMP status.	PE
show snmp engineid	Displays the SNMP engine ID.	PE
show snmp filters	Displays the configuration of filters.	PE
show snmp group	Displays the configuration of groups.	PE

Command	Description	Mode[a]
show snmp user	Displays the configuration of users.	PE
show snmp views	Displays the configuration of views.	PE
show trapflags	Displays SNMP traps globally or displays specific SNMP traps.	PE
snmp-server community	Sets up the community access string to permit access to SNMP protocol.	GC
snmp-server community-group	Maps SNMP v1 and v2 security models to the group name.	GC
snmp-server contact	Sets up a system contact (sysContact) string.	GC
snmp-server enable traps	Enables SNMP traps globally or enables specific SNMP traps.	GC
snmp-server engineID local	Specifies the Simple Network Management Protocol (SNMP) engine ID on the local switch.	GC
snmp-server filter	Creates or updates an SNMP server filter entry.	GC
snmp-server group	Configures a new SNMP group or a table that maps SNMP users to SNMP views.	GC
snmp-server host	Specifies the recipient of SNMP notifications.	GC
snmp-server location	Sets the system location string.	GC
snmp-server user	Configures a new SNMP Version 3 user.	GC
snmp-server view	Creates or updates a Simple Network Management Protocol (SNMP) server view entry.	GC
snmp-server v3-host	Specifies the recipient of Simple Network Management Protocol Version 3 (SNMPv3) notifications.	GC
snmp-server source-interface	Selects the interface from which to use the IP address in the source IP address field of transmitted SNMP traps and informs.	GC

a. For the meaning of each Mode abbreviation, see Mode Types.

Support Assist

Command	Description	Mode[a]
eula-consent	Accepts or rejects the end-user license agreement (EULA) for the SupportAssist server.	GC
contact-company	Configures the contact information to be sent to the SupportAssist server.	SAC
contact-person	Configures the contact information to be sent to the SupportAssist server.	SAC
enable	Enables a SupportAssist server.	SAC
proxy-ip-address	Configures a proxy server to be used to contact the SupportAssist servers.	SAC
server	Configures a SupportAssist server and enter SupportAssist server configuration mode.	SAC
show eula-consent support-assist	Reviews the EULA details whenever desired.	PE
show support-assist status	Displays information on the SupportAssist feature status	PE, GC
support-assist	Enables support-assist configuration mode if the EULA has been accepted.	GC
url	Configures the URL to reach on the SupportAssist remote server.	SAC

a. For the meaning of each Mode abbreviation, see Mode Types.

SYSLOG

Command	Description	Mode[a]
clear logging	Clears messages from the in memory logging buffer.	PE
clear logging file	Clears messages from the logging file.	PE
description (Logging)	Describes the SYSLOG server.	L
level	Specifies the level of SYSLOG messages sent to the server.	L

Command	Description	Mode[a]
logging cli-command	Enables CLI command logging.	GC
logging	Configures a SYSLOG server	GC
logging audit	Enables switch auditing.	GC
logging buffered	Enables logging to the in-memory log.	GC
logging console	Enables logging to the console.	GC
logging facility	Configures the facility to be used in SYSLOG messages.	GC
logging file	Enables logging to the persistent (on flash) log.	GC
logging monitor	Enables logging messages to telnet and SSH sessions with the default severity level.	GC
logging on	Enables error messages logging.	GC
logging protocol	Logs messages in RFC5424 of RFC 3164 format.	GC
logging snmp	Enables SNMP Set command logging.	GC
logging source-interface	Selects the interface from which to use the IP address in the source IP address field of transmitted SYSLOG packets.	GC
logging traps	Sets the lowest severity level at which SNMP traps are logged.	GC
logging web-session	Enables web session logging.	GC
port	Specifies the port number on which the SYSLOG server listens for messages.	L
show logging	Displays the state of logging and the messages stored in the internal buffer.	PE
show logging file	Displays the state of logging and the messages stored in the logging file.	PE
show syslog-servers	Displays the SYSLOG server settings.	PE
terminal monitor	Enables the display of logging messages over a telnet of SSH session.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

System Management

Command	Description	Mode[a]
asset-tag	Specifies the switch asset-tag.	GC
banner exec	Sets the message that is displayed after a successful login.	GC
banner login	Sets the message that is displayed just before the login prompt.	GC
banner motd	Specifies message-of-the-day banner.	GC
banner motd acknowledge	Acknowledges message-of-the-day banner.	GC
buffers	Configures the rising and falling thresholds for the issuance of the message buffer SNMP trap and notification via a SYSLOG message.	GC
clear checkpoint statistics	Clears the statistics for the checkpointing process.	GC
clear counters stack-ports	Clears the statistics for all stack-ports.	PE
connect	Connects to the serial console of a different stack member.	PE
exit	Disconnects the serial connection to the remote unit.	UE
hostname	Specifies or modifies the switch host name.	GC
initiate failover	Forces failover of management unit.	GC
load-interval	Loads the interface utilization measurement interval.	IC
locate	Locates a switch by LED blinking.	PE
logout	Disconnects the serial connection to a remote unit on a stack member.	UE
member	Preconfigures a stack member.	SG
memory free low-watermark	Configures the notification of a low memory condition on the switch for the issuance of the CPU overload SNMP trap and notification via a SYSLOG message.	GC

Command	Description	Mode[a]
nsf	Specifies non-stop forwarding.	GC
ping	Sends ICMP echo request packets to another node on the network.	UE
process cpu threshold	Configures the rising and falling thresholds for the issuance of the CPU overload SNMP trap and notification via a SYSLOG message.	GC
quit	Disconnects the serial connection to the remote unit on a stack member.	UE
reload	Reloads the operating system.	PE
set description	Associates a text description with a switch in the stack.	SG
slot	Configures a slot in the system.	GC
show banner	Displays banner information.	PE
show buffers	Displays the system allocated buffers.	UE or PE
show checkpoint statistics	Displays the statistics for the checkpointing process.	PE
show cut-through mode	Show the cut-through mode on the switch.	PE
show hardware profile portmode	Displays the hardware profile information for the 40G ports.	PE
show idprom interface	Displays the optics EEPRM contents in a user-readable format.	UE or PE
show interfaces	Displays the traffic statistics for one or multiple interfaces.	UE
show interfaces advanced firmware	Displays the firmware revision of the PHY for a port.	PE
show interfaces	Displays the static and dynamic parameters for the optics.	UE or PE
show memory cpu	Displays the interface utilization.	PE
show memory cpu	Checks the total and available RAM space on the switch.	PE
show msg-queue	Displays the internal message queue allocations.	PE, GC

Command	Description	Mode[a]
show nsf	Shows non-stop forwarding status.	PE
show power-usage-history	Shows the history of unit power consumption for the unit specified in the command and total stack power consumption.	PE
show process app-list	Displays the system applications.	PE or GC
show process app-resource-list	Lists the configured and in-use resources for each application known to the Process Manager.	PE or GC
show process cpu	Checks the CPU utilization for each process currently running on the switch.	PE
show process proc-list	Lists the configured and in-use resources for each application known to the Process Manager.	PE or GC
show sessions	Displays a list of the open console sessions.	PE
show slot	Displays information about all the slots in the system or for a specific slot.	UE
show supported cardtype	Displays information about all card types supported in the system.	UE
show supported switchtype	Displays information about all supported switch types.	UE
show switch	Displays information about the switch status.	UE
show system	Displays system information.	UE
show system fan	Explicitly displays the fan status.	UE or PE
show system id	Displays the service ID information.	UE
show system power	Displays information about the system level power consumption.	UE or PE
show system temperature	Displays information about the system temperature and fan status.	UE or PE
show tech-support	Displays system and configuration information (for debugging/calls to technical support).	PE
show users	Displays information about the active users, including which profiles have been assigned to local user accounts and which profiles are active for logged-in users.	PE

Command	Description	Mode[a]
show version	Displays the system version information.	UE
stack	Sets the mode to Stack Configuration mode.	GC
stack-port	Sets the mode to Stack Configuration mode to configure Stack ports as either Stacking ports or as Ethernet ports.	GC
stack-port shutdown	Enables or disable the stack port administratively.	SC
standby	Configures the standby in the stack.	SG
switch renumber	Changes the identifier for a switch in the stack.	GC
telnet	Logs into a host that supports Telnet.	PE
traceroute	Discovers the IP routes that packets actually take when traveling to their destinations.	PE
traceroute ipv6	Discovers the IP routes that packets actually take when traveling to their destinations.	PE
update bootcode	Updates the boot code on one or more switches.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Telnet Server

Command	Description	Mode[a]
ip telnet server disable	Enables/disables the Telnet service on the switch.	GC
ip telnet port	Configures the Telnet TCP port number on the switch.	GC
show ip telnet	Displays the status of the Telnet server and the Telnet TCP port number.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

Time Ranges

Command	Description	Mode[a]
time-range [name]	Creates a time range identified by name, consisting of one absolute time entry and/or one or more periodic time entries.	GC
absolute	Adds an absolute time entry to a time range.	TRC
periodic	Adds a periodic time entry to a time range.	TRC
show time-range	Displays a time range and all the absolute/periodic time entries that are defined for the time range.	PE

a. For the meaning of each Mode abbreviation, see Mode Types.

USB Flash Drive

Command	Description	Mode[a]
unmount usb	Makes the USB flash device inactive.	PE
show usb	Displays the USB flash device details.	PE
dir usb	Displays the USB device contents and memory statistics.	PE
recover	Mounts the USB stick, copies the image from the USB root level directory into RAM, and executes the image.	UB

a. For the meaning of each Mode abbreviation, see Mode Types.

User Interface

Command	Description	Mode[a]
configure terminal	Enters Global Configuration mode.	PE
do	Executes commands available in Privileged Exec mode with command line completion.	All except PE and UE
enable	Enters Privileged Exec mode.	UE

Command	Description	Mode[a]
end	Gets the CLI user control back to the privileged execution mode or user execution mode.	Any
exit	Exits any configuration mode to the previously highest mode in the CLI mode hierarchy.	(All)
quit | exit | logout	Closes an active terminal session by logging off the switch.	UE

a. For the meaning of each Mode abbreviation, see Mode Types.

Web Server

Command	Description	Mode[a]
common-name	Specifies the common-name for the device.	CR
country	Specifies the country.	CR
crypto certificate generate	Generates a HTTPS certificate.	GC
crypto certificate import	Imports a certificate signed by the Certification Authority for HTTPS.	GC
crypto certificate request	Generates and displays a certificate request for HTTPS.	PE
duration	Specifies the duration in days.	CR
email	Identifies the email address used to contact your organization.	CR
ip http port	Specifies the TCP port for use by a web browser to configure the switch.	GC
ip http server	Enables the switch to be configured from a browser.	GC
ip http secure-certificate	Configures the active certificate for HTTPS.	GC
ip http secure-port	Configures a TCP port for use by a secure web browser to configure the switch.	GC
ip http secure-server	Enables the switch to be configured, monitored, or modified securely from a browser.	GC
ip scp server enable	Enables the internal SCP server.	GC
key-generate	Specifies the key-generate.	CR

Command	Description	Mode[a]
location	Specifies the location or city name.	CR
no crypto certificate	Deletes a certificate from the switch.	GC
organization-name	Identifies the legal name of the organization requesting the certificate.	CR
organization-unit	Specifies the organization-unit or department name.	CR
quit	Exits from crypto certificate generate mode, crypto certificate import mode, or crypto certificate request mode without performing the action.	CR
show crypto certificate mycertificate	Displays the SSL certificates of your switch.	PE, GC
show ip http server status	Displays the HTTP server status information.	UE, PE, GC
show ip http server secure status	Displays the HTTP secure server status information.	UE, PE, GC
state	Specifies the state or province name.	CR
subject-alternative-name	Adds a subject alternative name to a certificate request.	CR

a. For the meaning of each Mode abbreviation, see Mode Types.

2

Using the CLI

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Introduction

This section describes the basics of entering and editing the Dell EMC Networking N1100-ON, N1500, N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON Series Command Line Interface (CLI) commands and defines the command hierarchy. It also explains how to activate the CLI and implement its major functions.

This section covers the following topics:

- Entering and Editing CLI Commands
- CLI Command Modes
- Starting the CLI
- Using CLI Functions and Tools

Entering and Editing CLI Commands

A CLI command is a series of keywords and arguments. The total number of characters that may be entered in a single command is limited to 1536 characters. Keywords identify a command and arguments specify configuration parameters. For example, in the command **show interfaces status** *gigabitethernet 1/0/5*, **show**, **interfaces** and **status** are keywords; *gigabitethernet* is an argument that specifies the interface type, and *1/0/5* is an argument that specifies the unit/slot/port.

When working with the CLI, the command options are not displayed. The command is not selected by a menu but is entered manually. To see what commands are available in each mode or within an Interface Configuration, the CLI provides a method of displaying the available commands, the command syntax requirements and in some instances parameters required to complete the command. The standard command to request context-sensitive help is the <?> key.

Two instances where the help information can be displayed are:

- **Keyword lookup** — The <?> key is entered in place of a command. A list of all valid commands and corresponding help messages is displayed.
- **Partial keyword lookup** — A command is incomplete and the <?> key is entered in place of a parameter. The matched parameters for this command are displayed.

The following features and conventions are applicable to CLI command entry and editing:

- History Buffer
- Negating Commands
- Show Command
- CLI Output Filtering
- Command Completion
- Short Form Commands
- Keyboard Shortcuts
- Parameters
- Command Scripting
- CLI Command Notation Conventions
- Interface Naming Conventions

History Buffer

Every time a command is entered in the CLI, it is recorded in an internally managed Command History buffer. Commands are stored in the buffer, which operates on a *First In First Out (FIFO)* basis. These commands can be recalled, reviewed, modified, and reissued. This buffer is not preserved after switch resets.

Table 2-1. History Buffer

Keyword	Source or Destination
Up-arrow key <Ctrl>+<P>	Recalls commands in the history buffer, beginning with the most recent command. Repeats the key sequence to recall successively older commands.
Down-arrow key <Ctrl>+<N>	Returns to more recent commands in the history buffer after recalling commands with the up-arrow key. Repeating the key sequence recalls more recent commands in succession.

By default, the history buffer system is enabled, but it can be disabled at any time. The standard number of 10 stored commands can be increased to 216. By configuring 0, the effect is the same as disabling the history buffer system. For information about the command syntax for configuring the command history buffer, see the history size command in the Line command mode section of this guide.

Negating Commands

For many commands, the prefix keyword **no** is entered to cancel the effect of a command or reset the configuration to the default value. Nearly all configuration commands have this capability. This guide describes the negation effect for all commands to which it applies.

Show Command

The **show** command executes in the User Executive (Exec), Privileged Executive (Exec), Global Configuration mode, Interface Configuration mode and all configuration submodes with command completion. Output from show commands is paginated. Use the **terminal length** command to set the number of lines displayed in a page. When the paging prompt appears, press the space bar to display the next page of output or the enter key to display the next line of output.

Example:

console>en

console#configure

console(config)#interface Gi1/0/1

console(config-if-Gi1/0/1)#show interface status

Port	Name	Duplex	Speed State	Neg Status	Link	Flow Control
Gi1/0/1		N/A	Unknown	Auto	Down	Inactive
Gi1/0/2		N/A	Unknown	Auto	Down	Inactive
Gi1/0/3		N/A	Unknown	Auto	Down	Inactive
Gi1/0/4		N/A	Unknown	Auto	Down	Inactive
Gi1/0/5		N/A	Unknown	Auto	Down	Inactive
Gi1/0/6		N/A	Unknown	Auto	Down	Inactive

CLI Output Filtering

Many CLI **show** commands include considerable content to display to the user. This can make output confusing and cumbersome to parse through to find the information of desired importance. The CLI Output Filtering feature allows the user, when executing CLI `show display` commands, to optionally specify arguments to filter the CLI output to display only desired information. The result is to simplify the display and make it easier for the user to find the information the user is interested in.

The main functions of the CLI Output Filtering feature are:

- Pagination Control
  - Supports enabling/disabling paginated output for all **show** CLI commands. When disabled, output is displayed in its entirety. When enabled, output is displayed page-by-page such that content does not scroll off the terminal screen until the user presses a key to continue. --More-- or (q)uit is displayed at the end of each page.
  - When pagination is enabled, press the return key to advance a single line, press **q** or **Q** to stop pagination, or press any other key to advance a whole page. These keys are not configurable.

NOTE: Although some **show** commands already support pagination, the implementation is unique per command and not generic to all commands.

- Output Filtering
  - "Grep"-like control for modifying the displayed output to only show the user-desired content.
    - Filter displayed output to only include lines containing a specified string match.
    - Filter displayed output to exclude lines containing a specified string match.
    - Filter displayed output to only include lines including and following a specified string match.
    - Filter displayed output to only include a specified section of the content (for example, "interface 0/1") with a configurable end-of-section delimiter.
    - String matching should be case insensitive.
    - Pagination, when enabled, also applies to filtered output.

Example: The following shows an example of the extensions made to the CLI **show** commands for the Output Filtering feature.

```
(Routing) #show running-config ?
<cr>                         Press enter to execute the command.
|                            Output filter options.
<scriptname>                 Script file name for writing active configuration.
all                          Show all the running configuration on the switch.
interfaceDisplay the running configuration for specified interface on the
switch.

(Routing) #show running-config | ?
begin                        Begin with the line that matches
exclude                      Exclude lines that matches
include                      Include lines that matches
section                      Display portion of lines
```

For new commands for the feature, see CLI Output Filtering Commands.

Command Completion

CLI can complete partially entered commands when the user presses the <tab> or <space> key. If a command entered is not complete, is not valid, or if some parameters of the command are not valid or missing, an error message is displayed to assist in entering the correct command. By pressing the <tab> key, an incomplete command is changed into a complete command. If the characters already entered are not enough for the system to identify a single matching command, the <?>key displays the available commands matching the characters already entered.

Short Form Commands

The CLI supports the short forms of all commands. As long as it is possible to recognize the entered command unambiguously, the CLI accepts the short form of the command as if the user typed the full command.

Keyboard Shortcuts

The CLI has a range of keyboard shortcuts to assist in editing the CLI commands. The **help** command, when used in the User Exec and Privileged Exec modes, displays the keyboard short cuts.

Table 2-2 contains the CLI shortcuts displayed by the **help** command.

Table 2-2. CLI Shortcuts

Keyboard Key	Description
<Delete, Backspace>	Delete previous character
<Ctrl>+<A>	Go to beginning of line
<Ctrl>+<E>	Go to end of line
<Ctrl>+<F>	Go forward one character
<Ctrl>+<B>	Go backward one character
<Ctrl>+<D>	Delete current character
<Ctrl>+<U,X>	Delete to beginning of line
<Ctrl>+<K>	Delete to the end of the line.
<Ctrl>+<W>	Delete previous word
<Ctrl>+<T>	Transpose previous character
<Ctrl>+<P>	Go to previous line history buffer
<Ctrl>+<R>	Rewrites or pastes the line
<Ctrl>+<N>	Go to next line in history buffer
<Ctrl>+<Y>	Print last deleted character
<Ctrl>+<Q>	Pauses screen output.
<Ctrl>+<S>	Resumes screen output.
<Ctrl>+<Z>	Return to root command prompt
<Tab, SPACE>	Command-line completion
end	Return to the root command prompt
exit	Go to next lower command prompt
<?>	List choices

Parameters

Command line parameters are entered by the user to choose an individual value or range of values for the specific command. Command line parameters are not syntax or range checked until the carriage return is entered. In some cases, the user may need to enter special characters, most often in a string parameter such as a password or a label. Special characters are one of the following characters (`! $ % ^ & * ( ) _ - + = { [}] : ; @ ' " ~ # | \ < , > ./

) or a blank. In these cases, it may be necessary to enclose the entire string in double or single quotes for the command line parser to properly interpret the parameter.

Command Scripting

The CLI can be used as a programmable management interface. To facilitate this function, the exclamation point <!> and any characters entered after the exclamation point up until the end of the line are treated as a comment and ignored by the CLI. If it is desired to include an exclamation point in a command parameter, enclose the parameter in quotes. Also, the CLI allows the user to disable session timeouts.

CLI Command Notation Conventions

In this document, the command name is in bold font. Parameters are in italic font. You must replace the parameter name with an appropriate value, which might be a name or number. Parameters are order dependent.

The parameters for a command might include mandatory values, optional values, or keyword choices.

When entering commands there are certain command-entry notations which apply to all commands. Table 2-3 describes the conventions this document uses to distinguish between value types.

Table 2-3. CLI Command Notation Conventions

<table>
<tr><th>Convention</th><th>Example</th><th>Description</th></tr>
<tr><td>[ ] square brackets</td><td>[value]</td><td>In a command line, square brackets indicate an optional parameter that you can enter in place of the brackets and text inside them.</td></tr>
<tr><td>{ } curly braces</td><td>{choice1|choice2}</td><td>In a command line, inclusive brackets indicate a selection of compulsory parameters separated by the | character. You must select a parameter from the list of choices. For example: flowcontrol {auto | on | off} means that for the flowcontrol command either auto, on or off must be selected.</td></tr>
<tr><td>| vertical bars</td><td>choice1|choice2</td><td>Separates the mutually exclusive choices.</td></tr>
<tr><td>[{}] braces within square brackets</td><td>[{choice1|choice2}]</td><td>Indicates a choice within an optional element.</td></tr>
<tr><td>Italic</td><td></td><td>Indicates a variable value. You must replace the italicized text with an appropriate value, which might be a name or number.</td></tr>
<tr><td><Enter></td><td></td><td>Any individual key on the keyboard.</td></tr>
<tr><td><Ctrl>+<F4></td><td></td><td>Any combination of keys pressed simultaneously on the keyboard.</td></tr>
<tr><td>Screen Display</td><td></td><td>Indicates system messages and prompts appearing on the console.</td></tr>
<tr><td>all</td><td></td><td>Indicates a literal parameter, entered into the command as it is.</td></tr>
</table>

Interface Naming Conventions

The conventions for naming interfaces in CLI commands are as follows:

Ethernet Interfaces

Individual Ethernet interfaces (Gigabit Ethernet, Ten Gigabit Ethernet, and Forty Gigabit Ethernet) are identified in the CLI by the variable *unit/slot/port*, where:

- *<Interface Type> Unit#/Slot#/Port#* — Identifies a specific interface by the interface type tag followed by the Unit# followed by a / symbol, then the Slot# followed by a / symbol, and then the Port#. For example, gi*2/0/10* identifies the Gigabit interface 10 in slot 0 within the second unit on a non-blade switch. Table 2-4 below lists the supported interface type tags.
- *Unit #* — The unit number is greater than 1 only in a stacking solution where a number of switches are stacked to form a virtual switch. In this case, the Unit# indicates the logical position of the switch in a stack. The range is 1–<*maximum supported on platform*>. The unit value is 1 for standalone switches.
- *Slot#* — The slot number is an integer number assigned to a particular slot. Front panel ports have a slot number of 0. Rear panel ports are numbered from 1 and can be identified by the lexan on the rear panel. Use the show slot command to retrieve information for a particular slot.
- *Port#* — The port number is an integer number assigned to the physical port on the switch and corresponds to the lexan printed next to the port on the front or back panel. Ports are numbered from 1 to the maximum number of ports available on the switch unit, typically 24 or 48.

Logical interfaces are identified by one of the keywords: loopback, port-channel, tunnel or vlan followed an integer index identifying the specific logical interface.

Within this document, unless specified otherwise, the tag *interface–id* refers to a logical or Ethernet interface identifier that follows the naming convention above. If the command is restricted to a subset of the interfaces, then the subset is described in the command description. Ethernet interfaces are Gigabitethernet, Tengigabitethernet, and Fortygigabitethernet. NBASE-T interfaces running at 2.5 and 5 Gigabit speeds are identified as Gigabitethernet.

Table 2-4. Interface Identifiers

Interface Type	Long Form	Short Form	Single Character Short Form	Interface Identifier
Gigabit Ethernet	Gigabitethernet	G or Gi	Y	unit/slot/port
10-Gigabit Ethernet	Tengigabitethernet	Te	Y	unit/slot/port
21-Gigabit Stacking	Twentygigabitstacking	Tw	n/a	unit/slot/port
40-Gigabit Ethernet	Fortygigabitethernet	Fo	Y	unit/slot/port
Loopback	Loopback	Lo	Y	loopback-id (0-7)
Port Channel	Port-channel	Po	Y	port-channel-number (1-128) N1500 (1–64)
Tunnel	Tunnel	Tu	n/a	tunnel-id (0-7)
Vlan	VLAN	Vl	Y	vlan-id (1-4093)

A single character short form of the interface commands indicated in Table 2-4 is implemented in version 6.5 for Gigabit Ethernet interfaces only.

When listed in command line output, Gigabit Ethernet interfaces are preceded by the characters *Gi*, Ten-Gigabit Ethernet interfaces are preceded by *Te*, and Forty-Gigabit Ethernet interfaces are preceded by *Fo,* as shown in the examples below.

Stacking Interfaces

Stacking interfaces are represented in the CLI with the same unit/slot/port form as Ethernet interfaces. The fixed stacking interfaces on the N2000/N2100-ON/N2200-ON/N3000-ON switches always use the TwentyGigabitStacking or Tw notation and on the N1100-ON/N1500 switches, are referred to using Ethernet notation.

Loopback Interfaces

Loopback interfaces are represented in the CLI by the keyword **loopback** followed by the variable *loopback-id*, which can assume values from 0–7.

Port Channel Interfaces

Port-channel (or LAG) interfaces are represented in the CLI by the keyword **port-channel** followed by the variable *port-channel-number*.

When listed in command line output, port channel interfaces are preceded by the characters *Po*.

Tunnel Interfaces

Tunnel interfaces are represented in the CLI by the keyword **tunnel** followed by the variable *tunnel-id*, which can assume values from 0–7.

VLAN Routing Interfaces

VLAN interfaces are represented in the CLI by the keywords **interface vlan** followed by the variable *vlan-id*, which can can assume values from 1-4093. A VLAN routing interface will typically have an IP address assigned, either via DHCP or a static assignment or, in the case of IPv6, auto assignment of a link local address.

Operating on Multiple Interfaces (Ranges)

The CLI allows the user to operate on multiple interfaces in one operation. The guidelines are as follows for range operation:

- The **range** key word is used to identify that an interface range specifier follows.
  - An interface range specifier consists of an interface identifier followed by an optional range parameter. The interface type may be an Ethernet interface or a logical interface (port channel or VLAN) as described in the Interface Naming Conventions section.
- The range parameter may be written in the following manner:

  (#-#) — a range from a particular interface to another higher-numbered interface (inclusive). For example, 1/0/1-10 indicates that the operation applies to the Ethernet interfaces 1 to 10 in slot 0 on unit 1. The number to the left of the hyphen must always be less than or equal to the number to the right of the hyphen, e.g. interface range Gi1/0/10-1 is not valid.

(#, #, #) — a list of interfaces. For example, (1/0/1, 1/0/1,1/0/3, 1/0/5) indicates that the operation applies to the Ethernet interfaces 1, 3, and 5 on unit 1. The interfaces may or may not be consecutive, nor must the interfaces be of the same type.

(#, #-#, #) — ranges and non-consecutive interfaces listed together. For example, (1/0/1, 1/0/3-5, 1/0/7) indicates that the operation applies to the Ethernet interfaces 1, 3, 4, 5, and 7 on unit 1.

NOTE: Each Ethernet interface must be a fully qualified interface identifier in the format *unit*/*slot*/*port*. See Interface Naming Conventions.

- Port channels and VLANs are supported in ranges.
- No spaces are allowed anywhere in a range parameter, e.g. Gi1/0/1 -2 is not accepted, nor is Gi1/0/2, Gi1/0/4. Use Gi1/0/1-2 and Gi/1/0/2,Gi1/0/4 respectively.
- When operating on a range of interfaces, the CLI implementation hides the parameters that may not be configured in a range (for example, parameters that must be uniquely configured for each instance).
- The CLI uses best effort when operating on a list of objects. If the user requests an operation on a list of objects, the CLI attempts to execute the operation on as many objects in the list as possible even if failure occurs for some of the items in the list. The CLI provides the user with a detailed list of all failures, listing the objects and the reasons for the failures.

Some parameters must be configured individually for each port or interface.

Examples

Example 1 shows the various forms of interface notation that can be entered in the CLI. Examples 2 and 3 show various forms of CLI output using shorthand interface notation.

Example #1

```
gigabitethernet 1/0/1
gigabitethernet1/0/1 (there is no space)
gi 1/0/1
gi1/0/1    (there is no space)
port-channel 1
vlan 5
```

```
tunnel 7
loopback 3
```

Example #2

```
console(config-if-Gi1/0/23)#show vlan

VLAN   Name                             Ports          Type
-----  ---------------                  -------------  --------------
1      default                          Po1-128,       Default
                                        Gi1/0/1-24,
                                        Te1/0/1-2

RSPAN Vlan
---------------------------------------------------------------------
None


console(config-if-Gi1/0/23)#show slot 2/0

Slot............................. 2/0
Slot Status...................... Empty
Admin State...................... Enable
Power State...................... Enable
Configured Card:
   Model Identifier.............. Dell Networking N3024F
   Card Description.............. Dell 24 Port 10G Fiber
Pluggable........................ No
```

Example #3

```
console(config-if-Gi1/0/23)#show slot

              Admin   Power          Configured Card
Slot  Status  State   State             Model ID             Pluggable
----- ------ ------- ------- -------------------------------- ---------
1/0   Full   Enable  Enable  Dell Networking N3024F              No
1/1   Empty  Disable Disable                                     Yes
2/0   Empty  Enable  Enable  Dell Networking N3024F              No
2/1   Empty  Enable  Enable                                      Yes
3/0   Empty  Enable  Enable  Dell Networking N3048               No
3/1   Empty  Enable  Enable                                      Yes


console(config-if-Gi1/0/23)#show slot 1/0

Slot............................. 1/0
Slot Status...................... Full
Admin State...................... Enable
Power State...................... Enable
Inserted Card:
   Model Identifier.............. Dell Networking N3024F
```

```
   Card Description.............. Dell 24 Port 10G Fiber
Configured Card:
   Model Identifier.............. Dell Networking N3024F
   Card Description.............. Dell 24 Port 10G Fiber
Pluggable........................ No
```

Entering Network Addresses

MAC Addresses

MAC addresses are specified in 3 groups of four upper or lower case hexadecimal characters separated by periods with no spaces, e.g. 0011.2233.FFee or by eight pairs of upper or lower case hexadecimal characters separated by colons, e.g. 00:11:22:33:FF:ee. Leadings zeros must be specified in all cases.

IPv4 Addresses

IPv4 addresses are specified by four groups of decimal integers in the range 0-255, i.e. dotted quad notation. Leading zeros are not required. Example IPv4 addresses are 1.2.3.4 or 255.255.255.255.

The net mask, if specified, consists of four decimal digits in dotted quad notation, e.g. 255.255.252.0 or a decimal prefix length preceded by a forward slash and indicating the number of left justified 1 bits in the net mask. The net mask is always separated from an IPv4 address by one or more spaces, regardless of the format. Bits that are not significant must be zeroed, for example, 1.1.1.1/24 is not a valid subnet as the rightmost 1 bit is not configured to be a zero. User 1.1.1.0/24 instead.

Examples:

```
1.2.3.0 /24 is equivalent to 1.2.3.0 255.255.255.0
```

IPv6 Addresses

IPv6 addresses may be expressed in up to eight blocks of four upper or lower case hexadecimal characters. For simplification, the leading zeros of each 16 bit block may be omitted. One sequence of 16 bit blocks - containing only zeros - may be replaced by a double colon"::", but not more than one at a time. Example IPv6 addresses are:

Dropped zeros: 3ffe:ffff:100:f101:0:0:0:1 becomes 3ffe:ffff:100:f101::1

Local Host: 0000:0000:0000:0000:0000:0000:0000:0001 becomes ::1

Any host: 0000:0000:0000:0000:0000:0000:0000:0000 becomes ::

The prefix length, if specified, ranges from 1 to 128 and is specified by a forward slash and a decimal number indicating the significant bits of the address, e.g. 3ffe:ffff:100:f101:0:0:0:/64. No spaces are allowed between the last address digit or colon and the forward slash.

CLI Command Modes

Since the set of CLI commands is very large, the CLI is structured as a command-tree hierarchy, where related command sets are assigned to command modes for easier access. At each level, only the commands related to that level are available to the user and only those commands are shown in the context sensitive help for that level.

In this guide, commands are organized into multiple categories:

- Layer 2 Switching commands
- Security commands
- Data Center Technology commands
- Layer 3 Routing commands
- Switch Management commands

Layer 2 Switching describes the commands used for filtering and forwarding of packets within a VLAN based upon learned MAC addresses.

Security describes the commands used to configure switch administrator and end user network access.

Layer 3 Routing describes the commands used to forward packets within and across VLANs based upon the IP addresses as well as management of the routing protocols necessary to enable the distribution of routes.

Switch Management describes commands used to manage the switch.

Commands that cause specific actions to be taken immediately by the system and do not directly affect the system configurations are defined at the top of the command tree. For example, commands for rebooting the system or for downloading or backing up the system configuration files are placed at the top of the hierarchy tree.

Commands that result in configuration changes to the switch are grouped in a Global Configuration sub tree.

There are levels beneath the Global Configuration mode for further grouping of commands. The system prompt reflects these sub-Configuration modes.

All the parameters are provided with reasonable defaults where possible.

When starting a session, the initial mode is the User Exec mode (privilege level 0). Only a limited subset of commands is available in this mode. This level is reserved for tasks that do not change the configuration. To enter the next level, Privileged Exec mode (privilege level 1) may be required if configured by the administrator.

Privileged Exec mode provides access to commands that can not be executed in the User Exec mode and permits access to Global Configuration mode.

Global Configuration mode manages switch configuration on a global level. For specific configurations, command modes exist at a sublevel.

Entering a <?> at the system prompt displays a list of commands available for that particular command mode. A specific command is used to navigate from one command mode to another. The standard order to access the modes is as follows: User Exec mode, Privileged Exec mode, Global Configuration mode, and Interface Configuration and other specific configuration modes.

User Exec Mode

After logging into the switch, the user is automatically in the User Exec command mode unless the user is defined as a privileged user. In general, the User Exec commands allow the user to perform basic tests, and list system information.

The user-level prompt consists of the switch host name followed by the angle bracket (>).

```
console>
```

The default host name is Console unless it has been changed using the **hostname** command in Global Configuration mode.

Privileged Exec Mode

Because many of the privileged commands set operating parameters, privileged access may be password-protected to prevent unauthorized use. The password is not displayed on the screen and is case sensitive.

Privileged users enter into the Privileged Exec mode from User Exec mode, where the following prompt is displayed.

```
console#
```

Global Configuration Mode

Global Configuration commands allow the operator to change the configuration of the switch. The Privileged Exec mode command **configure** (or **configure terminal**) is used to enter Global Configuration mode.

```
console(config)#
```

The following are the Global Configuration submodes:

- **SNMP v3 Host Configuration** — Configures the parameters for the SNMP v3 server host.
- **SNMP Community Configuration** — Configures the parameters for the SNMP server community.
- **MST** — The Global Configuration mode command spanning-tree mst configuration is used to enter into the Multiple Spanning Tree configuration mode.
- **Line Interface** — Contains commands to configure the management connections. These include commands such as line speed and time-out settings. The Global Configuration mode command **line** is used to enter the Line Interface mode.
- **Router OSPF Configuration** — Global configuration mode command **router ospf** is used to enter into the Router OSPF Configuration mode.
- **Router RIP Configuration** — Global configuration mode command **router rip** is used to enter into the Router RIP Configuration mode.
- **Router OSPFv3 Configuration** — Global configuration mode command **ipv6 router ospf** is used to enter into the Router OSPFv3 Configuration mode.
- **Router BGP Configuration** — Global configuration mode command **router bgp** is used to enter into the Router BGP Configuration mode.
- **IPv6 DHCP Pool Mode** — Global configuration mode command **ipv6 dhcp pool** is used to enter into the IPv6 DHCP Pool mode.
- **Management Access List** — Contains commands to define management access administration lists. The Global Configuration mode command **management access-list** is used to enter the Management Access List configuration mode.
- **Policy-map** — Use the **policy-map** command to access the QoS policy map configuration mode to configure the QoS policy map.

- **Policy Class** — Use the **class** command to access the QoS Policy-class mode to attach or remove a diffserv class from a policy and to configure the QoS policy class.
- **Class-Map —** This mode consists of class creation/deletion and matching commands. The class matching commands specify layer 2, layer 3 and general match criteria. Use the **class-map class-map-name** commands to access the QoS Class Map Configuration mode to configure QoS class maps.
- **Stack** — Use the stack command to access the Stack Configuration Mode.
- **SSH Public Key-chain** — Contains commands to manually specify other switch SSH public keys. The Global Configuration mode command **crypto key pub-key chain ssh** is used to enter the SSH Public Key-chain configuration mode.
- **SSH Public Key-string** — Contains commands to manually specify the SSH Public-key of a remote SSH Client.
- **MAC Access-List** — Configures conditions required to allow traffic based on MAC addresses. The Global Configuration mode command **mac access-list** is used to enter the MAC Access-List configuration mode.
- **TACACS** — Configures the parameters for the TACACS server.
- **RADIUS** — Configures the parameters for the RADIUS server.
- **SNMP Host Configuration** — Configures the parameters for the SNMP server host. Only IPv4 hosts are supported.
- **Crypto Certificate Request** — Configures the parameters for crypto certificate request.
- **Crypto Certificate Generation** — Configures the parameters for crypto certificate generate.
- **Logging** — Configures the parameters for SYSLOG servers.
- **VLAN**— Creates a VLAN and configures non-L3 parameters on a VLAN.
- **Virtual Router Configuration**— Configures parameters for a virtual routing instance.

Pre-configuration

Nearly all switch features support a pre-configuration capability, even when a feature is not enabled or the required hardware is not present.

Pre-configured capabilities become active only when enabled (typically via an admin mode control) or when the required hardware is present (or both). For example, a port can be pre-configured with both trunk and access mode information. The trunk mode information is applied only when the port is placed into trunk mode and the access mode information is only applied when the port is placed into access mode. Likewise, OSPF routing can be configured in the switch without being enabled on any port.

Interface Configuration Modes

Interface configuration modes are used to modify specific interface operations. The following are the Interface Configuration and other specific configuration modes:

- **Ethernet** — Contains commands to manage Ethernet port configuration. The Global Configuration mode command **interface** *interface-id* enters the Interface Configuration mode to configure an Ethernet interface.
- **Port Channel** — Contains commands to configure port-channels, i.e., assigning ports to a port-channel. Most of these commands are the same as the commands in the Ethernet interface mode and are used to manage the member ports as a single entity. The Global Configuration mode command **interface port-channel** *port-channel-number* is used to enter the Port Channel mode.
- **Tunnel** — Contains commands to manage tunnel interfaces. The Global Configuration mode command interface tunnel enters the Tunnel Configuration mode to configure an tunnel type interface.
- **Loopback** — Contains commands to manage loopback interfaces. The Global Configuration mode command **interface loopback** enters the Loopback Configuration mode to configure an loopback type interface.
- **Out-of-band**—Contains commands to manage the out-of-band interface, if present. The Global Configuration mode command interface out-of-band enters the Out-of-band Interface mode to configure the out-of-band interface.
- **Interface VLAN**— Enables routing on a VLAN and configures routing/L3 parameters on a VLAN.

Identifying the Switch and Command Mode from the System Prompt

The system prompt provides the user with the name of the switch (hostname) and identifies the command mode. The following is a formal description of the system command prompt:

[*device name*][([*command mode*-[*object*]])][# | >]

[*device name*] — is the name of the managed switch, which is typically the user-configured hostname established by the **hostname** command.

[*command mode*] — is the current configuration mode and is omitted for the top configuration levels.

[*object*] — indicates specific object or range of objects within the configuration mode.

For example, if the current configuration mode is config-if and the object being operated on is Gigabit Ethernet 1 on unit 1, the prompt displays the object type and unit (for example, Gi1/0/1).

[# | >] — The # sign is used to indicate that the system is in the Privileged Exec mode. The > symbol indicates that the system is in the User Exec mode, which is a read-only mode in which the system does not allow configuration.

Navigating CLI Command Modes

Table 2-5 describes how to navigate through the CLI Command Mode hierarchy.

Table 2-5. Navigating CLI Command Modes

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
User Exec	The user is automatically in User Exec mode unless the user is defined as a privileged user.	console>	logout

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
Privileged Exec	Use the **enable** command to enter into this mode. This mode is password protected.	console#	Use the **exit** command, or press <Ctrl>+<Z> to return to the User Exec mode.
Global Configuration	From Privileged Exec mode, use the **configure** command.	console(config)#	Use the **exit** command, or press <Ctrl>+<Z> to return to the Privileged Exec mode.
Line Interface	From Global Configuration mode, use the **line** command.	console(config-line)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
BGP Router Configuration	From Global Configuration mode, use the **router bgp** command.	console(config-router)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
IPv6 Address Family Configuration	From BGP Router Configuration mode, use the **address-family ipv6** command.	console (config-router-af)#	To exit to BGP Router Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Management Access-List	From Global Configuration mode, use the **management access-list** command.	console(config-macl)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Policy-Class-Map	From Global Configuration mode, use the **policy-map class** command.	console(config-policy-map)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Class-Map	From Global Configuration mode, use the **class-map** command.	console(config-classmap)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	**Access Method**	**Command Prompt**	**Exit or Access Previous Mode**
MAC Access List	From Global Configuration mode, use the **mac access-list** command.	console(config-mac-access-list)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
SSH Public Key-Chain	From Global Configuration mode, use the **crypto key pubkey-chain ssh** command.	console(config-pubkey-chain)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
SSH Public Key String	From the SSH Public Key- Chain mode, use the **user-key** <*user name* > {**rsa** | **dsa**} command.	console(config-pubkey-key)#	To return to the SSH Public key-chain mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
TACACS	From Global Configuration mode, use the **tacacs-server host** command.	console(config-tacacs)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
RADIUS Server Configuration	From Global Configuration mode, use the **radius server host** command.	console(Config-auth-radius)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
RADIUS Dynamic Authorization	From Global Configuration, use the **aaa server radius dynamic-author** command.	console(config-radius-da)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
SNMP Host Configuration	From Global Configuration mode, use the **snmp-server** command.	console(config-snmp)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
SNMP v3 Host Configuration	From Global Configuration mode, use the **snmp-server v3-host** command.	console(config-snmp)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
SNMP Community Configuration	From Global Configuration mode, use the **snmp-server community** command.	console(config-snmp)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode
Crypto Certificate Generation	From Global Configuration mode, use the **crypto certificate** *number* **generate** command.	console(config-crypto-cert)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Crypto Certificate Request	From Privileged Exec mode, use the **crypto certificate** *number* **request** command.	console(config-crypto-cert)#	To exit to Privileged Exec mode, use the **exit** command, or press <Ctrl>+<Z>.
Stack	From Global Configuration mode, use the **stack** command.	console(config-stack)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
Logging	From Global Configuration mode, use the **logging** command.	console(config-logging)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
MST	From Global Configuration mode, use the **spanning-tree mst configuration** command.	console(config-mst)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
VLAN Config	From Global Configuration mode, use the **vlan** command.	console(config-vlan)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Router OSPF Config	From Global Configuration mode, use the **router ospf** command.	console(config-router)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	**Access Method**	**Command Prompt**	**Exit or Access Previous Mode**
Virtual Router Config	From Global Configuration mode, use the **ip vrf** command.	console(config-vrf-XXX)#where XXX is the VRF name.	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode
Router RIP Config	From Global Configuration mode, use the **router rip** command.	console(config-router)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode
Router OSPFv3 Config	From Global Configuration mode, use the **ipv6 router ospf** command.	console(config-rtr)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode
IPv6 DHCP Pool Mode	From Global Configuration mode, use the **ipv6 dhcp pool** command.	console(config-dhcp6s-pool)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	**Access Method**	**Command Prompt**	**Exit or Access Previous Mode**
Track Configuration Mode	From Global Configuration mode, use the **track object-number ip sla operation-number** command.	Switch (config-track)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
IP SLA Configuration Mode	From Global Configuration mode, use the **ip sla operation-number** command.	Switch (config-ip-sla)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
IP SLA ICMP ECHO Configuration Mode	From IP SLA Configuration mode, use the **icmp-echo destination-ip-address** command.	Switch (config-ip-sla-echo)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
ERSPAN Source Session Configuration	From Global Configuration mode, use the **monitor session type erspan-source** command to configure an ERSPAN source session.	console (config-erspan-src)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
ERSPAN Destination Session Configuration	From Global Configuration mode, use the **monitor session type erspan-destination** command to configure an ERSPAN destination session.	Switch (config-erspan-src)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
ERSPAN Configuration Modes			
ERSPAN Destination Source Configuration	From ERSPAN Source Configuration mode, use the **destination** command to enter destination configuration mode on the source session switch.	Switch (config-erspan-src-dst)#	To exit to ERSPAN Source Configuration mode, use the **exit** command.
ERSPAN Source Destination Configuration	From ERSPAN Source Destination Configuration mode, use the **destination interface** command to configure the destination interface on a destination switch.	Switch (config-erspan-dst)#	To exit to ERSPAN Source Destination Configuration mode, use the **exit** command.
Interface Configuration Modes			

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
Gigabit Ethernet	From Global Configuration mode, use the **interface gigabitethernet** command. Or, use the abbreviation **interface gi**.	console (config-if-Gi*unit/slot/port*#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
10 Gigabit Ethernet	From Global Configuration mode, use the **interface tengigabitethernet** command. Or, use the abbreviation **interface te**.	console (config-if-Te*unit/slot/port*#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
40 Gigabit Ethernet	From Global Configuration mode, use the **interface fortygigabitethernet** command. Or, use the abbreviation **interface fo**.	console (config-if-Fo*unit/slot/port*#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Port Channel	From Global Configuration mode, use the **interface port-channel** command. Or, use the abbreviation **interface po**.	console (config-if-po*port-channel-number*)#	To exit to Global Configuration mode, use the **exit** command, or <Ctrl>+<Z> to Privileged Exec mode.

Table 2-5. Navigating CLI Command Modes *(continued)*

Command Mode	Access Method	Command Prompt	Exit or Access Previous Mode
VLAN	From Global Configuration mode, use the **interface vlan** command.	console(config-if-vlan*vlan-id*)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Tunnel	From Global Configuration mode, use the **interface tunnel** command. Or, use the abbreviation **interface tu**.	console(config-tunnel*tunnel-id*)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.
Loopback	From Global configuration mode, use the **interface loopback** command. Or, use the abbreviation **interface lo**.	console(config-loopback*loopback-id*)#	To exit to Global Configuration mode, use the **exit** command, or press <Ctrl>+<Z> to Privileged Exec mode.

Starting the CLI

To begin running the CLI, perform the following steps:

NOTE: This procedure is for use on the console line only.

NOTE: The Easy Setup Wizard may appear if the switch has no user configuration saved. Follow the procedure in the Getting Started Guide to configure the switch using the Easy Setup Wizard.

1. Start the switch and wait until the startup procedure is complete and the User Exec mode is entered. The prompt *console>* is displayed.
2. Configure the switch and complete any required tasks.

3 When finished, exit the session with the **quit** or **exit** command.

The switch can be managed over a direct connection to the switch console port or through a Telnet connection. If access is through a Telnet connection, the switch must have a defined IP address, corresponding management access granted, and a connection to the network.

Using CLI Functions and Tools

The CLI has been designed to manage the switch's configuration file system and to manage switch security. A number of resident tools exist to support these and other functions.

Configuration Management

All managed systems have software images and databases that must be configured, backed up and restored. Two software images may be stored on the system, but only one of them is active. The other one is a backup image. The same is true for configuration files, which store the configuration parameters for the switch. The system has three configuration files. One file is a memory-only file and is the current configuration file for the switch. The second file is the one that is loaded by the system when it reboots. There is one backup configuration file. The system also provides methods to back up these files to a remote system.

File System Commands

All files are stored in a file system. The commands shown in Table 2-6 are used to perform operations on these files.

Table 2-6. File System Commands

Command	Description
delete *file*	Deletes file.
filedescr *file description*	Adds a description to a file (up to 128 characters can be used).
copy *source destination*	Copies a file from source file to destination file.

Copying Files

The **copy** command not only provides a method for copying files within the file system, but also to and from remote servers. With the copy command and URLs to identify files, the user can back up images to local or remote systems or restore images from local or remote systems.

To use the **copy** command, the user specifies the source file and the destination file. For example, **copy** *tftp://remotehost/pub/backupfile backup-config* copies a file from the remote TFTP server to a local backup configuration file. In this case, if the local configuration file does not exist, then it is created by the command. If it does exist, it is overwritten. If there is not enough space on the local file system to accommodate the file, an error is flagged.

Refer to the copy command description in the Layer 2 commands section of the guide for command details.

Referencing External/Internal File systems

Configuration or software images are copied to or retrieved from remote systems using the TFTP or FTP protocols.

- tftp://server-name/path/filename — identifies a file on a remote TFTP server identified by the server-name. Trivial file transfer protocol is a simplified FTP and uses a UDP port instead of TCP and does not have password protection.
- *<ftp://{user@ipaddress | hostname}/filepath/filename>* — Identifies a file on a remote FTP server identified by the server-name. The File Transfer Protocol (FTP) is a standardized protocol used to transfer files over the network using TCP. FTP is optionally secured with a clear-text user name and password.

Special System Files

The following special filenames are used to refer to special virtual system files, which are under control of the system and may not be removed or added. These file names are reserved and may not be used as user-defined files. When the user copies a local source file into one of these special files and the source file has an attached file description, it also is copied as the file description for the special file.

- **backup-config** — This file refers to the backup configuration file.

- **running-config** — This file refers to the configuration file currently active in the system. It is possible to copy the running-config image to a backup-config file or to the startup-config file.
- **startup-config** — This file refers to the special configuration image stored in flash memory which is loaded when the system next reboots. The user may copy a particular configuration file (remote or local) to this special file name and reboot the system to force it to use a particular configuration.
- **active & backup** — These files refer to software images. The active image will be loaded when the system next reboots. Either the active or backup can be chosen for the next reboot using the command **boot system.**

The CLI prevents the user from accidentally copying a configuration image onto a software image and vice versa.

Management Interface Security

This section describes the minimum set of management interface security measures implemented by the CLI. Management interface security consists of user account management, user access control and remote network/host access controls.

CLI through Telnet, SSH, Serial Interfaces

The CLI is accessible through a local serial interface/console port, the out-of-band interface, or in-band interfaces. Since the console port requires a physical connection for access, it is used if all else fails. The console port interface is the only interface from which the user may access the Easy Setup Wizard. It is the only interface that the user can access if the remote authentication servers are down and the user has not configured the system to revert to local managed accounts.

The following rules and specifications apply to these interfaces:

- The CLI is accessible from remote telnet through the IP address for the switch. IP addresses are assigned separately for the out-of-band interface and the in-band ports.
- The CLI is accessible from a secure shell interface.
- The administrator generates keys for SSH locally via the CLI.

- The serial session defaults to 9600 BAUD, eight data bits, one stop bit, no parity and no flow control (115200 for the N1100-ON, N2100-ON, N2200-ON, N3100-ON, and N3200-ON).

User Accounts Management

The CLI provides configuration of authentication for switch administrators or network users either through remote authentication servers supporting TACACS+ or RADIUS or through a set of locally managed user accounts. The setup wizard asks the user to create the initial administrator account and password at the time the system is booted.

The following rules and specifications apply:

- The administrator may create additional administrator accounts.
- User accounts have an associated privilege level, a user name, and a user password.
- The administrator is able to delete the administrator accounts.
- The password is saved internally in encrypted format and never appears in clear text anywhere on the CLI.
- The CLI supports TACACS+ and RADIUS authentication servers and RADIUS accounting servers.
- The CLI allows the administrator to configure primary and secondary authentication servers. If the primary authentication server fails to respond within a configurable period, the CLI automatically tries the secondary authentication server.
- The administrator can specify whether the CLI should revert to using local accounts when the remote authentication servers do not respond or if the CLI simply fails the login attempt because the authentication servers are down. This capability applies only when the administrator is logged in through a telnet or an SSH session.
- The CLI always allows the administrator to log in to a local serial port even if the remote authentication server(s) are down. In this case, CLI reverts to using the locally configured accounts to allow the administrator to log in.

User Access Control

In addition to authenticating an administrator, the CLI also assigns the administrator access to one of two security levels. Privilege level 1 has read-only access. This level allows the administrator to read information but not configure the switch. The access to this level cannot be modified. Level 15 is the special access level assigned to the superuser of the switch. This level has full access to all functions within the switch.

If the account is created and maintained locally, each account is given an access level at the time of account creation. If the administrator is authenticated through remote authentication servers, the authentication server is configured to pass the access level to the CLI when the account is authenticated. When RADIUS is used, the *Vendor-Specific Option* field returns the access level. Two vendor specific options are supported. These are CISCO-AV-Pairs(Shell:priv-lvl=x) and Dell RADIUS VSA (user-group=x). TACACS+ provides the appropriate level of access.

The following rules and specifications apply:

- The administrator determines whether remote authentication servers or locally defined authentication accounts are used.
- If authentication servers are used, the administrator can identify at least two remote servers (the user may choose to configure only one server) and what protocol to use with the server, TACACS+ or RADIUS. One of the servers is primary and the other is the secondary server (the user is not required to specify a secondary server). If the primary server fails to respond in a configurable time period, the CLI automatically attempts to authenticate the user with the secondary server.
- The administrator is able to specify what happens when both primary and secondary servers fail to respond. In this case, the user is able to indicate that the CLI should either use the local user accounts or reject all requests.
- Even if the administrator configures the CLI to fail login when the remote authentication servers are down, the CLI allows access via the serial interface authenticated by locally managed account data. The default for serial port access is no login or password required.

SYSLOG

The switch supports sending logging messages to a remote SYSLOG server. The administrator configures a remote log server to which SYSLOG messages are sent.

The following rules apply:

- The administrator configures a remote SYSLOG server to which system logging messages are sent.
- Log messages are implementation-dependent but may contain debug messages, security or fault events.
- The switch maintains at most the last 1000 system events in the in-memory log.

Security Logs

The system log records security events including the following:

- User login.
- User logout.
- Denied login attempts.
- User attempt to exceed security access level.
- Denied attempts by external management system to access the system.

The security log record contains the following information:

- The login name, if available, or the protocol being accessed if the event is related to a remote management system.
- The IP address from which the user is connecting or the IP address of the remote management system.
- A description of the security event.
- A timestamp of the event

If a SYSLOG server is configured and available, the switch sends security records to the configured servers.

Management ACL

In addition to user access control, the system also supports filtering of management protocol packets addressed to the switch over the in-band ports. This capability allows individual hosts or subnets to access the switch using specific management protocols.

The administrator defines a management profile, which identifies management protocols such as the following:

- Telnet.
- SSH and the keying information to use for SSH.
- HTTP.
- HTTPS and the security certificate to be used.
- SNMPv1/v2c and the read and read/write community strings to be used.
- SNMPv3 and the security information for used this protocol.

For each of these management profiles, the administrator defines the list of hosts or subnets from which the management profiles may be used. The management ACL capability only applies to VLANs configured on in-band ports and may not be configured on the out-of-band management port.

Other CLI Tools and Capabilities

The CLI has several other capabilities associated with its primary functions.

Terminal Paging

The default terminal width and length for CLI displays is 79 characters and 25 lines, respectively. The length setting is used to control the number of lines the CLI will display before it pauses. For example, the CLI pauses at 24 lines and prompts the user with the *--More-- or (q)uit* prompt on the 25th line. The CLI waits for the user to press either <q> or <Enter> or any other key. If the user presses any key other than <Enter> or <q>, the CLI shows the next page. A <q> key stops the display and returns to the CLI prompt. The <Enter> key advances the display by one line. Use the **terminal length** command to change the number of lines displayed in a page. A terminal length of 0 disables pagination. This option is not recommended for serial console speeds of less than 115200.

Boot Message

The boot message is a system message that is not user-configurable and is displayed when the system is booting.

To start the normal booting process, select item 1 in the Boot Menu. The following is a sample log for booting information.

```
Select startup option within 5 seconds, else Operational Code will start
automatically...

Operational Code Startup -- Main Menu

1 - Start Operational Code
2 - Display Boot Menu

Select (1, 2)#
active = /dev/mtd7
Extracting Operational Code from .stk file...done.
Loading Operational Code...done.
Decompressing Operational Code...done.
Scanning devshell symbols file...
47544 symbols, loading...
Done.
PCI unit 0: Dev 0xb842, Rev 0x02, Chip BCM56842_A0, Driver BCM56840_B0
SOC unit 0 attached to PCI device BCM56842_A0
Adding BCM transport pointers
Configuring CPUTRANS TX
Configuring CPUTRANS RX


<186> Aug 26 08:18:23 0.0.0.0-1 General[72162340]: bootos.c(166) 4 %%
Event(0xaaaaaaaa)                                  started!

(Unit 1 - Waiting to select management unit)>
Applying Global configuration, please wait ...

Applying Interface configuration, please wait ...
```

Boot Utility Menu

If a user is connected through the serial interface during the boot sequence, the operator is presented with the option to enter the Boot Utility Menu during the boot sequence. Selecting item 2 displays the menu and may be typed only during the initial boot up sequence.

```
Dell EMC Networking Boot Options
================================

Select a menu option within 3 seconds or the Operational Code will start
automatically...
```

```
1 - Start Operational Code
2 - Display Boot Menu

Select (1, 2)# 2


Boot Main Menu
==============

    1  - Start Operational Code
    2  - Select Baud Rate
    3  - Retrieve Logs
    4  - Load New Operational Code
    5  - Display Operational Code Details
    9  - Reboot
   10  - Restore Configuration to Factory Defaults
   11  - Activate Backup Image
   12  - Start Password Recovery
   13  - Boot ONIE (Rescue Mode)
   14  - Boot Diagnostics

Enter Choice#

Creating tmpfs filesystem on /mnt/download for download...done.
Current Active Image# /dev/mtd7
Which Image to Update Active (/dev/mtd7) OR Back-Up (/dev/mtd6)? Select
(A/B): B
You selected to update Back-Up Image /dev/mtd6...
Select Mode of Transfer (Press T/X/Y/Z for TFTP/XMODEM/YMODEM/ZMODEM) []:T

Please ensure TFTP server is running to begin Transfer...
Enter Server IP []:10.27.9.99
Enter Host IP []:10.27.22.99
Enter Host Subnet Mask [255.255.255.0]:255.255.252.0
Enter Gateway IP []:10.27.20.1
Enter Filename []:jmclendo/N2000v6.0.0.8.stk
Do you want to continue? Press(Y/N):  y
Bringing up eth0 interface...done.
Adding default gateway 10.27.20.1 to the Routing Table...done.
Bringing down eth0 interface...done.
Erasing /dev/mtd6!!!
Erasing 128 Kibyte @ 17e0000 -- 99 % complete.
Updating code file...
Code Update Instructions Found!
Critical components modified on Back-Up Partition -- Please activate Back-Up
Image to load the same on Reboot

Do you wish to activate Back-Up Image? (Y/N):
Cleaning tmpfs filesystem on /mnt/download...done.
Enter Choice# 5
```

```
active = /dev/mtd7
Extracting Operational Code from .stk file...done.
Loading Operational Code...done.
Decompressing Operational Code...done.
Product Details:-
         Operational Code Image File Name - N2000v6.0.0.8
         Rel 6, Ver 0, Maint Lev 0, Bld No 8
         Timestamp - Thu Aug 22 13:09:33 EDT 2013
         Number of components - 1
         Device 776
         ImageFlags 1
         L7_MODULE_LIST=linux-kernel-bde.ko linux-user-bde.ko

Enter Choice# 10

Are sure you want to Erase Current Configuration? (Y/N): y
Erasing Current Configuration...done.


Boot Menu Rev: 6.0

Boot Main Menu
==============

    1  - Start Operational Code
    2  - Select Baud Rate
    3  - Retrieve Logs
    4  - Load New Operational Code
    5  - Display Operational Code Details
    9  - Reboot
   10  - Restore Configuration to Factory Defaults
   11  - Activate Backup Image
   12  - Start Password Recovery
   13  - Boot ONIE (Rescue Mode)
   14  - Boot Diagnostics

Enter Choice# 11

Current Active Image# /dev/mtd7
Checking for valid back-up image at /dev/mtd6...done.
Activating Back-Up Image /dev/mtd6...done.
Code Update Instructions Found!
Back-Up Image on /dev/mtd6 Activated -- System Reboot Recommended!

Reboot? (Y/N):
Enter Choice# 12

Starting Operational Code for Password Recovery...
active = /dev/mtd6
Extracting Operational Code from .stk file...done.
Loading Operational Code...done.
Decompressing Operational Code...done.
```

```
4 START_OPR_CODE_PASSWD_RECOVERY MODE
Uncompressing apps.lzma
SyncDB Running...
DMA pool size: 16777216
PCI unit 0: Dev 0xb842, Rev 0x02, Chip BCM56842_A1, Driver BCM56840_B0
SOC unit 0 attached to PCI device BCM56842_A1
hpc - No stack ports. Starting in stand-alone mode.


<186> Jul 12 02:40:46 0.0.0.0-1 General[63446620]: bootos.c(179) 11 %%
Event(0xaaaaaaaa)                  started!

(Unit 1 - Waiting to select management unit)>

Applying Global configuration, please wait ...


Welcome to Dell Easy Setup Wizard

The setup wizard guides you through the initial switch configuration, and
gets you up and running as quickly as possible. You can skip the setup
wizard, and enter CLI mode to manually configure the switch. You must
respond to the next question to run the setup wizard within 60 seconds,
otherwise the system will continue with normal operation using the default
system configuration. Note: You can exit the setup wizard at any point
by entering [ctrl+z].

Would you like to run the setup wizard (you must answer this question within
60 seconds)? [Y/N] n

Thank you for using the Dell Easy Setup Wizard. You will now enter CLI mode.

Applying Interface configuration, please wait ...
```

Booting without a Startup Configuration

When the system boots without a startup configuration (which is not the same as an empty startup-config) and no EULA Accept file exists on the management unit in the stack, the following prompt occurs:

```
(Unit 1 - Waiting to select management unit)>
Applying Global configuration, please wait...


                           SupportAssist EULA
I accept the terms of the license agreement. You can reject the license
agreement by configuring this command 'eula-consent support-assist reject'.
By installing SupportAssist, you allow Dell to save your contact
information(e.g. name, phone number and/or email address) which would be used
to provide technical support for your Dell products and services. Dell may
use the information for providing recommendations to improve your IT
infrastructure. SupportAssist also collects and stores machine diagnostic
```

```
information, which may include but is not limited to configuration
information, user supplied contact information, names of data volumes, IP
addresses, access control lists, diagnostics & performance information,
network configuration information, host/server configuration& performance
information and related data (Collected Data) and transmits this information
to Dell. By downloading SupportAssist and agreeing to be bound by the set
terms and the Dell end user license agreement, available at:
www.dell.com/aeula, you agree to allow Dell to provide remote monitoring
services of your IT environment and you give Dell the right to collect the
Collected Data in accordance with Dells Privacy Policy, available at:
www.dell.com/privacypolicycountryspecific, in order to enable the
performance of all of the various functions of SupportAssist during your
entitlement to receive related repair services from Dell,. You further agree
to allow Dell to transmit and store the Collected Data from SupportAssist in
accordance with these terms. You agree that the provision of SupportAssist
may involve international transfers of data from you to Dell and/or to Dells
affiliates, subcontractors or business partners. When making such transfers,
Dell shall ensure appropriate protection is in place to safeguard the
Collected Data being transferred in connection with SupportAssist. If you are
downloading SupportAssist on behalf of a company or other legal entity, you
are further certifying to Dell that you have appropriate authority to provide
this consent on behalf of that entity. If you do not consent to the
collection, transmission and/or use of the Collected Data, you may not
download, install or otherwise use SupportAssist.

   AeroHive HiveManager NG EULA
This switch includes a feature that enables it to work with HiveManager (an
optional management suite), by sending the switch's service tag number to
HiveManager to authenticate your entitlement to use HiveManager. If you wish
to disable this feature, you should run command "eula-consent hiveagent
reject" immediately upon powering up the switch for the first time, or at any
time thereafter.

Welcome to Dell Easy Setup Wizard

The setup wizard guides you through the initial switch configuration, and
gets you up and running as quickly as possible. You can skip the setup
wizard, and enter CLI mode to manually configure the switch. You must
respond to the next question to run the setup wizard within 60 seconds,
otherwise the system will continue with normal operation using the default
system configuration. Note: You can exit the setup wizard at any point
by entering [ctrl+z].

Would you like to run the setup wizard (you must answer this question within
60 seconds)? (y/n)
```

Regardless of if the administrator runs or does not run the Easy Setup wizard and if the SupportAssist application is installed:

```
eula-consent support-assist accept
```

is entered into the running-config if the SupportAssist EULA Accept file exists on the management unit in the stack and contains the 'EULA: Accepted' text.

Regardless of whether the administrator runs or does not run the Easy Setup wizard and if the HiveAgent is installed:

```
eula-consent hiveagent accept
```

is entered into the running-config if the HiveAgent EULA Accept file exists on the management unit in the stack and contains the 'EULA: Accepted' text.

The Easy Setup Wizard also prompts the user to configure a proxy server as follows:

```
Step 5:
Would you like to configure the address of an HTTPS proxy server used by the
SupportAssist agent? [Y/N] y
Enter the IPv4 or IPv6 address of the proxy server:192.168.0.3
Enter the port number used by HTTPS [443]:
Enter the user name required to access the proxy server:
Enter the password required to access the proxy server:

This is the configuration information that has been collected:

User Account setup = admin
Password = ********
Out-of-band IP address = DHCP
VLAN1 Router Interface IP = 0.0.0.0 0.0.0.0
Proxy Server Address: 192.168.0.3
Proxy Server Port: 443
Proxy Server User Name:
Proxy Server Password:
```

Monitoring Traps from CLI

It is possible to connect to the CLI session and monitor the events or faults that are being sent as traps from the system. This feature is equivalent to the alarm-monitoring window in a typical network management system. The user enables display of events or monitor traps from the CLI by entering the command **logging console**. Traps generated by the system are dumped to all CLI sessions that have requested monitoring mode to be enabled. The **no logging console** command disables trap monitoring for the session. By default, console logging is enabled. Use the terminal monitor command to observe logging messages when connected via telnet or SSH.

Viewing System Messages

System messages autonomously display information regarding occurrences that may affect switch operations. By default, system messages are not displayed on CLI sessions connected via telnet or SSH. Use the **terminal monitor** command to enable the autonomous display of system messages when connecting to the switch via telnet or SSH. System messages are always displayed on the serial console.

3

Layer 2 Switching Commands

The sections that follow describe commands that conform to the OSI model data link layer (Layer 2). Layer 2 commands provide a logical organization for transmitting data bits on a particular medium. This layer defines the framing, addressing, and checksum functions for Ethernet packets.

This section of the document contains the following Layer 2 topics:

Ethernet CFM Commands	IPv6 MLD Snooping Commands	Port Monitor Commands	—

ACL Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Access to a switch or router can be made more secure through the use of Access Control Lists (ACLs) to control the type of traffic allowed into or out of specific ports. An ACL consists of a series of rules, each of which describes the type of traffic to be processed and the actions to take for packets that meet the classification criteria. Rules within an ACL are evaluated sequentially until a match is found, if any. An implicit deny-all rule is added after the end of the last configured access group. ACLs can help ensure that only authorized users have access to specific resources while blocking out any unwarranted attempts to reach network resources.

ACLs may be used to restrict contents of routing updates, decide which types of traffic are forwarded or blocked and, above all, provide security for the network. ACLs are normally used in firewall routers that are positioned between the internal network and an external network, such as the Internet. They can also be used on a router positioned between two parts of the network to control the traffic entering or exiting a specific part of the internal network.

The Dell EMC Networking ACL feature allows classification of packets based upon Layer 2 through Layer 4 header information. An Ethernet IPv6 packet is distinguished from an IPv4 packet by its unique EtherType value; thus, all IPv4 and IPv6 classifiers implicitly include the EtherType field.

Multiple ACLs per interface are supported. The ACLs can be a combination of Layer 2 and/or Layer 3/4 ACLs. ACL assignment is appropriate for both Ethernet ports and LAGs. ACLs can also be time based. The maximum number of ACLs and rules supported depends on the resources consumed by other processes and configured features running on the switch.

ACL Logging

Access list rules are monitored in hardware to either permit or deny traffic matching a particular classification pattern, but the network administrator currently has no insight as to which rules are being matched. Dell EMC Networking platforms have the ability to count the number of matches for a particular classifier rule. The ACL logging feature allows these hardware “hit” counts to be collected on a per-rule basis and reported periodically to the network administrator using the system logging facility and an SNMP trap.

The Dell EMC Networking ACL syntax supports a **log** parameter that enables hardware hit count collection and reporting. A five minute logging interval is used, at which time trap log entries are written for each ACL logging rule that accumulated a nonzero hit count during that interval. The logging interval is not user configurable.

How to Build ACLs

This section describes how to build ACLs that are less likely to exhibit false matches.

Administrators are cautioned to specify ACL access-list, permit and deny rule criteria as fully as is possible in order to avoid false matches. As an example, rules that specify a TCP or UDP port value should also specify the TCP or UDP protocol and the IPv4 or IPv6 Ether type. Rules that specify an IP protocol should also specify the Ether type value for the frame. In general, any rule that specifies matching on an upper layer protocol field should also include matching constraints for each of the lower layer protocols. For example, a rule to match packets directed to the well-known UDP port number 22 (SSH) should also include matching constraints on the IP protocol field (protocol = 0x11 or UDP) and the Ether type field (Ether type = 0x0800 or IPv4). In Table 3-1 is a list of commonly used Ether types and, in Table 3-2 commonly used IP protocol numbers.

Table 3-1. Common EtherTypes

EtherType	Protocol
0x0800	Internet Protocol version 4 (IPv4)
0x0806	Address Resolution Protocol (ARP)
0x0842	Wake-on LAN Packet
0x8035	Reverse Address Resolution Protocol (RARP)
0x8100	VLAN tagged frame (IEEE 802.1Q)
0x86DD	Internet Protocol version 6 (IPv6)
0x8808	MAC Control
0x8809	Slow Protocols (IEEE 802.3)
0x8870	Jumbo frames
0x888E	EAP over LAN (EAPOL – 802.1x)
0x88CC	Link Layer Discovery Protocol
0x8906	Fibre Channel over Ethernet
0x8914	FCoE Initialization Protocol
0x9100	Q in Q

Table 3-2. Common IP Protocol Numbers

IP Protocol Numbers	Protocol
0x00	IPv6 Hop-by-hop option
0x01	ICMP
0x02	IGMP
0x06	TCP
0x08	EGP
0x09	IGP
0x11	UDP

ip access-list

Use the **ip access-list** command in Global Configuration mode to create an Access Control List (ACL) that is identified by the parameter *list-name* and to enter IPv4-Access-List configuration mode. If parameterized with the name of an existing access list, additional match clauses are added to the end of the access list.

Syntax

ip access-list *list-name* [**extended**]

no ip access-list *list-name*

- *list-name*—Access-list name up to 31 characters in length.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Access lists use the extended access list format. Multiple permit and deny clauses and actions may be specified without requiring the access list name to be entered each time. Permit and deny clauses are entered in order from the first match clause when in Access List Configuration mode.

ACL names are global. An IPv6 access list cannot have the same name as an IPv4 access list. Access list names can consist of any printable character except a question mark. Names can be up to 31 characters in length. ACLs referenced in a route map may not be edited. Instead, create a new ACL with the desired changes and refer to the new ACL in the route map.

deny | permit (IP ACL)

Use this command in Ipv4-Access-List Configuration mode to create a new rule for the current IP access list. Each rule is appended to the list of configured rules for the list if no sequence number is specified. Use the **no** form of the command to delete an existing permit/deny clause.

Syntax

[*sequence-number*]{**deny** | **permit**} {*ipv4-protocol* | *0-255* | *every*} {*srcip srcmask* | **any** | **host** *srcip*} [{**range** {*portkey* | *startport*} {*portkey* | *endport*}} | {**eq** | **neq** | **lt** | **gt**} {*portkey* | *0-65535*}] {*dstip dstmask* | **any** | **host** *dstip*} [{**range** {*portkey* | *startport*} {*portkey* | *endport*}} | {**eq** | **neq** | **lt** | **gt**} {*portkey* | *0-65535*}] [**flag** [**+fin** | **-fin**] [**+syn** | **-syn**] [**+rst** | **-rst**] [**+psh** | **-psh**] [**+ack** | **-ack**] [**+urg** | **-urg**] [**established**]] [**icmp-type** *icmp-type* [**icmp-code** *icmp-code*] | **icmp-message** *icmp-message*] [**igmp-type** *igmp-type*] [**fragments**] [**precedence** *precedence* | **tos** *tos* [*tosmask*] | **dscp** *dscp*]}} [**time-range** *time-range-name*] [**log**] [**assign-queue** *queue-id*] [{**mirror** | **redirect**} *interface-id*] [**rate-limit** *rate burst-size*]

no <*sequence-number*>

- [*sequence-number*]—Identifies the order of application of the permit/deny statement. If no sequence number is assigned, permit/deny statements are assigned a sequence number beginning at 1000 and incrementing by 10. Statements are applied in hardware beginning with the lowest sequence number. Sequence numbers only have applicability within an access group, i.e. the ordering applies within the access-group scope. The range for sequence numbers is 1– 2147483647.
- {**deny** | **permit**}–Specifies whether the IP ACL rule permits or denies the matching traffic.
- {*ipv4-protocol* | *number*| **every**}—Specifies the protocol to match for the IP ACL rule.
  - IPv4 protocols: **eigrp, gre, icmp, igmp, ip, ipinip, ospf, tcp, udp, pim**, **arp, sctp**
  - **number**: a protocol number in decimal, for example, 8 for EGP
  - **every**: Match any protocol (don’t care)
- *srcip srcmask* | **any** | **host** *srcip*—Specifies a source IP address and netmask to match for the IP ACL rule.
  - Specifying “any” implies specifying *srcip* as “0.0.0.0” and *srcmask* as “255.255.255.255” for IPv4.
  - Specifying “host A.B.C.D” implies *srcip* as “A.B.C.D” and *srcmask* as “0.0.0.0”.

- [{{**eq** | **neq** | **lt** | **gt**} {*portkey* | *number*} | **range** *startport endport*}]—Specifies the layer 4 source or destination port match condition for the TCP/UDP ACL rule. When the protocol is SCTP, TCP or UDP, a source or destination port number, which ranges from 0-65535, or a *portkey*, which can be one of the following keywords: domain, echo, ftp, ftp-data, http, smtp, snmp, telnet, tftp, www, bgp, pop2, pop3, ntp, rip, time, who may be entered. Each of these keywords translates into its equivalent destination port number.
  - When "range" is specified, IP ACL rule matches only if the layer 4 port number falls within the specified port range. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range.
  - When "eq" is specified, IP ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey.
  - When "lt" is specified, IP ACL rule matches if the layer 4 destination port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>.
  - When "gt" is specified, IP ACL rule matches if the layer 4 destination port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535.
  - When "neq" is specified, IP ACL rule matches only if the layer 4 destination port number is not equal to the specified port number or portkey.
  - IPv4 TCP/UDP port names: domain, echo, ftp, ftp-data, http, smtp, snmp, telnet, tftp, www, bgp, pop2, pop3, ntp, rip, time, who
- *dstip dstmask* | **any** | **host** *dstip*—Specifies a destination IP address and netmask for match condition of the IP ACL rule.
  - Specifying "any" implies specifying *dstip* as "0.0.0.0" and *dstmask* as "255.255.255.255".
  - Specifying "host A.B.C.D" implies *dstip* as "A.B.C.D" and *dstmask* as "0.0.0.0".

- [**precedence** *precedence* | **tos** *tos* [*tosmask*] | **dscp** *dscp*]—Specifies the TOS for an IP/TCP/UDP ACL rule depending on a match of precedence or DSCP values using the parameters dscp, precedence, or tos tosmask.
- **flag** [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]—Specifies that the IP/TCP/UDP ACL rule matches on the TCP flags.
  - **Ack** – Acknowledgment bit
  - **Fin** – Finished bit
  - **Psh** – push bit
  - **Rst** – reset bit
  - **Syn** – Synchronize bit
  - **Urg** – Urgent bit
  - When "+<tcpflagname>" is specified, a match occurs if specified <tcpflagname> flag is set in the TCP header.
  - When "-<tcpflagname>" is specified, a match occurs if specified <tcpflagname> flag is *NOT* set in the TCP header.
  - When "established" *is* specified, a match occurs if either the RST or ACK bits are set in the TCP header.
  - This option is visible only if protocol is "tcp".
- [**icmp-type** *icmp-type* [**icmp-code** *icmp-code*] | **icmp-message** *icmp-message*] —Specifies a match condition for ICMP packets.
  - When icmp-type is specified, IP ACL rule matches on the specified ICMP message type, a number from 0 to 255.
  - When icmp-code is specified, IP ACL rule matches on the specified ICMP message code, a number from 0 to 255.
  - Specifying icmp-message implies both icmp-type and icmp-code are specified.
  - ICMP message is decoded into corresponding ICMP type and ICMP code within that ICMP type. This option is visible only if the protocol is "icmp".

– IPv4 ICMP message types: echo echo-reply host-redirect mobile-redirect net-redirect net-unreachable redirect packet-too-big port-unreachable source-quench router-solicitation router-advertisement time-exceeded ttl-exceeded unreachable

- **igmp-type** *igmp-type*—When igmp-type is specified, IP ACL rule matches on the specified IGMP message type (i.e., a number from 0 to 255).
- **fragments**—Specifies the rule matches packets that are non-initial fragments (fragment bit asserted). Not valid for rules that match L4 information such as TCP port number since that information is carried in the initial packet.
- **log**—Specifies that this rule is to be logged if the permit/deny rule has been matched one or more times since the expiry of the last logging interval. The logging interval is 5 minutes.
- **time-range** *time-range-name*—Allows imposing time limitation on the ACL rule as defined by the parameter time-range-name. (See **Time Ranges Commands** for more information.) If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.
- **assign-queue** *queue-id*—Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned. The queue ID is the internal queue number (traffic class), not the CoS value. Use the **show classofservice** command to display the assignment of CoS and DSCP values to internal queue numbers.
- {**mirror** | **redirect**} *interface-id*—Specifies the mirror or redirect Ethernet interface to which packets matching this rule are copied or forwarded, respectively. The mirroring or redirect logic stage occurs after the tag processing stage on ingress. Egress mirroring or redirect is not supported.
- **rate-limit** *rate burst-size*—Specifies the allowed rate of traffic as per the configured rate in Kbps, and burst-size in kbytes. Rate limits only apply to permit rules.
  – Rate – the committed rate in kilobits per second

– Burst-size – the committed burst size in Kilobytes.

Default Configuration

No ACLs are configured by default. An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Command Mode

Ipv4-Access-List Configuration mode

User Guidelines

Administrators are cautioned to specify permit and deny rule matches as fully as is possible in order to avoid false matches. Rules that specify an IP port value should also specify the protocol (TCP or UDP) and relevant IP addresses or subnets. In general, any rule that specifies matching on an upper layer protocol field should also include matching constraints for lower layer protocol fields. For example, a rule to match packets directed to the well-known UDP port number 22 (SSH) should also include constraints on the IP protocol field (UDP). IPv4 and IPv6 ACLs implicitly include the EtherType in the match criteria. Below is a list of commonly used EtherTypes:

Ethertype	Protocol
0x0800	Internet Protocol version 4 (IPv4)
0x0806	Address Resolution Protocol (ARP)
0x0842	Wake-on LAN Packet
0x8035	Reverse Address Resolution Protocol (RARP)
0x8100	VLAN tagged frame (IEEE 802.1Q)
0x86DD	Internet Protocol version 6 (IPv6)
0x8808	MAC Control
0x8809	Slow Protocols (IEEE 802.3)
0x8870	Jumbo frames
0x888E	EAP over LAN (EAPOL – IEEE 802.1x)
0x88CC	Link Layer Discovery Protocol

Ethertype	Protocol
0x8906	Fibre Channel over Ethernet
0x8914	FCoE Initialization Protocol
0x9100	Q in Q

In order to provide the greatest amount of flexibility in configuring ACLs, the permit/deny syntax allows combinations of matching criteria that may not make sense when applied in practice.

Port ranges are not supported for ACLs configured in egress (out) access-groups. This means that only the **eq** operator is supported in an egress (out) ACL.

The protocol type must be **sctp**, **tcp** or **udp** to specify a port range.

The fragment keyword is not supported for ACLs configured in egress (out) IPv4 access-groups.

Rate limits are only valid for permit rules.

Any – is equivalent to 0.0.0.0 255.255.255.255 for IPv4 access lists

Host – indicates specified address with mask equal to 255.255.255.255 and address 0.0.0.0 for IPv4.

The command accepts the optional **time-range** parameter. The **time-range** parameter allows imposing a time limitation on the IP ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist, and the IP ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with the specified name exists, and the IP ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with a specified name becomes active. The ACL rule is removed when the time-range with a specified name becomes inactive.

An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Every permit/deny rule that does not have a rate-limit parameter is assigned a counter. If counter resources become exhausted, a warning is issued and the rule is applied to the hardware without the counter.

If a permit|deny clause is entered with the same sequence number as an existing rule, an error is displayed and the existing rule is not updated with the new information.

Command History

Updated in 6.3.0.1 firmware. Description updated in the 6.4 release.

Example

```
console(config)#ip access-list ipv4
console(config-ip-acl)#100 deny ip any any precedence 3
```

deny | permit (Mac-Access-List-Configuration)

Use the **deny** command in Mac-Access-List Configuration mode to deny traffic if the conditions defined in the deny statement are matched. Use the **permit** command in Mac-Access-List Configuration mode to allow traffic if the conditions defined in the permit statement are matched.

Use this command in Mac-Access-List Configuration mode to create a new rule for the current MAC access list. Each rule is appended to the list of configured rules for the list, if no sequence number is specified.

The command is enhanced to accept the optional **time-range** parameter. The **time-range** parameter allows imposing a time limitation on the MAC ACL rule as defined by the parameter *time-range-name*. If a time range with the specified name does not exist, and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with the specified name exists, and the MAC ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with a specified name becomes active. The ACL rule is removed when the time-range with a specified name becomes inactive.

Use the **no** form of the command to delete an existing permit/deny clause.

Syntax

[*sequence-number*] **deny | permit** (MAC access-list configuration) [*sequence-number*] {**deny** | **permit**} {{**any** | *srcmac srcmacmask*} {**any** | **bpdu** | *dstmac* **dstmacmask**}} [*ethertypekey* | [*0x0600-0xFFFF*] [**vlan** {**eq** *0-4095*}] [secondary-vlan {eq 0-4095}] [**cos** *0-7*] [**log**] [**time-range** *time-range-name*] [**assign-queue** *queue-id*] [{**mirror** | **redirect**} *interface-id*] [**rate-limit** *rate burst-size*]

no *sequence-number*

- *sequence-number*—Identifies the order of application of the permit/deny statement. If no sequence number is assigned, permit/deny statements are assigned a sequence number beginning at 1000 and incrementing by 10. Statements are applied in hardware beginning with the lowest sequence number. Sequence numbers only have applicability within an access group, i.e. the ordering applies within the access-group scope. The range for sequence numbers is 1– 2147483647.
- *srcmac*—Valid source MAC address in format xxxx.xxxx.xxxx.
- *srcmacmask*—Valid MAC address bit mask for the source MAC address.
- **any**—Packets sent to or received from any MAC address.
- *dstmac*—Valid destination MAC address.
- *destmacmask*—Valid MAC address bit mask for the destination MAC address.
- **bpdu**—Bridge protocol data unit
- *ethertypekey*—Either a keyword or valid four-digit hexadecimal number. (Range: Supported values are appletalk, arp, ibmsna, ipv4, ipv6, ipx, mplsmcast, mplsucast, Netbios, novell, pppoe, rarp.)
- *0x0600-0xFFFF*—Specify custom EtherType value (hexadecimal range 0x0600-0xFFFF).
- **vlan eq**—VLAN identifier. (Range 0-4095). This matches the outer VLAN of a single or double-tagged packet. It does not match untagged packets.
- **secondary-vlan eq**—VLAN identifier. (Range 0-4095). This matches the inner VLAN of a double-tagged packet. It does not match single or untagged packets.
- **cos**—Class of service. (Range 0-7)
- **log**—Specifies that this rule is to be logged if the permit/deny rule has been matched one or more times since the expiry of the last logging interval. The logging interval is 5 minutes.

- *time-range-name*—Use the **time-range** parameter to impose a time limitation on the MAC ACL rule as defined by the parameter.
- **assign-queue**—Specifies particular hardware queue for handling traffic that matches the rule.
- *queue-id* —0-6, where n is number of user configurable queues available for that hardware platform. The queue ID is the internal queue number (traffic class), not the CoS value. Use the **show classofservice** command to display the assignment of CoS and DSCP values to internal queue numbers.
- **mirror**—Copies the traffic matching this rule to the specified interface. The port mirroring logic state occurs after the tag processing stage on ingress. Egress mirroring is not supported.
- **redirect**—Forwards traffic matching this rule to the specified Ethernet interface. The redirect logic stage occurs after the tag processing stage on ingress. Egress redirect is not supported.
- *interface-id*—An Ethernet interface identifier, for example gi1/0/12.
- **rate-limit** *rate burst-size*—Specifies the allowed rate of traffic per the configured rate in Kbps and burst-size in kbytes. Rate limits only apply to permit rules.
  - Rate— The committed rate in kilobits per second
  - Burst-size—The committed burst size in Kilobytes.

Default Configuration

An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Command Mode

Mac-Access-List Configuration mode

User Guidelines

The assign-queue and redirect parameters are only valid for permit commands.

An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Every permit/deny rule that does not have a rate-limit parameter is assigned a counter. If counter resources become exhausted, a warning is issued and the rule is applied to the hardware without the counter.

If a permit|deny clause is entered with the same sequence number as an existing rule, an error is displayed and the existing rule is not updated with the new information.

Command History

Updated in 6.3.0.1 firmware. Secondary VLAN option added in 6.3.5 release.

Example

The following example configures a MAC ACL to deny traffic from MAC address 0806.c200.0000.

```
console(config)#mac access-list extended DELL123
console(config-mac-access-list)#500 deny 0806.c200.0000 0000.0000.0000 any
```

ip access-group

Use the **ip access-group** command in Global and Interface Configuration modes to apply an IP-based ACL on an interface or a group of interfaces.

Use the **no ip access-group** command to disable an IP-based ACL on an interface or a group of interfaces.

Syntax

ip access-group *name* [**in | out | control-plane**] *[seqnum]*

no ip access-group *name* [**in | out | control-plane**]

- *name* — Access list name. (Range: Valid IP access-list name up to 31 characters in length)
- **in** — The access list is applied to ingress packets.
- **out**—The access list is applied to egress packets.
- **control-plane**—The access list is applied to egress control plane packets only. This is only available in Global Configuration mode.
- *seqnum* — Precedence for this interface and direction. A lower sequence number has higher precedence. Range: 1 – 4294967295. Default is 1.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration and Interface Configuration (Ethernet, VLAN, or Port Channel) modes

User Guidelines

The Global Configuration mode command configures the ACL on all Ethernet and port-channel interfaces, whereas the interface mode command does so for the selected interface.

Dell EMC Networking switches support configuration of multiple access groups. Packets are matched against group entries, from lowest sequence number to highest. Configuring an access-group, using the same sequence number as an existing entry, replaces the original group entry.

If the access-list specified in the command does not exist, an error is given.

The ACLs in the access-group are configured in hardware when the interface becomes active. Resource contention issues will only become apparent at that time. It is recommended that ACLs be configured on an active interface as a check prior to deployment in the network.

The optional control-plane keyword allows application of an ACL on the CPU port. Control-plane match actions occur in the egress direction. System level rules are applied on ingress, after application of any user defined ingress rules, therefore, it is not possible to rate limit packets matching the system defined rules with an ACL having a control-plane target. Use the **rate-limit cpu** command to reduce the effects of low priority traffic on the switch CPU.

An implicit deny-all rule is added after the end of the last access group in each direction (in or out).

Examples

```
console(config)#ip access-list aclname
console(config-ip-acl)#exit
console(config)#ip access-group aclname in
console(config)#no ip access-group aclname in
console(config)#ip access-list aclname1
console(config-ip-acl)#exit
console(config)#ip access-group aclname1 out
```

```
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#ip access-group aclname out 2
console(config-if-Te1/0/1)#no ip access-group aclname out
```

Command History

Example and description updated in the 6.4 release.

mac access-group

Use the **mac access-group** command in Global Configuration or Interface Configuration mode to attach a specific MAC Access Control List (ACL) to an interface.

Syntax

mac access-group *name* [**in** | **out** | **control-plane**] [*sequence*]

no mac access-group *name* [**in** | **out** | **control-plane**]

- *name* — Name of the existing MAC access list. (Range: 1-31 characters)
- [**in** | **out** | **control-plane**]— The packet direction. **in** applies the access-list to ingress packets. **out** applies the access-list to egress packets. control-plane applies the access-list to ingress control plane packets. control-plane is only valid in Global Configuration mode.
- *sequence* — Order of access list relative to other access lists already assigned to this interface and direction. (Range: 1-4294967295)

Default Configuration

No ACLs are configured by default.

Command Mode

Global Configuration mode or Interface Configuration (Ethernet, VLAN or Port Channel) mode

User Guidelines

If the access-list specified in the command does not exist, an error is given.

The ACLs in the access-group are configured in hardware when the interface becomes active. Resource contention issues will only become apparent at that time. It is recommended that ACLs be configured on an active interface as a check prior to deployment in the network.

An optional sequence number may be specified to indicate the order of this access-list relative to the other access-lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number already is in use for this interface and direction, the specified access-list replaces the currently attached access list using that sequence number. If the sequence number is not specified for this command, a sequence number is selected that is one greater than the highest sequence number currently in use for this interface and direction.

The optional **control-plane** keyword allows the application of an egress MAC ACL on the CPU port.

This command specified in Interface Configuration mode only affects a single interface.

Example

This example rate limits IPv4 multicast traffic ingressing the front panel ports to 8 Kbps and a maximum burst of 4 kilobytes.

```
console(config)# mac access-list extended ipv4-multicast
console(config-mac-access-list)#permit 01:00:5e:00:00:00 00:00:00:ff:ff:ff
any rate-limit 8 4
console(config-mac-access-list)#permit any any

console(config-mac-access-list)#exit
console(config)#mac access-group ipv4-multicast in
```

mac access-list extended

Use the **mac access-list extended command** in Global Configuration mode to create the MAC Access Control List (ACL) identified by the *name* parameter and enter MAC Access-list Configuration mode.

Syntax

mac access-list extended *name*

no mac access-list extended *name*

- *name* — Name of the access list. (Range: 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Use this command to create a mac access control list. The CLI mode is changed to Mac-Access-List Configuration when this command is successfully executed.

Example

The following example creates MAC ACL and enters MAC-Access-List-Configuration mode.

```
console(config)#mac access-list extended dell-networking
```

mac access-list extended rename

Use the **mac access-list extended rename** command in Global Configuration mode to rename the existing MAC Access Control List (ACL).

Syntax

mac access-list extended rename *name newname*

- *name* — Existing name of the access list. (Range: 1-31 characters)
- *newname* — New name of the access list. (Range: 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Command fails if the new name is the same as the old one.

Example

The following example shows the **mac access-list extended rename** command.

```
console(config)#mac access-list extended DELL1
console(config-mac-access-list)#exit
console(config)#mac access-list extended rename DELL1 DELL2
```

remark

Use the **remark** command to add a comment to an ACL rule. Use the **no** form of the command to remove a comment from an ACL rule.

Syntax

remark *comment*

no remark *comment*

- *comment*—Each remark line is limited to 100 characters. The remark may consist of characters in the range A-Z, a-z, 0-9, and special characters like space, hyphen, underscore. The total length of the remark must not exceed 100 characters.

Default Configuration

No remarks are present by default.

Command Mode

IPv4 Access-list Configuration mode, IPv6 Access-list Configuration mode, MAC Access-list Configuration mode, ARP Access-list Configuration mode

The **no** form of the command is executed in Global Configuration mode.

User Guidelines

The administrator can use the remark keyword to add comments to ACL rule entries belonging to an IPv4, IPv6, MAC or ARP ACL. Remarks are associated with the ACL rule that is created immediately after the remarks are created. When the ACL rule is removed, the associated remarks are also deleted.

Remarks are shown only in **show running-config** and are not displayed in **show ip access-lists**.

The **no remark** command removes the first matching remark from an ACL access-list. Repeated execution of this command with the same remark comment removes the remark from the next ACL rule which associated with the comment (if there is any rule configured with the same comment) or an error message is displayed if there are no matching comments.

Command History

Updated in 6.3.0.1 firmware

Example

```
console(config)#arp access-list new
console(config-arp-access-list)#remark "test1"
console(config-arp-access-list)#permit ip host 1.1.1.1 mac host
00:01:02:03:04:05
console(config-arp-access-list)#remark "test1"
console(config-arp-access-list)#remark "test2"
console(config-arp-access-list)#remark "test3"
console(config-arp-access-list)#permit ip host 1.1.1.2 mac host
00:03:04:05:06:07
console(config-arp-access-list)#permit ip host 2.1.1.2 mac host
00:03:04:05:06:08
console(config-arp-access-list)#remark "test4"
console(config-arp-access-list)#remark "test5"
console(config-arp-access-list)#permit ip host 2.1.1.3 mac host
00:03:04:05:06:01
```

service-acl input

Use the **service-acl input** command in Interface Configuration mode to block Link Local Protocol Filtering (LLPF) protocol(s) on a given port. Use the **no** form of this command to unblock link-local protocol(s) on a given port.

Syntax

service-acl input {blockcdp | blockvtp | blockdtp | blockudld | blockpagp | blocksstp | blockall}

no service-acl input [blockcdp | blockvtp | blockdtp | blockudld | blockpagp | blocksstp | blockall]

- **blockcdp**—To block CDP PDU's from being forwarded.
- **blockvtp**—To block VTP PDU's from being forwarded.
- **blockdtp**—To block DTP PDU's from being forwarded.
- **blockudld**—To block UDLD PDU's from being forwarded.
- **blockpagp**—To block PAgP PDU's from being forwarded.
- **blocksstp**—To block SSTP PDU's from being forwarded.
- **blockall**—To block all the PDU's with MAC of 01:00:00:0c:cc:cx (x-don't care) from being forwarded.

Default Configuration

The default is that none of the listed protocol PDUs are blocked. UDLD is blocked by default. No other protocol is blocked by default.

Command Mode

Interface Configuration (Ethernet, Port-channel)

User Guidelines

To specify multiple protocols, enter the protocol parameters together on the command line, separated by spaces. This command may be entered multiple times and will block all protocols identified in the arguments. This command is not supported on the N1500 Series switches.

Example

```
console(config-if-Te1/0/1)#service-acl input blockall
```

show service-acl interface

This command displays the status of LLPF rules configured on a particular port or on all the ports.

Syntax

show service-acl interface {*interface-id* | **all**}

- *interface-id*—An Ethernet interface identifier or a port channel interface identifier. See Interface Naming Conventions for interface representation.

Default Configuration

UDLD is blocked by default. No other protocol is blocked by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is not supported on the N1500 Series switches.

Example

```
console#show service-acl interface te1/0/1

console(config-if-Te1/0/1)#show service-acl interface te1/0/1

Service-acl Interface Te1/0/1

Protocol          Mode
---------------- ----------
CDP               Disabled
VTP               Disabled
DTP               Disabled
UDLD              Enabled
PAGP              Disabled
SSTP              Disabled
ALL               Disabled
```

show access-lists interface

Use the **show access-lists interface** command to display interface ACLs.

Syntax

show access-lists interface {*interface-id* {**in** | **out**}} | **control-plane**

- *interface-id*—The interface identifier (Ethernet, port-channel, or VLAN).
- **in**—Show the ingress ACLs.
- **out**—Show the egress ACLs.
- **control-plane**—Show the control plane ACLs.

Default Configuration

No ACLs are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Examples

```
console#show access-lists interface control-plane

ACL Type             ACL Name                          Sequence Number
--------        -------------------------------    ---------------
IPv6            ip61                               1000
```

show ip access-lists

Use the **show ip access-lists** command to display an IP ACL and time-range parameters.

Syntax

show ip access-lists [*accesslistname*]

- *accesslistname*—The name used to identify the IP ACL.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays information about the attributes “icmp-type”, “icmp-code”, “igmp-type,” “fragments,” “routing,” and “source and destination L4 port ranges.” It displays the committed rate, committed burst size and the ACL rule hit count of packets matching the ACL rule. This matching packet counter value rolls over upon reaching the maximum value (18446744073709551615 or 2^{64} -1).

For an ACL with multiple match rules, processing occurs in order until a rule is matched. Only the counter associated with the matching rule is incremented. (e.g., consider an ACL with three rules, rule 1 does not match, and rule 2 is matched. Rule 3 is not processed. The counters for rule 1 and rule 3 are not incremented.)

If an ACL rule is configured with a rate limit, the counter value is the matched packet count (i.e., both the forwarded and dropped packets are counted). If an ACL rule is configured without a rate limit, the counter value is the count of either the permitted or denied packets.

ACL counters do not interact with DiffServ policies. ACL counters do not interact with PBR counters.

ACL hit counters are associated with the ACL, not the interface on which the ACL is applied. An ACL applied to multiple interfaces will display identical (or nearly identical) counts for each interface. The count displayed is the sum of matching packets received or transmitted on all associated interfaces.

Command History

Updated in 6.3.0.1 firmware.

Examples

The following example displays the configured IP ACLs.

```
console(config)#show ip access-lists
Current number of ACLs: 4  Maximum number of ACLs: 100
ACL Name          Rules Count      Interface(s)               Direction
---------------- ----- ---------- ------------------------- ---------
```

```
TO_FRM             2     437        Gi1/0/26                  Inbound
UPLINKS            5     0          Gi1/0/26                  Outbound
Allow-192-168-0-x  3     7617636    Gi1/0/29                  Inbound
```

The following example displays the IP ACLs configured on a device.

```
console#show ip access-lists asdasd

IP ACL Name: asdasd

Inbound Interface(s):
Gi1/0/7


Rule Number: 1
Action......................................... permit
Match All...................................... FALSE
Protocol....................................... 6(tcp)
Source IP Address.............................. 1.2.3.4
Source IP Mask................................. 0.0.0.0
Source Layer 4 Operator........................ Equal To
Source L4 Port Keyword......................... 43
Destination IP Address......................... any
TCP Flags...................................... FIN (Ignore)
                                                SYN (Set)
                                                RST (Ignore)
                                                PSH (Ignore)
                                                ACK (Ignore)
                                                URG (Ignore)
ACL Hit Count.................................... 43981900


Rule Number: 2
Action......................................... permit
Match All...................................... FALSE
Protocol....................................... 6(tcp)
Source IP Address.............................. any
Destination IP Address......................... 1.2.3.4
Destination IP Mask............................ 0.0.0.0
TCP Flags...................................... FIN (Ignore)
                                                SYN (Set)
                                                RST (Ignore)
                                                PSH (Ignore)
                                                ACK (Ignore)
                                                URG (Ignore)
ACL Hit Count.................................. 1
```

The following examples show Dynamic ACLs configured for both the data and voice VLAN.

IPv4 Data and Voice:

```
console#show ip access-lists
Current number of ACLs: 4 Maximum number of ACLs: 100
ACL Name              Rules   Count  Interface(s)  Direction
---------------------- -----   -----  ------------  ---------
IP-DACL-IN-Gi1/0/9#d   1       418    Gi1/0/9       Inbound
IP-VDACL-IN-Gi1/0/9#d  1       0      Gi1/0/9       Inbound
```

IPv6 Data and Voice:

```
console#show ipv6 access-lists
Current number of ACLs: 4 Maximum number of ACLs: 100
IPv6 ACL Name         Rules   Count  Interface(s)  Direction
---------------------- ------  -----  ------------  ---------
IPV6-DACL-IN-Gi1/0/9#d    1    246    Gi1/0/9       Inbound
IPV6-VDACL-IN-Gi1/0/9#d   1    0      Gi1/0/9       Inbound
```

Display with the ACL name for any of the above (no #d required in command):

```
console#show ip access-lists IP-DACL-IN-Gi1/0/9
IP ACL Name: IP-DACL-IN-Gi1/0/9#d
Inbound Interface(s):
Gi1/0/9
Rule Number: 50
Action......................................... permit
Match All...................................... TRUE
ACL Hit Count.................................. 418
```

show mac access-lists

Use the **show mac access-lists** command to display a MAC access list and all the rules that are defined for the MAC ACL. Use the [name] parameter to identify a specific MAC ACL to display.

Syntax

show mac access-lists *name*

- *name*—Use this parameter to identify the specific MAC ACL to display.

Default Configuration

This command has no default configuration

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The hit counter applies to the ACL, not to the interface. It shows the sum of all matching packets across all interfaces to which the ACL is applied. For an ACL applied to multiple interfaces, the hit counter will be identical for all interfaces.

Command History

Updated in 6.3.0.1 firmware. Updated User Guidelines in 6.3.0.5 firmware.

Example

```
console#show mac access-lists

Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name     Rules Count      Interface(s)              Direction
--------------- ----- ---------- ------------------------- ---------
DELL123          1     0          Gi1/0/1                   Inbound
ipv4-multicast   2     14666      Po1-64,Gi1/0/1-24,        Inbound

console#show mac access-lists mac-acl

MAC ACL Name: mac-acl

Outbound Interface(s):
Gi1/0/8


Rule Number: 1
Action......................................... permit
Source MAC Address............................. 0000.1122.3344
Source MAC Mask................................ FFFF.0000.0000
EtherType...................................... ipx
VLAN........................................... 100
ACL Hit Count.................................. 213
```

```
Rule Number: 2
Action......................................... permit
Source MAC Address............................. 0000.1133.2244
Source MAC Mask................................ FFFF.0000.0000
EtherType...................................... ip
VLAN........................................... 100
ACL Hit Count.................................. 213
```

MAC Address Table Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking switches implement a MAC Learning Bridge is compliance with IEEE 802.1Q. The switches implement independent VLAN learning (IVL). Dynamically learned MAC addresses are used to filter the set of ports on which a frame is forwarded within a VLAN, that is, the destination MAC address and ingress VLAN for a frame entering the switch is looked up in the MAC address table and, if a match is found, the frame is forwarded out the matching port(s). If no match is found, the frame is flooded out all ports in the VLAN except for the ingress port.

When a frame is received on a port, the source MAC address (and VLAN) is looked up in the MAC address table. If no matching entry is found, a new entry is added to the MAC address table associated with the source port. If a matching entry is found, the matching entry timestamp is refreshed such that it will continue to remain in the MAC address table. Dynamic MAC address entries for which no frames have been received within the aging period are removed out of the MAC address table. The administrator can globally configure the MAC address aging timer.

Administrators can configure static MAC address entries. Static MAC entries are treated in the same manner as dynamic MAC address entries for the purposes of frame forwarding. Static MAC addresses never age out of the MAC address database and can only be removed by administrator action.

Port security allows the administrator to disable learning of MAC addresses on selected interfaces. Dynamically learned MAC addresses are flushed on an interface at the time port security is enabled. The interface then dynamically learns MAC addresses up to the configured limit and no more. The administrator may configure a limit of 0 in order to disable MAC learning on the interface entirely. In this configuration, it is advisable to configure static MAC entries on the interface in order to facilitate forwarding.

clear mac address-table

Use the **clear mac address-table** command to remove learned entries from the forwarding database.

Syntax

clear mac address-table dynamic [**address** *mac-addr* | **interface** *interface-id* | **vlan** *vlan-id* | **notification**]

- *mac-addr*—Delete the specified MAC address.
- *interface-id*—Delete all dynamic MAC addresses on the specified Ethernet port or port channel.
- *vlan-id*—Delete all dynamic MAC addresses for the specified VLAN. The range is 1 to 4093.
- **notification** — Clear the MAC notification counters.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

In this example, the mac address-table tables are cleared.

```
console#clear mac address-table dynamic
```

Command History

Syntax updated in version 6.7.0 firmware.

mac address-table aging-time

Use the **mac address-table aging-time** command in Global Configuration mode to set the aging time of the address. To restore the default, use the **no** form of the **mac address-table aging-time** command.

Syntax

mac address-table aging-time {0 | *10-1000000*}

no mac address-table aging-time

- **0**—Disable aging time for the MAC Address Table.
- *10-1000000*—Set the number of seconds aging time for the MAC Address Table.

Default Configuration

300 seconds

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

In this example the MAC Address Table aging time is set to 400.

```
console(config)#mac address-table aging-time 400
```

mac address-table multicast forbidden address

Use the **mac address-table multicast forbidden address** command in Global Configuration mode to forbid adding a specific multicast address to specific ports. To allow the multicast group, use the **no** form of this command.

Syntax

mac address-table multicast forbidden address vlan *vlan-id* {*mac-multicast-address* | *ip-multicast-address*} {**add** | **remove**} **interface** *interface-list*

no mac address-table multicast forbidden address vlan *vlan-id* {*mac-multicast-address* | *ip-multicast-address*}

- **add**—Adds ports to the group.
- **remove**—Removes ports from the group.
- vlan *vlan-id*—A valid vlan-id. (Range 1-4093)
- *mac-multicast-address*—MAC multicast address.
- *ip-multicast-address* —IP multicast address.

- *interface-list* —Specify a comma separated list of interface identifiers, a range of interfaces, or a combination of both. Interface identifiers can be port channel interface identifiers or Ethernet interface identifiers. Embedded blanks are not allowed in the list.

Default Configuration

No forbidden addresses are defined.

Command Mode

Global Configuration mode

User Guidelines

Before defining forbidden ports, ensure that the multicast group is registered. Changing an unregistered multicast address to forbidden on an mrouter port will effectively forbid the multicast group on all ports on the switch as it inhibits the source of the multicast group.

Examples

In this example the MAC address 0100.5e02.0203 is forbidden on port 2/0/9 within VLAN 8.

```
console(config)#mac address-table multicast forbidden address vlan 8
0100.5e02.0203 add interface gigabitethernet 2/0/9
```

mac address-table static

Use the **mac address table static** command in Global Configuration mode to add a static MAC-layer station source address to the bridge table. To delete the MAC address, use the **no** form of the **mac address table static** command.

Syntax

mac address-table static *mac-addr* **vlan** *vlan-id* **interface** *interface-id*

no mac address-table static *mac-addr* **vlan** *vlan-id interface-id]*

- *mac-address*—A valid MAC address.
- *vlan-id*—Valid VLAN ID (1-4093).

- *interface-id*—The interface to which the received packet is forwarded. Ethernet interface identifiers and port channel identifiers are valid for this command.

Default Configuration

No static addresses are defined. The default mode for an added address is permanent.

Command Mode

Global Configuration mode

User Guidelines

The MAC address may be a unicast or multicast MAC address. Static MAC addresses are never overridden by dynamically learned addresses. This has implications for protocols like IGMP snooping, where statically configuring the MAC address of a multicast router keeps IGMP snooping from dynamically adding the multicast router to a different port.

The maximum number of static MAC addresses that may be configured on a port is limited by the switchport port-security maximum command.

This command may be invoked multiple times with different interfaces (and the same VLAN) when used with a multicast MAC address.

Example

The following example adds a permanent static MAC address c2f3.220a.12f4 to the MAC address table.

```
console(config)# mac address-table static c2f3.220a.12f4 vlan 4 interface
gigabitethernet6/0/1
```

switchport port-security (Global Configuration)

Use the **switchport port-security** command in Global Configuration mode to enable port security globally. Use the **no** form of the command to disable port security globally.

Syntax

switchport port-security

no switchport port-security

Default Configuration

Port security is disabled by default.

No MAC addresses are learned or configured by default.

Command Mode

Global Configuration mode

User Guidelines

Port security must be enabled globally and on the interface or VLAN in order to be active. Disabling port security globally does not remove sticky MAC address configuration from the running-config.

Port security allows the network administrator to secure interfaces or VLANs by specifying (or learning) the allowable MAC addresses on a given port. Packets with a matching source MAC address are forwarded normally. All other host packets are discarded. Port security operates on access, trunk and general mode ports.

Two methods are used to implement Port MAC locking: dynamic locking and static locking. Static locking further has an optional sticky mode.

Dynamic locking implements a 'first arrival' mechanism for MAC locking. The administrator specifies how many dynamic addresses may be learned on the locked port. If the limit has not been reached, then a packet with an unknown source MAC address is learned and forwarded normally. If the MAC address limit has been reached, the packet is discarded. The administrator can disable dynamic locking (learning) by setting the number of allowable dynamic entries to zero.

When a MAC locking enabled link goes down, all of the dynamically locked addresses are 'freed.' When the link is restored, that port can once again learn MAC addresses up to the administrator specified limit.

A dynamically locked MAC address is eligible to be aged out if another packet with that MAC address is not seen within the age-out time. Dynamically locked MAC addresses are also eligible to be relearned on another port if station movement occurs. Statically locked MAC addresses are not eligible for aging. If a packet arrives on a port with a source MAC address that is statically locked on another port, then the packet is discarded.

Static locking allows the administrator to specify a list of host MAC addresses that are admitted on a port. The behavior of packets is the same as for dynamic locking: only packets with a known source MAC address can be admitted and forwarded. Any packets with source MAC addresses that are not configured are discarded. The switch treats this as violation and supports send a SNMP port-security trap.

If the administrator knows the specific MAC address (or addresses) that will be connected to a particular port, she can specify those addresses as static entries. By setting the number of allowable dynamic entries to zero, only packets with a source MAC address matching a MAC address in the static list are forwarded.

To configure static locking only, set the dynamic MAC limit to 0. To configure dynamic locking only, set the static MAC limit to 0.

Sticky mode configuration converts all the existing dynamically learned MAC addresses on an interface to sticky. This means that they will not age out and will appear in the running-config. In addition, new addresses learned on the interface will also become sticky. Note that sticky is not the same as static – the difference is that all sticky addresses for an interface are removed from the running-config when the interface is taken out of sticky mode. Static addresses must be removed from the running-config individually.

Sticky MAC addresses appear in the running-config in the following form:

```
switchport port-security mac-address sticky 0011.2233.4455 vlan 33
```

Statically locked MAC addresses appear in the running-config in the following form:

```
switchport port-security mac-address 0011.2233.4455 vlan 33
```

Command History

Updated in 6.3.0.1 firmware. VLAN capability added in the 6.6.1 firmware release.

Example

Enable port security/MAC locking globally and on an interface.

```
console(config)#switchport port-security
console(config)#interface gi1/0/3
console(config-if-gi1/0/3)#switchport port-security
```

Enable port security/MAC locking globally and on an interface, enable sticky mode on the interface and convert all dynamic addresses on the interface to sticky.

```
console(config)#switchport port-security
console(config)#interface gi1/0/3
console(config-if-gi1/0/3)#switchport port-security
console(config-if-gi1/0/3)#switchport port-security mac-address sticky
```

Add a statically locked MAC address to trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address
0011.2233.4455 vlan 33
```

Add a sticky mode statically locked MAC address to trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
0011.2233.4455 vlan 33
```

Remove a sticky mode MAC address from trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#no switchport port-security mac-address
0011.2233.4455 vlan 33
```

Convert all dynamically learned MAC addresses on trunk port gi1/0/3 to sticky MAC addresses and save the running-config so the configuration will persist across reboots.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
console(config)#do write
```

Convert all sticky MAC addresses on trunk port gi1/0/3 to sticky MAC addresses and save the running-config so the configuration will persist across reboots.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
console(config)#do write
```

switchport port-security (Interface Configuration)

Use the **switchport port-security** command to enable or configure port security (MAC locking) globally. Use the **no** form of the command to disable port security globally.

Syntax

switchport port-security [**dynamic** { *value* | **vlan** {*vlan-id* | **range** *vlan-range* } **maximum** *limit* } | **mac-address** {*mac-address* **vlan** *vlan-id* | **sticky** [*mac-addr* **vlan** *vlan-id*] } | **maximum** {*val*} | **violation** {**protect** | **shutdown**}]

no switchport port-security [**dynamic** [**vlan** {*vlan-id* | **range** *vlan-range*}] | **mac-address** { *mac-addr* **vlan** *vlan-id*| **sticky**} | **maximum** | **violation**]

- **mac-address** — The static MAC address to be configured on the interface and VLAN.
- *vlan-id* — The VLAN identifier on which to configure the MAC address.
- **dynamic** — Configure the maximum number of dynamic MAC addresses that be be learned on the interface. Setting the dynamic limit to 0 causes all received packets with non-static MAC addresses to be considered as violations.
- **sticky** – Configure a sticky MAC address on the interface. If the sticky parameter not given, a statically locked MAC address is configured on the interface.
- **maximum** <*limit*> — Configure the maximum number of static MAC addresses that may be learned on the interface or VLAN.
- **violation**—Configure the interface to:

- **protect**—Protect the interface or VLAN by discarding MAC frames that are not learned (default) and issuing a log message and a trap.
- **shutdown**—Protect the interface or VLAN by error disabling the interface and issuing a log message and a trap. If the MAC address limit is exceeded for a VLAN, the ports participating in the VLAN are shut down.

Default Configuration

By default, port security is not enabled and VLAN port security is not enabled. The default behavior is to drop unknown packets when the limit is exceeded.

There is no default action. Notifications are not sent by default.

No static or sticky MAC addresses are learned or configured by default.

The default number of dynamic MAC addresses per interface is 600 (300 for the N1500 Series switches). The default number of static MAC addresses per interface is 100.

Both limits are subject to the total MAC address limit supported by the system.

Command Mode

Interface (Ethernet and port-channel) Configuration mode.

Interface Range mode - Only when using switchport port-security syntax.

User Guidelines

Port security allows the network administrator to secure interfaces or VLANs by specifying (or learning) the allowed MAC addresses or a limit on a given port or VLAN. Packets with a matching source MAC address are forwarded normally. All other host packets are discarded. Port security operates on access, trunk and general mode ports.

Two methods are used to implement port security: dynamic locking and static locking. Static locking supports an optional sticky mode.

Dynamic locking implements a ‘first arrival’ mechanism for MAC locking. The administrator specifies how many dynamic addresses may be learned on the secure port. If the limit has not been reached, then a packet with an unknown source MAC address is learned and forwarded normally. If the MAC address limit has been reached, the packet is discarded, the MAC address is not learned, and a violation is raised. The administrator can disable dynamic learning by setting the number of allowable dynamic entries to zero. This causes all packets with unknown MAC addresses to be considered as violations.

When a port security enabled link goes down, all of the dynamically learned addresses are removed from the MAC forwarding database. When the link is restored, that port can once again learn MAC addresses up to the administrator specified limit.

A dynamically learned MAC address is eligible to be aged out if another packet with that MAC address is not seen within the age-out time. Dynamically learned MAC addresses are also eligible to be re-learned on another port if station movement occurs.

Static locking allows the administrator to specify a list of MAC addresses that are allowed on a port. The behavior of packets is the same as for dynamic learning once the dynamic limit has been reached: only packets with a known source MAC address can be forwarded. Any packets with source MAC addresses that are not configured are discarded. The switch treats this as violation.

If the administrator knows the specific MAC address (or addresses) that will be connected to a particular port, she can specify those addresses as static entries. By setting the number of allowable dynamic entries to zero, only packets with a source MAC address matching a MAC address in the static list are forwarded.

Statically locked MAC addresses are not eligible for aging. If a packet arrives on a port with a source MAC address that is statically locked on another port, then the packet is discarded.

To configure static locking only, set the dynamic MAC limit to 0 and configure the static MAC addresses on the interface. To configure dynamic locking only, set the static MAC limit to 0, and set the appropriate dynamic MAC address limit.

Source MAC addresses seen on an interface/VLAN other than the learned or configured MAC addresses and in excess of the limit are considered violations of port security. Trap issuance violation actions can be configured using the **snmp-server enable traps port-security** command. The default action is to log a message and send an SNMP trap. Port security can optionally error disable an interface on which a violation occurs using the **switchport port-security violation shutdown** command. Setting the port to shutdown mode also enables the sending of port-security traps.

Enabling sticky mode configuration converts all the existing dynamically learned MAC addresses on an interface to sticky. It also converts the last violation MAC address to sticky, even if the dynamic limit is set to 0. These MAC addresses will not age out and will appear in the running-config. In addition, new addresses learned on the interface will also become sticky. Note that sticky is not the same as static – the difference is that all sticky addresses for an interface are removed from the running-config when the interface is taken out of sticky mode. Static addresses must be removed from the running-config individually. Save the running-config to ensure that sticky addresses survive a switch boot.

Sticky MAC addresses appear in the running-config in the following form:

```
switchport port-security mac-address sticky 0011.2233.4455 vlan 33
```

Statically locked MAC addresses appear in the running-config in the following form:

```
switchport port-security mac-address 0011.2233.4455 vlan 33
```

In order for sticky or static MAC addresses to survive a reboot, the configuration must be saved.

Dynamic port security may be implemented on a VLAN or interface basis. Use the **switchport port-security dynamic vlan *vlan-id* maximum *val*** or **switchport port-security dynamic vlan range *vlan-range* maximum *val*** syntax to configure VLAN security. Use the **switchport port-security dynamic** *val* syntax to configure port based security.

VLAN port security allows the administrator to secure the network by locking a station to a particular VLAN. Packets with a matching source MAC address are forwarded normally in the identified VLAN. All other packets in the VLAN are dropped.

Port security must be enabled globally to enable VLAN port security. Either or both may be enabled. Interface port security and VLAN port security may be configured simultaneously on a port. In the case of conflicts in configuration, VLAN port security is given precedence.

A maximum of 600 MAC address may be learned on a VLAN with VLAN port security

enabled.

Command History

Updated in 6.3.0.1 firmware. Additional VLAN security parameters added in the 6.6.1 firmware release.

Example

Enable port security/MAC locking globally and on an interface.

```
console(config)#switchport port-security
console(config)#interface gi1/0/3
console(config-if-gi1/0/3)#switchport port-security
```

Enable port security/MAC locking globally and on an interface, enable sticky mode on the interface and convert all dynamic addresses on the interface to sticky.

```
console(config)#switchport port-security
console(config)#interface gi1/0/3
console(config-if-gi1/0/3)#switchport port-security
console(config-if-gi1/0/3)#switchport port-security mac-address sticky
```

Add a statically locked MAC address to trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address
0011.2233.4455 vlan 33
```

Add a sticky mode statically locked locked MAC address to trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
0011.2233.4455 vlan 33
```

Remove a sticky mode MAC address from trunk port Gi1/0/3 and VLAN 33.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#no switchport port-security mac-address
0011.2233.4455 vlan 33
```

Convert all dynamically learned MAC addresses on trunk port 33 to sticky MAC addresses and save the running-config so the configuration will persist across reboots.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
console(config)#do write
```

Convert all sticky MAC addresses on trunk port 33 to sticky MAC addresses and save the running-config so the configuration will persist across reboots.

```
console(config)#vlan 33
console(config-vlan33)#interface gi1/0/3
console(config-if-Gi1/0/3)#switchport mode trunk
console(config-if-Gi1/0/3)#switchport port-security mac-address sticky
console(config)#do write
```

show mac address-table multicast

Use the **show mac address-table multicast** command to display multicast MAC address table information.

Syntax

show mac address-table multicast [**count**]|[[**vlan** *vlan-id*] [**address** {*mac-multicast-address* | *ip-multicast-address*}] [**format** {**ip** | **mac**}]]

- *vlan-id* — A valid VLAN ID value.
- *mac-multicast-address* — A valid MAC multicast address.
- *ip- multicast-address* — A valid IP multicast address.
- **format** — Multicast address display format. Can be **ip** or **mac**.

Default Configuration

If format is unspecified, the default is **mac**.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The count parameter requests the display of the address table usage. No other parameters may be supplied with the count parameter. The **address** parameter indicates that the entry matching the specified address is displayed. The **vlan** parameter requests display of entries associated with the specified VLAN. The **format** parameter requests that addresses be displayed in the specified format. The **vlan**, **address**, and **format** parameters may all be specified together.

A MAC address can be displayed in IP format only if it is in the range 01:00:5e:00:00:00 through 01:00:5e:7f:ff:ff.

Static multicast MAC addresses can be added via the **mac address-table static** command.

Example

In this example, multicast MAC address table information is displayed.

```
console#show mac address-table multicast

Vlan      MAC Address         Type     Ports
-----   -------------------  -------   ------------------
1         0100.5E05.0505      Static

Forbidden ports for multicast addresses:

Vlan         MAC Address                Ports
----  -----------------------  ---------------------------
1       0100.5E05.0505
```

NOTE: A multicast MAC address maps to multiple IP addresses, as shown above.

Command History

The description was updated in the 6.4 release.

show mac address-table

Use the **show mac address-table** command in User Exec or Privileged Exec mode to display all entries in the bridge-forwarding database.

Syntax

show mac address-table

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Use the **show mac address-table multicast** to display multicast MAC address entries along with forbidden multicast MAC entries.

Example

In this example, all classes of entries in the mac address-table are displayed.

```
console#show mac address-table

Aging time is 300 Sec

Vlan Mac Address      Type       Port
---- ---------------- ---------- -----------
0    001E.C9AA.AE19   Management  CPU Interface
1    001E.C9AA.AC19   Dynamic     Gi1/0/21
1    001E.C9AA.AE1B   Management  Vl1
10   001E.C9AA.AE1B   Management  Vl10
90   001E.C9AA.AE1B   Management  Vl90

Total MAC Addresses in use: 5
```

show mac address-table address

Use the **show mac address-table address** command in User Exec or Privileged Exec mode to display all entries in the bridge-forwarding database for the specified MAC address.

Syntax

show mac address-table address *mac-address* [**interface** *interface-id*] [**vlan** *vlan-id*]

- *mac-address*—A MAC address.

- *interface-id*—Display information for a specific interface. Valid interfaces include Ethernet ports and port channels.
- *vlan-id*—Display entries for the specific VLAN only. The range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

In this example, the mac address table entry for 0000.E26D.2C2A is displayed.

```
console#show mac address-table address 0000.E26D.2C2A

Vlan Mac Address    Type     Port
---- -------------- -------- -------------
1    0000.E26D.2C2A Dynamic  Gi1/0/1
```

show mac address-table count

Use the **show mac address-table count** command in User Exec or Privileged Exec mode to display the number of addresses present in the Forwarding Database.

Syntax

show mac address-table count [**vlan** *vlan-id* **|** **interface** *interface-id*]

- *interface-id*—Specify an interface type; valid interfaces include Ethernet ports and port channels.
- *vlan-id*—Specify a valid VLAN, the range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the addresses in the Forwarding Database:

```
console#show mac address-table count
Capacity: 8192
Used: 109
Static addresses: 2
Secure addresses: 1
Dynamic addresses: 97
Internal addresses: 9
```

show mac address-table dynamic

Use the **show mac address-table** command in User Exec or Privileged Exec mode to display all dynamic entries in the bridge-forwarding database.

Syntax

show mac address-table dynamic [**address** ***mac-address***] [**interface** ***interface-id***] [**vlan** ***vlan-id***]

- *mac-address*—A MAC address.
- *interface-id* —Display information for a specific interface. Valid interfaces include Ethernet ports and port channels.
- *vlan-id*—Display entries for the specific VLAN only. The range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

In this example, all dynamic entries in the mac address-table are displayed.

```
console#show mac address-table dynamic
Aging time is 300 Sec
Vlan Mac Address    Type    Port
---- -------------- ------- -------------
1    0000.0001.0000 Dynamic Gi1/0/1
1    0000.8420.5010 Dynamic Gi1/0/1
1    0000.E26D.2C2A Dynamic Gi1/0/1
1    0000.E89A.596E Dynamic Gi1/0/1
1    0001.02F1.0B33 Dynamic Gi1/0/1
```

show mac address-table interface

Use the **show mac address-table** command in User Exec or Privileged Exec mode to display all entries in the mac address-table.

Syntax

show mac address-table interface *interface-id* [**vlan** *vlan-id*]

- *interface-id* —Specify an interface type.Valid interfaces include Ethernet ports and port channels.
- *vlan-id*—Specify a valid VLAN. The range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

In this example, all classes of entries in the bridge-forwarding database for Gigabit Ethernet interface 1/0/1 are displayed.

```
console#show mac address-table interface gigabitethernet 1/0/1
Aging time is 300 Sec
Vlan Mac Address    Type    Port
---- -------------- ----    -------------
1    0000.0001.0000 Dynamic Gi1/0/1
1    0000.8420.5010 Dynamic Gi1/0/1
1    0000.E26D.2C2A Dynamic Gi1/0/1
1    0000.E89A.596E Dynamic Gi1/0/1
1    0001.02F1.0B33 Dynamic Gi1/0/1
```

show mac address-table static

Use the **show mac address-table static** command in User Exec or Privileged Exec mode to display static entries in the bridge-forwarding database.

Syntax

show mac address-table static [**address** *mac-address*] [**interface** *interface-id*] [**vlan** *vlan-id*]

- *mac-address* —A MAC address.
- *interface-id* —Specify an interface type; valid interfaces include Ethernet ports and port channels.
- *vlan-id*—Specify a valid VLAN; the range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

In this example, all static entries in the bridge-forwarding database are displayed.

```
console#show mac address-table static

Vlan Mac Address    Type     Port
---- -------------- -----    -----
1    0001.0001.0001 Static Gi1/0/1
```

show mac address-table vlan

Use the **show mac address-table vlan** command in User Exec or Privileged Exec mode to display all entries in the bridge-forwarding database for the specified VLAN.

Syntax

show mac address-table [**vlan** *vlan-id*]

- *vlan-id*—Specify a valid VLAN; the range is 1 to 4093.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

In this example, multiple classes of entries in the bridge forwarding database are displayed.

```
console(config-if-Gi1/0/4)#show mac address-table vlan 1
```

```
Aging time is 400 Sec
Vlan     Mac Address           Type        Port
-------- --------------------- ----------- ---------------------
1        1418.7715.1BAA        Dynamic     Gi2/0/29
1        1418.7715.47E8        Management  CPU
1        2047.47BA.F696        Dynamic     Gi2/0/29
1        B8CA.3AD5.DF1A        Static      Gi2/0/29
```

show port-security

Use the **show ports security** command to display port security (MAC locking) configuration.

Syntax

show port-security [*interface-id* | **all** | **dynamic** *interface-id* | **static** *interface-id* | **violation** *interface-id*]

- *interface-id* —An Ethernet or port channel interface identifier.
- *all*—Display information for all interfaces.

Default Configuration

Port security is disabled by default.

No port security MAC addresses are learned or configured by default.

The maximum static MAC address limit is 100 MAC addresses.

The maximum dynamic MAC address limit is 600 MAC addresses.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Setting the dynamic limit to 0 causes all received packets with non-static or sticky MAC addresses to be considered as violations.

This information is shown if no parameters are given:

Field	Description
Admin Mode	The configured global administrative status of port MAC locking.

This information is shown if only an interface parameter is given:

Field	Description
Interface Identifier	The interface identifier.
Status	The port security administrative status (enabled/disabled).
Max-dynamic	The dynamic MAC address limit.
Max-static	The static address limit.
Protect	Trap issued on violation (enabled/disabled).
Frequency	The frequency of trap issuance (in seconds).
Shutdown	Shut down (err-disable) interface on violation (enabled/disabled).
Sticky Mode	Sticky mode configuration (enabled/disabled).

This information is shown if the dynamic parameter is given:

Field	Description
Dynamically Learned MAC Address	Dynamically learned MAC addresses.
VLAN ID	The VLAN on which the MAC address is learned.

This information is shown if the static parameter is given:

Field	Description
Statically Configured MAC Address	Statically configured MAC addresses.
VLAN ID	The VLAN identifier of the MAC address.
Sticky	Indicates if the secure MAC address is sticky.

This information is shown if the violation parameter is given:

Field	Description
MAC address	The source MAC address of the last packet discarded on the interface. These are packets with unknown MAC addresses, e.g., as in the case of the dynamic limit set to 0.
VLAN ID	The VLAN identifier of the discarded packet, if applicable.

Command History

Updated in 6.3.0.1 firmware.

Example

```
console(config)#show port-security static gi1/0/1

Number of static MAC addresses configured: 2

Static MAC address  VLAN ID   Sticky
------------------  -------   ------
00:01:ad:32:01        2       Yes
00:10:fe:48:19        2       No
```

MAC Notification Commands

mac address-table notification change

Use this command to enable and configure MAC address change notification. Use the **no** form of the command to return the configuration to the default.

Syntax

mac address-table notification change [**history** *size* | **interval** *seconds*]>

no mac address-table notification change

- *size* — Configure the size of the MAC address table buffer. The range is 1 to 255.
- *seconds* — Configure the SNMP trap notification interval. The range is 1 to 2,147,483,647 seconds.

Default Configuration

MAC address notification is disabled by default.

The default history size is 255.

The default notification interval is 1 second.

Command Mode

Global Configuration mode

User Guidelines

MAC address notification allows the operator to receive an SNMP trap or inform when a MAC address is learned by the switch or the MAC address ages out of the MAC address table. MAC movement is not tracked.

Setting the interval to 1 causes the trap/inform to be sent immediately on the occurrence of any event. This may cause CPU congestion if a large number of events occurs in a short period of time.

MAC notification maintains a history buffer of MAC address changes that have not yet been transmitted. The MAC address table history buffer is a finite resource. It is indexed in a circular manner, overwriting older entries.

The range of the index is 1..N+1 where N is the size of the history buffer. If a trap has not been sent with the information in the buffer by the time a new entry is added that overwrites an existing entry, the information is lost.

If the history buffer size is reduced via configuration, the index is set to 1. If the history size is increased, exiting entries are not disturbed and the index is not adjusted (meaning some existing entries may be overwritten before the new empty entries are filled). Entries greater than the index are cleared (by being overwritten).

Use the **snmp-server enable traps mac-notification** command to enable the sending of traps/informs to SNMP servers. By default, trap and informs are sent to all configured SNMP servers. As MAC address notification has the capability to overwhelm the switch CPU sending traps, it is recommended to use the **snmp-server host { informs | traps } ... mac-notification** to limit the SNMP hosts which will receive trap/informs.

The notification contains a list of MAC addresses in the following format:

```
<operation><VLAN><MAC><dot1dBasePort>
```

where:

- `<operation>` is of size 1 octet and supports the following values:
  - 0 — End of MIB object.
  - 1 — MAC learned.
  - 2 — MAC removed.
- VLAN - two octets.
- MAC - six octets.
- dot1dBasePort - two octets (1.3.6.1.2.1.17.1.4.1.1 from bridge-mib).

Each MAC notification is 11 octets per entry - the MACChangedMsg data is packed in consecutive octets with no holes so that it may be copied directly into the message buffer without reformatting.

The format is big endian (Network Byte Format).

The switch may send more than one SNMP trap or inform every interval. The notification PDU is limited to 1472 octets or 133 MAC addresses.

MAC notification traps are only sent when enabled on an interface using the **snmp-trap mac-notification change** command in addition to the Global Configuration mode **snmp-server enable traps mac-notification change** and **mac address-table notification change** commands. At least one SNMP host must be configured.

Example

This example sets the history buffer size to 10, the notification interval to 2 seconds and enables MAC address table change notification.

```
console(config)# mac address-table notification change history 10 interval 2
console(config)# mac address-table notification change
```

The following command disables MAC address notification.

```
console(config)# no mac address-table notification change
```

Command History

Command introduced in version 6.7.0 firmware.

snmp trap mac-notification change

Use this command to enable MAC notification traps to be sent for an interface. Use the **no** form of the command to return the configuration to the default setting.

Syntax

snmp trap mac-notification change [**added** | **removed**]

no snmp trap mac-notification change

- **added** — Send a trap when a station MAC address is learned.
- **removed** — Send a trap when a station MAC address is removed from the MAC table.

Default Configuration

MAC address additions and removals are disabled by default.

Command Mode

Interface (Ethernet or port-channel) Configuration mode

User Guidelines

MAC notification traps are only sent when enabled on an interface using the **snmp trap mac-notification change** command, in addition to the Global Configuration mode **snmp-server enable traps mac-notification change** and **mac address-table notification change** commands.

Example

This example enables MAC notification, sets the buffer size to 255, and enables MAC notification traps for interface Gi1/0/3. This will send the MAC notification trap or inform to all configured SNMP hosts.

```
console(config)#mac address-table notification change
console(config)#mac address-table notification change history 255
console(config)#smnp-server enable traps mac-notification
console(config)#interface gi1/0/3
console(config-if-Gi1/0/3)#snmp trap mac-notification change added
console(config-if-Gi1/0/3)#snmp trap mac-notification change removed
```

Command History

Command introduced in version 6.7.0 firmware.

show mac address-table notification change

Use this command to display the MAC notification configuration and contents of the MAC notification history buffer.

Syntax

show mac address-table notification [**change** [**interface** [*interface-id*]]]

- **change** — Display the MAC notification configuration and buffer contents.
- **interface** — Display the interface MAC notification configuration.
- *interface-id* — An interface identifier (Ethernet or Port-Channel)

Default Configuration

If no interface-id is specified, all interfaces are shown by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The following items are displayed in the table:

Field	Description
Index	The SNMP Dot1dBasePort index.
MAC Address	The MAC address in dotted quad format.
Action	Add (new MAC learned) or remove (MAC address aged out or cleared).
Port	The port identifier in standard format.
VLAN	The numeric VLAN identifier.

Example

```
console#show mac address-table notification

MAC Notification is enabled
MAC Notification Traps are enabled
Trap notification interval: 1 secs
MAC change notifications sent: 47
MAC addresses added: 3082
MAC addresses removed: 2997
History table maximum size: 500
History table current entries: 5


console#show mac address-table notification change

MAC Notification is enabled
MAC Notification Traps are enabled
Trap notification interval: 1 secs
MAC change notifications sent: 47
MAC addresses added: 3082
MAC addresses removed: 2997
History table maximum size: 500
History table current entries: 5

Index  MAC Address    Action    Interface    VLAN
----- -------------- ------- ------------- ----
```

```
2      0000.0001.0000 Add     Gi1/0/1       4093
2      0000.8420.5010 Add     Gi1/0/1       4093
2      0000.E26D.2C2A Remove  Gi1/0/1       4093
5      0000.E89A.596E Add     Gi1/0/3       1
5      0001.02F1.0B33 Remove  Gi1/0/3       1


console#show mac-address-table notification change interface gi1/0/1
MAC Notification is enabled
MAC Notification Traps are enabled


Interface           MAC Added Trap  MAC Removed Trap
-------------     ---------------  ----------------
Gi1/0/1             Enabled         Disabled
```

Command History

Command introduced in version 6.7.0 firmware.

Auto-VoIP Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Voice over Internet Protocol (VoIP) allows network users to make telephone calls using a computer network over a data network like the Internet. With the increased prominence of delay-sensitive applications (voice, video, and other multimedia applications) deployed in networks today, proper QoS configuration ensures high-quality application performance. The Auto-VoIP feature is intended to provide an easy classification mechanism for voice packets so that they can be prioritized above data packets in order to provide better QoS. The Auto-VoIP service is independent of the Voice VLAN service. Only one of the two services should be deployed in any network.

The Auto-VoIP feature explicitly matches VoIP streams in Ethernet switches and provides them with a better class of service than ordinary traffic. The Auto VoIP module provides the capability to assign the highest priority for the following VoIP packets:

- Session Initiation Protocol (SIP)
- H.323
- Skinny Client Control Protocol (SCCP)

Auto-VoIP borrows ACL lists from the global system pool. ACL lists allocated by Auto-VoIP reduce the total number of ACLs available for use by the network operator. Enabling Auto-VoIP uses one ACL list to monitor for VoIP sessions. Each monitored VoIP session utilizes two rules from an additional ACL list. This means that the maximum number of ACL lists allocated by Auto-VoIP is two. The Auto-VoIP feature limits the maximum number of simultaneous users to 16. Administrators should utilize the Voice VLAN feature for deployment of IP voice service in an enterprise network because Voice VLAN scales to significantly higher numbers of users.

show switchport voice

Use the **show switchport voice** command to show the status of Auto-VoIP on an interface or all interfaces.

Syntax

show switchport voice [*interface-id*]

- *interface-id* —An Ethernet or port channel interface identifier.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

See the debug auto-voip command for assistance in troubleshooting Auto-VoIP issues.

This command accepts an Ethernet interface identifier or a port channel identifier.

Examples

The following example shows command output when a port is not specified:

```
console#show switchport voice

Interface  Auto VoIP Mode Traffic Class
---------  -------------- -------------
Gi1/0/1    Disabled       6
Gi1/0/2    Disabled       6
Gi1/0/3    Disabled       6
Gi1/0/4    Disabled       6
Gi1/0/5    Disabled       6
Gi1/0/6    Disabled       6
Gi1/0/7    Disabled       6
Gi1/0/8    Disabled       6
Gi1/0/9    Disabled       6
Gi1/0/10   Disabled       6
Gi1/0/11   Disabled       6
Gi1/0/12   Disabled       6
Gi1/0/13   Disabled       6
Gi1/0/14   Disabled       6
Gi1/0/15   Disabled       6
```

```
Gi1/0/16   Disabled       6
Gi1/0/17   Disabled       6
Gi1/0/18   Disabled       6
Gi1/0/19   Disabled       6
Gi1/0/20   Disabled       6
Gi1/0/21   Disabled       6
Gi1/0/22   Disabled       6
Gi1/0/23   Disabled       6
Gi1/0/24   Disabled       6
Po1        Disabled       6
Po2        Disabled       6
Po3        Disabled       6
Po4        Disabled       6
Po5        Disabled       6
Po6        Disabled       6
Po7        Disabled       6
Po8        Disabled       6
Po9        Disabled       6
Po10       Disabled       6
Po11       Disabled       6
Po12       Disabled       6
Po13       Disabled       6
Po14       Disabled       6
Po15       Disabled       6
```

The following example shows command output when a port is specified:

```
console#show switchport voice gigabitethernet 1/0/1

Interface  Auto VoIP Mode Traffic Class
---------  -------------- -------------
Gi1/0/1    Disabled       6
```

The command output provides the following information:

- **AutoVoIP Mode**—The Auto VoIP mode on the interface.
- **Traffic Class**—The Cos Queue or Traffic Class to which all VoIP traffic is mapped. This is not configurable and defaults to the highest COS queue available in the system for data traffic.

switchport voice detect auto

The **switchport voice detect auto** command is used to enable the VoIP Profile on all the interfaces of the switch (global configuration mode) or for a specific interface (interface configuration mode).Use the **no** form of the command to disable the VoIP Profile.

Syntax

switchport voice detect auto

no switchport voice detect auto

Default Configuration

This feature is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

The switch Auto-VoIP capability is independent of the Voice VLAN capability. Voice VLAN configuration has no effect on the Auto-VoIP capabilities. Voice VLAN is recommended for enterprise deployments as Auto-VoIP is limited in the number of active VoIP users that can be serviced.

This command is valid for Ethernet and port channel interfaces.

Example

```
console(config)#interface tengigabitethernet 1/0/1
console(config-if-Te1/0/1)#switchport voice detect auto
```

CDP Interoperability Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Industry Standard Discovery Protocol (ISDP) is a proprietary Layer 2 network protocol which inter-operates with Cisco network equipment and is used to share information between neighboring devices. Dell EMC Networking switches participate in the ISDP protocol and are able to both discover and be discovered by devices that support the Cisco Discovery Protocol (CDP). ISDP is based on CDP, which is a precursor to LLDP.

clear isdp counters

The **clear isdp counters** command clears the ISDP counters.

Syntax

clear isdp counters

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear isdp counters
```

clear isdp table

The **clear isdp table** command clears entries in the ISDP table.

Syntax

clear isdp table

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear isdp table
```

isdp advertise-v2

The **isdp advertise-v2** command enables the sending of ISDP version 2 packets from the device. Use the **no** form of this command to send version 1 packets.

Syntax

isdp advertise-v2

no isdp advertise-v2

Default Configuration

ISDP sends version 2 packets by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#isdp advertise-v2
```

isdp enable

The **isdp enable** command enables ISDP on the switch. User the “no” form of this command to disable ISDP. Use this command in global configuration mode to enable the ISDP function on the switch. Use this command in interface mode to enable sending ISDP packets on a specific interface.

Syntax

isdp enable

no isdp enable

Default Configuration

ISDP is enabled.

Command Mode

Global Configuration mode.

Interface Configuration (Ethernet) mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example enables isdp on interface Gi1/0/1.

```
console(config)#isdp enable
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#isdp enable
```

isdp holdtime

The **isdp holdtime** command configures the hold time for ISDP packets that the switch transmits. The hold time specifies how long a receiving device should store information sent in the ISDP packet before discarding it. The range is given in seconds. Use the **no** form of this command to reset the holdtime to the default.

Syntax

isdp holdtime *time*

no isdp holdtime

- *time*—The time in seconds (range 10–255 seconds).

Default Configuration

The default holdtime is 180 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command specifies the amount of time the partner device should maintain the ISDP information. The local device uses the hold time in packets received from the partner device. Configuring the hold time locally does not change the amount of time displayed by the **show isdp** command. Configure the hold time on the partner device to change the amount of time the switch maintains the partner information.

Example

The following example sets isdp holdtime to 40 seconds.

```
console(config)#isdp holdtime 40
```

isdp timer

The **isdp timer** command sets period of time between sending new ISDP packets. The range is given in seconds. Use the "no" form of this command to reset the timer to the default.

Syntax

isdp timer *time*

no isdp timer

- *time*—The time in seconds (range: 5–254 seconds).

Default Configuration

The default timer is 30 seconds.

Command Mode

Global Configuration mode

User Guidelines

Configuring the timer to a low value on a large number interfaces may affect system processing due to CPU overload. Use the **show process cpu** command to examine the system load.

Example

The following example sets the isdp timer value to 40 seconds.

```
console(config)#isdp timer 40
```

show isdp

The **show isdp** command displays global ISDP settings.

Syntax

show isdp

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show isdp
Timer............................... 30
Hold Time........................... 180
```

```
Version 2 Advertisements............ Enabled
Neighbors table last time changed.... 0 days 00:06:01
Device ID........................... QTFMPW82400020
Device ID format capability......... Serial Number
Device ID format.................... Serial Number
```

show isdp entry

The **show isdp entry** command displays ISDP entries. If a device id specified, then only the entry about that device is displayed.

Syntax

show isdp entry {**all** | *deviceid*}

- all—Show ISDP settings for all devices.
- *deviceid*—The device ID associated with a neighbor.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show isdp entry Switch

Device ID                        N2000/N3000-ON Series Switch
Address(es):
    IP Address:                  172.20.1.18
    IP Address:                  172.20.1.18
Capability                       Router IGMP
Platform                         cisco WS-C4948
Interface                        Gi1/0/1
Port ID                          Gi1/0/1
Native VLAN                      234
Holdtime                         64
```

```
Advertisement Version          2
Entry last changed time        0 days 00:13:50
Version:
Cisco IOS Software, Catalyst 4000 L3 Switch Software (cat4000 I9K91S-M),
Version 12.2(25)EWA9, RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 21-Mar-07 12:20 by tinhuang
```

show isdp interface

The **show isdp interface** command displays ISDP settings for the specified interface.

Syntax

show isdp interface {**all** | *interface-id*}

- *interface-id*—An Ethernet interface identifier.
- all—Display all interfaces.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command accepts an Ethernet interface identifier.

Example

```
console#show isdp interface all

Interface        Mode
---------------  ----------
Gi1/0/1          Enabled
Gi1/0/2          Enabled
Gi1/0/3          Enabled
Gi1/0/4          Enabled
Gi1/0/5          Enabled
Gi1/0/6          Enabled
```

```
Gi1/0/7          Enabled
Gi1/0/8          Enabled
Gi1/0/9          Enabled

console#show isdp interface gigabitethernet 1/0/1

Interface        Mode
---------------  ----------
Gi1/0/1             Enabled
```

show isdp neighbors

The **show isdp neighbors** command displays the list of neighboring devices.

Syntax

show isdp neighbors [*interface-id*][*detail*]

- *interface-id*—A Ethernet interface identifier.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The information displayed varies based upon the information received from the ISDP neighbor.

Example

```
console#show isdp neighbors

Capability Codes: R - Router, T - Trans Bridge, B - Source Route Bridge,
                  S - Switch, H - Host, I - IGMP, r - Repeater
Device ID                Intf      Holdtime  Capability Platform         Port ID
------------------------ --------- --------- ---------- ---------------- ---------
CN0H784T2829841E0534A00  Gi1/0/13  163       R          N3048            Gi1/0/13
R3                       Gi1/0/16  157       R          N3048            Gi1/0/16

console#show isdp neighbors detail

Device ID                       Switch
Address(es):
```

```
    IP Address:                 172.20.1.18
    IP Address:                 172.20.1.18
Capability                      Router IGMP
Platform                        cisco WS-C4948
Interface                       Gi1/0/1
Port ID                         GigabitEthernet1/1
Native VLAN                      234
Holdtime                        162
Advertisement Version           2
Entry last changed time         0 days 00:55:20
Version:
Cisco IOS Software, Catalyst 4000 L3 Switch Software (cat4000-I9K91S-M), Version
12.2(25)EWA9, RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 21-Mar-07 12:20 by tinhuang
```

show isdp traffic

The **show isdp traffic** command displays ISDP statistics.

Syntax

show isdp traffic

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show isdp traffic

ISDP Packets Received......................... 4253
ISDP Packets Transmitted...................... 127
ISDPv1 Packets Received....................... 0
ISDPv1 Packets Transmitted.................... 0
ISDPv2 Packets Received....................... 4253
ISDPv2 Packets Transmitted.................... 4351
ISDP Bad Header............................... 0
```

```
ISDP Checksum Error............................ 0
ISDP Transmission Failure...................... 0
ISDP Invalid Format............................ 0
ISDP Table Full................................ 392
ISDP Ip Address Table Full..................... 737
```

DHCP Layer 2 Relay Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

In the majority of network configurations, DHCP clients and their associated servers do not reside on the same IP network or subnet. Therefore, some kind of third-party agent is required to transfer DHCP messages between clients and servers. Such an agent is known as a DHCP Relay agent.

The DHCP Relay agent accepts DHCP requests from any routed interface, including VLANs. The agent relays requests from a subnet without a DHCP server to a server or next-hop agent on another subnet. Unlike a router which switches IP packets transparently, a DHCP Relay agent processes DHCP messages and generates new DHCP messages as a result.

The Dell EMC Networking DHCP Relay supports DHCP Option 82 circuit-id and remote-id for a VLAN.

dhcp l2relay (Global Configuration)

Use the **dhcp l2relay** command to enable Layer 2 DHCP Relay functionality. The subsequent commands mentioned in this section can only be used when the L2-DHCP Relay is enabled. Use the **no** form of this command to disable L2-DHCP Relay.

Syntax

dhcp l2relay

no dhcp l2relay

Default Configuration

DHCP L2 Relay is disabled by default.

Command Mode

Global Configuration.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#dhcp l2relay
```

dhcp l2relay (Interface Configuration)

Use the **dhcp l2relay** command to enable DHCP L2 Relay for an interface. Use the **no** form of this command to disable DHCP L2 Relay for an interface.

Syntax

dhcp l2relay

no dhcp l2relay

Default Configuration

DHCP L2Relay is disabled on all interfaces by default.

Command Mode

Interface Configuration (Ethernet, Port-channel).

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-Gi1/0/1)#dhcp l2relay
```

dhcp l2relay circuit-id

Use the **dhcp l2relay circuit-id** command to enable setting the DHCP Option 82 Circuit ID for a VLAN. When enabled, the interface number is added as the Circuit ID in DHCP option 82. Use the **no** form of this command to disable setting the DHCP Option 82 Circuit ID.

Syntax

dhcp l2relay circuit-id vlan *vlan-list*

no dhcp l2relay circuit-id vlan *vlan-list*

- *vlan-list* —A list of VLAN IDs. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

Setting the DHCP Option 82 Circuit ID is disabled by default.

Command Mode

Global Configuration

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#dhcp l2relay circuit-id vlan 340-350
```

dhcp l2relay remote-id

Use the **dhcp l2relay remote-id** command to enable setting the DHCP Option 82 Remote ID for a VLAN. When enabled, the supplied string is used for the Remote ID in DHCP Option 82. Use the **no** form of this command to disable setting the DHCP Option 82 Remote ID.

Syntax

dhcp l2relay remote-id *remoteId* **vlan** *vlan-list*

no dhcp l2relay remote-id vlan *vlan-list*

- *remoteId*—The string to be used as the remote ID in the Option 82 (Range: 1 - 128 characters).
- *vlan-list* —A list of VLAN IDs. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

Setting the DHCP Option 82 Remote ID is disabled by default.

Command Mode

Global Configuration.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#dhcp l2relay remote-id dslforum vlan 10,20-30
```

dhcp l2relay trust

Use the **dhcp l2relay trust** command to configure an interface to mandate Option-82 on receiving DHCP packets.

Syntax

dhcp l2relay trust

no dhcp l2relay trust

Default Configuration

DHCP Option 82 is discarded by default.

Configuration Mode

Interface Configuration (Ethernet, Port-channel).

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-Gi1/0/1)#dhcp l2relay trust
```

dhcp l2relay vlan

Use the **dhcp l2relay vlan** command to enable the L2 DHCP Relay agent for a set of VLANs. All DHCP packets which arrive on interfaces in the configured VLAN are subject to L2 Relay processing. Use the **no** form of this command to disable L2 DHCP Relay for a set of VLANs.

Syntax

dhcp l2relay vlan *vlan-list*

no dhcp l2relay vlan *vlan-list*

- *vlan-list*— A list of VLAN IDs. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

DHCP L2 Relay is disabled on all VLANs by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#dhcp l2relay vlan 10,340-345
```

show dhcp l2relay all

Use the **show dhcp l2relay all** command to display the summary of DHCP L2 Relay configuration.

Syntax

show dhcp l2relay all

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console #show dhcp l2relay all
DHCP L2 Relay is Enabled.
Interface   L2RelayMode  TrustMode
----------  -----------  --------------
 Gi1/0/2     Enabled      untrusted
 Gi1/0/4     Disabled     trusted
VLAN Id   L2 Relay    CircuitId   RemoteId
--------- ----------  ----------- ------------
 3           Disabled    Enabled    --NULL--
 5           Enabled     Enabled    --NULL--
 6           Enabled     Enabled    --dell--
 7           Enabled     Disabled   --NULL--
 8           Enabled     Disabled   --NULL--
 9           Enabled     Disabled   --NULL--
 10          Enabled     Disabled   --NULL--
```

show dhcp l2relay interface

Use the **show dhcp l2relay interface** command to display DHCP L2 Relay configuration specific to interfaces.

Syntax

show dhcp l2relay interface {**all** | *interface-id*}

- **all**—Show all interfaces.
- *interface-id*—Show the specified interface information. The interface may be an Ethernet interface or a port-channel.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Command History

Port-channel capability added in version 6.5 firmware.

Example

```
console#show dhcp l2relay interface all
DHCP L2 Relay is Enabled.
Interface  L2RelayMode   TrustMode
---------- -----------  --------------
 0/2        Enabled      untrusted
 0/4        Disabled     trusted
```

show dhcp l2relay stats interface

Use the **show dhcp l2relay stats interface** command to display DHCP L2 Relay statistics specific to interfaces.

Syntax

show dhcp l2relay stats interface {**all** | *interface-id*}

- **all**—Show all interfaces.
- *interface-id*—An Ethernet interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show dhcp l2relay stats interface all
```

```
DHCP L2 Relay is Enabled.

Interface    UntrustedServer UntrustedClient  TrustedServer    TrustedClient
MsgsWithOpt82MsgsWithOpt82   MsgsWithoutOpt82 MsgsWithoutOpt82
---------    -------------   ---------------- ---------------- -------------
 Gi1/0/1     0                 0                 0                0
 Gi1/0/2     0                 0                 3                7
 Gi1/0/3     0                 0                 0                0
```

show dhcp l2relay agent-option vlan

Use the **show dhcp l2relay agent-option vlan** command to display DHCP L2 Relay Option-82 configuration specific to VLANs.

Syntax

show dhcp l2relay agent-option vlan *vlan-list*

- *vlan-list*—Show information for the specified VLAN range. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console# show dhcp l2relay agent-option vlan 5-10
DHCP L2 Relay is Enabled.
VLAN Id    L2 Relay    CircuitId   RemoteId
--------- ----------  ----------- ------------
5           Enabled     Enabled    --NULL--
6           Enabled     Enabled    broadcom
7           Enabled     Disabled   --NULL--
8           Enabled     Disabled   --NULL--
9           Enabled     Disabled   --NULL--
```

```
10          Enabled     Disabled   --NULL—
```

show dhcp l2relay vlan

Use the **show dhcp l2relay vlan** command to display whether DHCP L2 Relay is globally enabled on the specified VLAN or VLAN range.

Syntax

show dhcp l2relay vlan *vlan-list*

- *vlan-list*—Show information for the specified VLAN range. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show dhcp l2relay vlan 100
DHCP L2 Relay is Enabled.
DHCP L2 Relay is enabled on the following VLANs:
100
```

show dhcp l2relay circuit-id vlan

Use the **show dhcp l2relay circuit-id vlan** command to display whether DHCP L2 Relay is globally enabled and whether the DHCP Circuit-ID option is enabled on the specified VLAN or VLAN range.

Syntax

show dhcp l2relay circuit-id vlan *vlan-list*

- *vlan-list*—Show information for the specified VLAN range. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show dhcp l2relay circuit-id vlan 300
DHCP L2 Relay is Enabled.
DHCP Circuit-Id option is enabled on the following VLANs:
300
```

show dhcp l2relay remote-id vlan

Use the **show dhcp l2relay remote-id vlan** command to display whether DHCP L2 Relay is globally enabled and shows the remote ID configured on the specified VLAN or VLAN range.

Syntax

show dhcp l2relay remote-id vlan *vlan-list*

- *vlan-list*—Show information for the specified VLAN range. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show dhcp l2relay remote-id vlan 200
DHCP L2 Relay is Enabled.
VLAN ID    Remote Id
--------   -------------
200        remote_22
```

clear dhcp l2relay statistics interface

Use the **show dhcp l2relay statistics interface** command to reset the DHCP L2 Relay counters to zero. Specify the port with the counters to clear, or use the **all** keyword to clear the counters on all ports.

Syntax

clear dhcp l2relay statistics interface {**all** | *interface-id*}

- **all**—Show all interfaces.
- *interface-id*—An Ethernet interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear dhcp l2relay statistics interface gi1/0/1
```

DHCP Snooping Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

DHCP Snooping is a security feature that monitors DHCP messages between DHCP clients and DHCP server to filter harmful DHCP messages and build a bindings database of {MAC address, IP address, VLAN ID, interface} tuples that are considered authorized.

The DHCP snooping application processes incoming DHCP messages. For DHCPRELEASE and DHCPDECLINE messages, the application compares the receive interface and VLAN with the client's interface and VLAN in the bindings database. If the interfaces do not match, the application logs the event and drops the message. For valid client messages, DHCP snooping compares the source MAC address to the DHCP client hardware address. When there is a mismatch, DHCP snooping logs and drops the packet. DHCP Snooping forwards valid client messages on trusted members within the VLAN. If DHCP Relay and/or DHCP Server coexist with DHCP Snooping, the DHCP client message is sent to the DHCP Relay or/and DHCP Server for further processing.

The DHCP Snooping application uses DHCP messages to build and maintain the binding's database. The binding's database only includes data for clients on untrusted ports. DHCP Snooping creates a tentative binding from DHCP DISCOVER and REQUEST messages. Tentative bindings tie a client to a port (the port where the DHCP client message was received). Tentative bindings are completed when DHCP Snooping learns the client's IP address from a DHCP ACK message on a trusted port. DHCP Snooping removes bindings in response to DECLINE, RELEASE, and NACK messages. The DHCP Snooping application ignores the ACK messages as a reply to the DHCP Inform messages received on trusted ports. The network administrator can enter static bindings into the binding database.

IP Source Guard and Dynamic ARP Inspection use the DHCP Snooping bindings database for the validation of IP and ARP packets.

clear ip dhcp snooping binding

Use the **clear ip dhcp snooping binding** command to clear all DHCP Snooping bindings on a specific interface or on all interfaces.

Syntax

clear ip dhcp snooping binding {* | **interface** *interface-id*}

- *—Clear all DHCP Snooping entries.
- *interface-id*—Clear all DHCP Snooping entries on the specified interface. The interface may be an Ethernet interface or a port-channel.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec

User Guidelines

There are no user guidelines for this command.

Command History

Port-channel capability added in version 6.5 firmware.

clear ip dhcp snooping statistics

Use the **clear ip dhcp snooping statistics** command to clear all DHCP Snooping statistics.

Syntax

clear ip dhcp snooping statistics

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear ip dhcp snooping statistics
```

ip dhcp snooping

Use the **ip dhcp snooping** command to enable DHCP snooping globally, or on a range of VLANs. Use the “no” form of this command to disable DHCP snooping.

Syntax

ip dhcp snooping [vlan *vlan-list*]

no ip dhcp snooping

Default Configuration

DHCP Snooping is globally disabled by default. DHCP Snooping is not enabled on any VLAN by default.

Command Mode

Global Configuration mode

User Guidelines

To enable DHCP snooping, do the following:

1. Enable DHCP Snooping globally.
2. Enable DHCP Snooping per VLAN.
3. Configure at least one DHCP Snooping trusted port via which the DHCP server may be reached.

The bindings database populated by DHCP snooping is used by several other services, including IP source guard and dynamic ARP inspection. DHCP snooping must be enabled for these services to operate.

Example

The following configuration enables DHCP snooping on VLAN 1 for a switch connected to a DHCP server over interface gi1/0/4:

```
console(config)#ip dhcp snooping
console(config)#ip dhcp snooping vlan 1
```

```
console(config-if-vlan1)#exit
console(config)#interface gi1/0/4
console(config-if-Gi1/0/4)#ip dhcp snooping trust
```

ip dhcp snooping binding

Use the **ip dhcp snooping binding** command to configure a static DHCP Snooping binding. Use the “no” form of this command to remove a static binding.

Syntax

ip dhcp snooping binding *mac-address* **vlan** *vlan-id ip-address* **interface** *interface-id*

no ip dhcp snooping binding *mac-address*

- *mac-address*—The client's MAC address.
- *vlan-id*—The identifier of the VLAN the client is authorized to use.
- *ip-address*—The IP address of the client.
- *interface-id*—The interface on which the client is authorized. The interface may be an Ethernet interface identifier or a port channel interface identifier.

Default Configuration

There are no static or dynamic DHCP snooping bindings by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ip dhcp snooping binding 00:00:00:00:00:01 vlan 10
10.131.12.134 interface Gi1/0/1
```

ip dhcp snooping database

Use the **ip dhcp snooping database** command to configure the persistent storage location of the DHCP snooping database. This can be local to the switch or on a remote machine.

Syntax

ip dhcp snooping database {**local** | **tftp://***hostIP***/***filename*}

- *hostIP*—The IP address of the remote host.
- *filename*—The name of the file for the database on the remote host. The filename may contain any printable character except a question mark and is checked only when attempting to open the file. The file must reside in the working directory of the TFTP server. Specification of a sub-directory in the file name parameter is not supported.

Default Configuration

The database is stored locally by default.

Configuration Mode

Global Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example configures the storage location of the snooping database as local.

```
console(config)#ip dhcp snooping database local
```

The following example configures the storage location of the snooping database as remote.

```
console(config)#ip dhcp snooping database tftp://10.131.11.1/db.txt
```

ip dhcp snooping database write-delay

Use the **ip dhcp snooping database write-delay** command to configure the interval in seconds at which the DHCP Snooping database will be stored in persistent storage. Use the “no” form of this command to reset the write delay to the default.

Syntax

ip dhcp snooping database write-delay *seconds*

no ip dhcp snooping database write-delay

- *seconds*—The write delay (Range: 15–86400 seconds).

Default Configuration

The write delay is 300 seconds by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ip dhcp snooping database write-delay 500
```

ip dhcp snooping limit

Use the **ip dhcp snooping limit** command to diagnostically disable itself if the rate of received DHCP messages exceeds the configured limit. Use the **no shutdown** command to re-enable the interface. Use the **no** form of this command to disable automatic shutdown of the interface.

Syntax

ip dhcp snooping limit {**rate** *rate* [**burst interval** *seconds*]}

no ip dhcp snooping limit

- *rate*—The maximum number of packets per second allowed (Range: 0–300 pps).

- *seconds*—Interval over which to measure a burst of packets. (Range: 1–15 seconds).

Default Configuration

By default, DCHP messages do not cause an interface to be disabled.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode or port channel interface configuration mode. The switch hardware rate limits DHCP packets sent to the CPU from snooping enabled interfaces to 512 Kbps.

To prevent DHCP packets from being used in a DoS attack when DHCP snooping is enabled; the snooping application allows configuration of rate limiting for received DHCP packets. DHCP snooping monitors the receive rate on each interface separately. If the receive rate exceeds the configured limit within the configured interval, DHCP snooping shuts down the interface. The administrator must perform the “no shutdown” command on the affected interface to re-enable the interface.

The administrator can configure the rate and burst interval. Rate limiting is configured independently on each Ethernet or port-channel interface and may be enabled on both DHCP trusted and untrusted interfaces. The rate limit is configurable in the range of 0-300 packets per second and the burst interval in the range of 1-15 seconds. In general, a rate limit of under 100 pps is valid for untrusted interfaces.

Examples

```
console(config-if-Gi1/0/1)#ip dhcp snooping limit rate 100 burst interval 1
```

ip dhcp snooping log-invalid

Use the **ip dhcp snooping log-invalid** command to enable logging of DHCP messages filtered by the DHCP Snooping application. Use the **no** form of this command to disable logging.

Syntax

ip dhcp snooping log-invalid

no ip dhcp snooping log-invalid

Default Configuration

Logging of filtered messages is disabled by default.

Invalid DHCP messages are not logged by default.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode or port channel configuration mode.

Example

```
console(config-if-Gi1/0/1)#ip dhcp snooping log-invalid

console(config-if-Gi1/0/1)#no ip dhcp snooping log-invalid
```

ip dhcp snooping trust

Use the **ip dhcp snooping trust** command to configure a port as trusted. Use the **no** form of this command to configure a port as untrusted.

Syntax

ip dhcp snooping trust

no ip dhcp snooping trust

Default Configuration

Ports are untrusted by default.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

Configuring an interface as trusted disables DHCP snooping validation of DHCP packets and exposes the port to IPv4 DHCP DoS attacks. Configuring an interface as untrusted indicates that the switch should firewall DHCP messages and act as if the port is connected to a device outside the DMZ.

DHCP snooping must be enabled globally and on the VLAN for which the port is a member for this command to have an effect.

Interfaces connected to the DHCP server must be configured as trusted in order for DHCP snooping to operate.

Use the ip verify source command to disallow traffic from untrusted sources on an interface.

Example

```
console(config-if-Gi1/0/1)#ip dhcp snooping trust
console(config-if-Gi1/0/1)#no ip dhcp snooping trust
```

ip dhcp snooping verify mac-address

Use the **ip dhcp snooping verify mac-address** command to enable the verification of the source MAC address with the client MAC address in the received DHCP message. Use the “no” form of this command to disable verification of the source MAC address.

Syntax

ip dhcp snooping verify mac-address

no ip dhcp snooping verify mac-address

Default Configuration

Source MAC address verification is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ip dhcp snooping verify mac-address
```

show ip dhcp snooping

Use the **show ip dhcp snooping** command to display the DHCP snooping global configuration.

Syntax

show ip dhcp snooping

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ip dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
Gi1/0/1        Yes            No
Gi1/0/2        No             Yes
Gi1/0/3        No             Yes
Gi1/0/4        No             No
Gi1/0/6        No             No
```

show ip dhcp snooping binding

Use the **show ip dhcp snooping binding** command to display the DHCP snooping binding entries.

Syntax

show ip dhcp snooping binding [{**static** | **dynamic**}] [**interface** *interface-id* **|** **port-channel** *port-channel-number*] [**vlan** *vlan-id*]

- **static | dynamic**—Use these keywords to filter by static or dynamic bindings.
- *interface-id*—The Ethernet interface for which to show bindings.
- *port-channel-number*—The port channel for which to show bindings.
- *vlan-id*—The VLAN identifier for which to show bindings.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ip dhcp snooping binding

Total number of bindings: 2

   MAC Address       IP Address     VLAN   Interface    Type    Lease (Secs)
-----------------  ---------------  ----  -----------  -------  ------------
00:02:B3:06:60:80    210.1.1.3      10     Gi1/0/1      Dyn     86400
00:02:FE:06:13:04    210.1.1.4      10     Gi1/0/1      Dyn     86400
```

show ip dhcp snooping database

Use the **show ip dhcp snooping database** command to display the DHCP snooping configuration related to the database persistence.

Syntax

show ip dhcp snooping database

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ip dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

show ip dhcp snooping interfaces

Use the **show ip dhcp snooping interfaces** command to show the DHCP Snooping status of the interfaces.

Syntax

show ip dhcp snooping interfaces [*interface-id*]

- *interface-id*—A valid Ethernet or port-channel interface.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ip dhcp snooping interfaces

Interface     Trust State     Rate Limit      Burst Interval
                              (pps)           (seconds)
----------   -------------   -------------    ---------------
Gi1/0/1       No             15               1
Gi1/0/2       No             15               1
Gi1/0/3       No             15               1

console#show ip dhcp snooping interfaces gigabitethernet 1/0/15

Interface     Trust State     Rate Limit      Burst Interval
                              (pps)           (seconds)
----------   -------------   -------------   ---------------

Gi1/0/15        Yes              15                 1
```

show ip dhcp snooping statistics

Use the **show ip dhcp snooping statistics** command to display the DHCP snooping filtration statistics.

Syntax

show ip dhcp snooping statistics

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed by this command:

Fields	Description
MAC Verify Failures	The number of DHCP messages that were filtered on an untrusted interface because of source MAC address and client MAC address mismatch.
Client Ifc Mismatch	The number of DHCP release and Deny messages received on the different ports than previously learned.
DHCP Server Msgs	The number of DHCP server messages received on untrusted ports.

Example

```
console#show ip dhcp snooping statistics

 Interface    MAC Verify   Client Ifc   DHCP Server
               Failures     Mismatch    Msgs Rec'd
-----------  ----------   ----------   -----------
Gi1/0/2               0            0             0
Gi1/0/3               0            0             0
Gi1/0/4               0            0             0
Gi1/0/5               0            0             0
Gi1/0/6               0            0             0
Gi1/0/7               0            0             0
Gi1/0/8               0            0             0
Gi1/0/9               0            0             0
Gi1/0/10              0            0             0
Gi1/0/11              0            0             0
Gi1/0/12              0            0             0
Gi1/0/13              0            0             0
Gi1/0/14              0            0             0
Gi1/0/15              0            0             0
Gi1/0/16              0            0             0
Gi1/0/17              0            0             0
Gi1/0/18              0            0             0
Gi1/0/19              0            0             0
Gi1/0/20              0            0             0
```

DHCPv6 Snooping Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

clear ipv6 dhcp snooping binding

Use the **clear ipv6 dhcp snooping binding** command to clear all IPv6 DHCP Snooping entries.

Syntax

clear ipv6 dhcp snooping binding {* | **interface** *interface-id*}

- *—Clears all snooping bindings.
- interface-id—Clears all snooping bindings on a specified Ethernet interface.

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec

User Guidelines

This command has no user guidelines.

Example

```
(console)#clear ipv6 dhcp snooping binding
```

clear ipv6 dhcp snooping statistics

Use the clear ipv6 dhcp snooping statistics command to clear all IPv6 DHCP Snooping statistics.

Syntax

clear ipv6 dhcp snooping statistics

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec

User Guidelines

The IPv6 snooping statistics are also cleared by the **clear counters** command.

Example

```
(console)#clear ipv6 dhcp snooping statistics
```

ipv6 dhcp snooping

Use the **ipv6 dhcp snooping** command to globally enable IPv6 DHCP snooping. Use the **no** form of the command to globally disable IPv6 DHCP snooping.

Syntax

ipv6 dhcp snooping

no ipv6 dhcp snooping

Default Configuration

By default, DHCP snooping is not enabled.

Command Modes

Global Configuration mode

User Guidelines

The DHCP snooping application processes incoming DHCP messages. For RELEASE and DECLINE messages from a DHCPv6 client and RECONFIGURE messages from a DHCPv6 server received on an untrusted interface, the application compares the receive interface and VLAN with the client's interface and VLAN in the bindings database. If the interfaces do not match, the application logs the event and drops the packet. If configured, for valid client messages, DHCP snooping additionally compares the source

MAC address to the DHCP client hardware address. If there is a mismatch, DHCP snooping logs a message and drops the packet. The network administrator can disable this option using the **no ip v6 dhcp snooping verify mac-address** for DHCPv6. DHCP snooping always forwards client messages on trusted interfaces within the VLAN. If DHCP relay or/and DHCP server are enabled simultaneously with DHCP snooping, the DHCP client message will be sent to the DHCP relay or/and DHCP server to process further.

Example

```
console(config)#ipv6 dhcp snooping
```

ipv6 dhcp snooping vlan

Use the **ipv6 dhcp snooping vlan** command to globally enable IPv6 DHCP on a set of VLANs. Use the **no** form of the command to globally disable IPv6 DHCP snooping on a set of VLANs.

Syntax

ipv6 dhcp snooping vlan *vlan-list*

no ipv6 dhcp snooping *vlan-list*

- *vlan-list* —A single VLAN, one or more VLANs separated by commas, or two VLANs separated by a single dash indicating all VLANs between the first and second inclusive. Multiple VLAN identifiers can be entered provided that no embedded spaces are contained within the *vlan-list*.

Default Configuration

By default, DHCP snooping is not enabled on any VLANs.

Command Modes

Global Configuration mode

User Guidelines

DHCP snooping must be enabled on at least one VLAN and globally enabled to become operational.

Example

```
console(config)#ipv6 dhcp snooping
```

```
console(config)#ipv6 dhcp snooping vlan 5-10,15,30
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport mode access
console(config-if-Te1/0/1)#switchport access vlan 10
console(config-if-Te1/0/1)#no ipv6 dhcp snooping trust
```

ipv6 dhcp snooping binding

Use the **ipv6 dhcp snooping binding** command to configure a static IPv6 DHCP snooping binding. Use the **no** form of the command to remove the entry from the binding database.

Syntax

ipv6 dhcp snooping binding *mac-address* **vlan** *vlan-id ip-address* **interface** {**gigabitethernet** *unit/slot/port* **|** **tengigabitethernet** *unit/slot/port* **|** **fortygigabitethernet** *unit/slot/port* **|** **port-channel** *port-channel-number*}

no ipv6 dhcp snooping binding *mac-address*

- *mac-address*—A valid mac address in standard format.
- *vlan-id* —A configured VLAN id. (Range 1-4093)
- *ip-address*—A valid IPv6 address.
- *interface-id*—A valid Ethernet interface ID in short or long format.
- *port-channel-number*—A valid port channel identifier.

Default Configuration

By default, no static DHCP bindings are configured.

Command Modes

Global Configuration mode

User Guidelines

Static bindings do not age out of the DHCP binding database.

ipv6 dhcp snooping database

Use the **ipv6 dhcp snooping database** command to configure the persistent location of the DHCP snooping database. This can be a local or remote file on a TFTP server.

Syntax

ipv6 dhcp snooping database {**local** | tftp://hostIP/filename}

no ipv6 dhcp snooping database

Default Configuration

By default, the local database is used.

Command Modes

Global Configuration mode

User Guidelines

The DHCP binding database is persistently stored on a configured external server or locally in flash, depending on the user configuration. A row-wise checksum is placed in the text file that is stored on the configured TFTP server. On switch startup, the switch reads the text file and uses the contents to build the DHCP snooping database. If the calculated checksum value equals the stored checksum, the switch uses the entries from the binding file and populates the binding database. Checksum failure or a connection problem to the external configured server causes the switch to lose the bindings and may cause connectivity loss for hosts if IPSG or DAI is enabled.

ipv6 dhcp snooping database write-delay

Use the **ipv6 dhcp snooping database write-delay** command to configure the time period between successive writes of the binding database. The binding database is used to persistently store the DHCP bindings. Use the **no** form of the command to return the write delay to the default value.

Syntax

ipv6 dhcp snooping database write-delay *seconds*

no ipv6 dhcp snooping write-delay

- *seconds*—The period of time between successive writes of the binding database to persistent storage. (Range 15-86400 seconds.)

Default Configuration

By default, the write delay is 300 seconds.

Command Modes

Global Configuration mode

User Guidelines

The binding database is cached in memory and written to storage every *write-delay* seconds.

ipv6 dhcp snooping limit

Use the **ipv6 dhcp snooping limit** command configures an interface to be diagnostically disabled if the rate of received DHCP messages exceeds the configured limit. Use the **no shutdown** command to reenable the interface. Use the **no** form of the command to disable diagnostic disabling of the interface.

Syntax

ipv6 dhcp snooping limit {**rate** *pps* [**burst interval** *seconds*]}

no ipv6 dhcp snooping limit

- pps—The rate in packets per interval. (Range 0-300.)
- seconds—The time interval over which to measure a burst of packets. (Range 1-15, default 1 second.)

Default Configuration

By default, DHCP messages do not shut down the interface.

Command Modes

Interface Configuration mode

User Guidelines

The switch hardware rate limits DHCP packets sent to the CPU from snooping enabled interfaces to 512 Kbps.

To prevent DHCP packets from being used in a DoS attack when DHCP snooping is enabled, the snooping application allows configuration of rate limiting for received DHCP packets. DHCP snooping monitors the receive rate on each interface separately. If the receive rate exceeds the configured limit within the configured interval, DHCP snooping diagnostically disables the interface. The administrator must perform the **no shutdown** command on the affected interface to reenable the interface.

The administrator can configure the rate and burst interval. Rate limiting is configured independently on each Ethernet interface and may be enabled on both trusted and untrusted interfaces. The rate limit is configurable in the range of 0-300 packets per second and the burst interval in the range of 1-15 seconds.

ipv6 dhcp snooping log-invalid

Use the **ipv6 dhcp snooping log-invalid** command to configure the port to log invalid received DHCP messages.

Syntax

ipv6 dhcp snooping log-invalid

no ipv6 dhcp snooping log-invalid

Default Configuration

By default, invalid DHCP messages are not logged.

Command Modes

Interface Configuration mode

User Guidelines

An invalid DHCP message is one that is received on an untrusted interface that is not a member of the VLAN over which the IP address (and optionally the MAC address) has been learned. Receiving large number of invalid messages may be an indication of an attack.

Logging invalid messages can use valuable CPU resources if the switch receives such messages at a high rate. To avoid allowing the switch to be vulnerable to a DoS attack, DHCP snooping only logs invalid messages if the user has enabled logging. Logging is enabled on individual interfaces so that only messages on interfaces of interest are logged. To further protect the system, invalid message logging is rate limited to 1 per second.

ipv6 dhcp snooping trust

Use the **ipv6 dhcp snooping trust** command to configure an interface as trusted. Use the **no** form of the command to return the interface to the default configuration.

Syntax

ipv6 dhcp snooping trust

no ipv6 dhcp snooping trust

Default Configuration

By default, interfaces are untrusted.

Command Modes

Interface Configuration mode (Ethernet and port-channel)

User Guidelines

Configuring an interface as trusted disables DHCP snooping address validation checking and exposes the port to IPv6 DHCP DoS attacks.

DHCP snooping must be enabled globally and on the VLAN for which the port is a member for this command to have an effect. Configuring a port as trusted indicates that the port is connected to an IPv6 DHCP server or to a trusted device. Configuring a port as untrusted indicates that the switch should firewall IPv6 DHCP messages and act as if the port is connected to an untrusted device.

Use the **ipv6 verify source** command to disable traffic from untrusted sources on an interface.

ipv6 dhcp snooping verify mac-address

Use the **ipv6 dhcp snooping verify mac-address** command to enable the additional verification of the source MAC address with the client hardware address in the received DHCP message.

Syntax

ipv6 dhcp snooping verify mac-address

no ipv6 dhcp snooping verify mac-address

Default Configuration

By default, MAC address verification is not enabled.

Command Modes

Global Configuration mode

User Guidelines

DHCP MAC address verification operates on DHCP messages received over untrusted interfaces. The source MAC address of DHCP packet is different from the client hardware if:

- A DHCP discovery/request broadcast packet that was forwarded by the relay agent.
- A DHCP unicast request packet was routed in renew process.

For DHCP servers and relay agents connected to untrusted interfaces, source MAC verification should be disabled.

DHCP snooping must be enabled on at least one VLAN and globally enabled to become operational.

Example

```
console(config)#ipv6 dhcp snooping
console(config)#ipv6 dhcp snooping vlan 5-10,15,30
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#switchport mode access
console(config-if-Te1/0/1)#switchport access vlan 10
console(config-if-Te1/0/1)#no ipv6 dhcp snooping trust
console(config-if-Te1/0/1)#exit
console(config)#ipv6 dhcp snooping verify mac-address
```

ipv6 verify binding

Use the **ipv6 verify binding** command to configure a static IP source guard binding.

Syntax

ipv6 verify binding *mac-address* **vlan** *vlan-id ip-address* **interface** *interface id*

no ipv6 verify binding *mac-address* **vlan** *vlan-id ip-address* **interface** *interface id*

- *mac-address* —A valid mac address in standard format.
- *vlan-id* —A configured VLAN id. (Range 1-4093.
- *ip-address* —A valid IPv6 address.
- *interface-id*—A valid interface ID in short or long format.

Default Configuration

By default, no static IP Source Guard entries are configured.

Command Modes

Global Configuration mode

User Guidelines

Traffic is filtered based upon the source IPv6 address and VLAN. Use the **switchport port-security** command in interface mode to optionally add MAC address filtering in addition to source IPv6 address filtering. If port security is enabled, the filtering is based upon IPv6 address, MAC address and VLAN.

ipv6 verify source

Use the **ipv6 verify source** command to configure an interface to filter (drop) incoming traffic from sources that are not present in the DHCP binding database. Use the **no** form of the command to enable unverified traffic to flow over the interfaces.

Syntax

ipv6 verify source [**port-security**]

no ipv6 verify source

- **port-security** — Enables filtering based upon source IP address, VLAN and MAC address.

Default Configuration

By default, no sources are blocked.

Command Modes

Interface Configuration mode (Ethernet and port-channel)

User Guidelines

DHCP snooping should be enabled on any interfaces for which **ipv6 verify source** is configured. If **ipv6 verify source** is configured on an interface for which DHCP snooping is disabled, or for which DHCP snooping is enabled and the interface is trusted, incoming traffic on the interface is dropped.

Traffic is filtered based on the source IP address and VLAN. When the port-security keyword is configured, filtering occur based upon source IP address, VLAN and source MAC address.

IP source guard also interacts with the port security component. Use the **port security** command in interface mode to optionally add checking of learned MAC addresses. When port security is enabled, MAC learning coordinates with the IP Source Guard component to verify that the MAC address is in the DHCP binding database. If it is not, port security is notified that the frame is in violation of the security policy.

show ipv6 dhcp snooping

Use the **show ipv6 dhcp snooping** command to display the IPv6 DHCP snooping configuration

Syntax

show ipv6 dhcp snooping

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

This command has no user guidelines.

Example

```
(console)#show ipv6 dhcp snooping

DHCP snooping is Disabled
DHCP snooping source MAC verification is enabled
DHCP snooping is enabled on the following VLANs:
11 - 30, 40

Interface   Trusted    Log Invalid Pkts
---------   --------   ----------------
Gi1/0/1      Yes             No
Gi1/0/2      No             Yes
Gi1/0/3      No             Yes
Gi1/0/4      No              No
Gi1/0/6      No              No
```

show ipv6 dhcp snooping binding

Use the **show ipv6 dhcp snooping binding** command to display the IPv6 DHCP snooping configuration

Syntax

show ipv6 dhcp snooping binding [{**static**|**dynamic**}] [**interface** *interface-id* | **port-channel** *port-channel-number*] [**vlan** *vlan-id*]

- **static**—Only show static entries.
- **dynamic**—Only show dynamic entries.
- *interface-id*—Limit the display to entries associated with Ethernet *interface-id*.
- *vlan-id*—Limit the display to entries associated with VLAN *vlan-id*.
- *port-channel-number*—Limit the display to entries associated with the identified port channel.

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

There are no user guidelines for this command.

Example

```
(console)#show ipv6 dhcp snooping binding

Total number of bindings: 2

MAC Address          IPv6 Address   VLAN  Interface  Lease time(Secs)
------------------  ------------  ----  ---------  -------------
00:02:B3:06:60:80   2000::1/64     10   0/1         86400
00:0F:FE:00:13:04   3000::1/64     10   0/1         86400
```

show ipv6 dhcp snooping database

Use the show ipv6 dhcp snooping database command to display IPv6 DHCP snooping configuration related to database persistency.

Syntax

show ipv6 dhcp snooping database

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

This command has no user guidelines.

Example

```
(console)#show ipv6 dhcp snooping database

agent url:  /10.131.13.79:/sai1.txt

write-delay:  5000
```

show ipv6 dhcp snooping interfaces

Use the show ipv6 dhcp snooping interfaces command to show the DHCP Snooping status of IPv6 interfaces.

Syntax

show ipv6 dhcp snooping interfaces [*interface id*]

- *interface id*—A valid Ethernet or port-channel interface.

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

If no parameter is given, all interfaces are shown.

Example

```
(console)#show ipv6 dhcp interfaces

Interface  Trust State   Rate Limit    Burst Interval
                           (pps)         (seconds)
---------- ------------- ------------- ---------------
Gi1/0/1              No            15               1
Gi1/0/2              No            15               1
Gi1/0/3              No            15               1
```

show ipv6 dhcp snooping statistics

Use the **show ipv6 dhcp snooping statistics** command to display IPv6 dhcp snooping filtration statistics.

Syntax

show ipv6 dhcp snooping statistics

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

The following statistics are displayed.

Parameter	Description
MAC Verify Failures	The number of DHCP messages that got filtered on an untrusted interface because of the source MAC address and client hardware address mismatch.
Client Ifc mismatch	The number of DHCP release and reply messages received on different ports than the ones they were learned on previously.
DHCP Server Msgs	It represents the number of DHCP server messages received on Untrusted ports.

Example

```
(console)#show ipv6 dhcp snooping statistics

 Interface     MAC Verify   Client Ifc   DHCP Server
                Failures     Mismatch    Msgs Rec'd
-----------   ----------   ----------   -----------
Gi1/0/2                0            0             0
Gi1/0/3                0            0             0
Gi1/0/4                0            0             0
Gi1/0/5                0            0             0
```

```
Gi1/0/6                 0             0             0
```

show ipv6 source binding

Use the **show ipv6 source binding** command to display the IPv6 Source Guard configurations on all ports, on an individual port, or on a VLAN.

Syntax

show ipv6 source binding [{**dhcp-snooping | static**}] [**interface** *interface-id*] [**vlan** vlan-id]

- dhcp-snooping — Displays the DHCP snooping bindings.
- static —Displays the statically configured bindings.

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

This command has no user guidelines.

Example

```
(console)#show ipv6 source binding

   MAC Address        IP Address       Type          Vlan     Interface
-----------------  ---------------  -------------  -----  ---------
00:00:00:00:00:08    2000::1     dhcpv6-snooping   2        Gi1/0/1
00:00:00:00:00:09    3000::1     dhcpv6-snooping   3        Gi1/0/1
00:00:00:00:00:0A    4000::1     dhcpv6-snooping   4        Gi1/0/1
```

show ipv6 verify

Use the **show ipv6 verify** command to display the IPv6 Source Guard configuration on all interfaces or the specified interface.

Syntax

show ipv6 verify [**interface** *if-id*]

- *if-id*—A valid interface ID (Ethernet)

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

The filter type is one of the following values:

- ipv6-mac: User has configure MAC address filtering on this interface
- ipv6: IPv6 address filtering is configured on this interface
- N/A: No filtering is configured on the interface

Example

```
console(config-if-Gi1/0/5)#show ipv6 verify

Interface    Filter Type
-----------  -----------
Gi1/0/1      ipv6
Gi1/0/2      ipv6-mac
Gi1/0/3      N/A
Gi1/0/4      N/A
Gi1/0/5      ipv6-mac
Gi1/0/6      N/A
Gi1/0/7      N/A
Gi1/0/8      N/A
Gi1/0/9      N/A

console(config-if-Gi1/0/5)#show ipv6 verify interface gi1/0/5

Interface    Filter Type
-----------  -----------
Gi1/0/5      ipv6-mac
```

show ipv6 verify source

Use the **show ipv6 verify source** command to display the IPv6 Source Guard configurations on all ports.

Syntax

show ipv6 verify source

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

If MAC address filtering is not configured on the interface, the MAC Address field is empty. If port security is disabled on the interface, the MAC Address field displays permit-all.

The filter type is one of the following:

- ipv6-mac: User has configured MAC address filtering on this interface.
- ipv6: Only IPv6 address filtering is configured on this interface.

Example

```
show ipv6 verify source

Interface  Filter Type    IPv6 Address      MAC Address          Vlan
---------  -----------  ---------------  -----------------       -----
Gi1/0/1     ipv6-mac       2000::1/64      00:02:B3:06:60:80     10
Gi1/0/1     ipv6-mac       3000::1/64      00:0F:FE:00:13:04     10
```

Dynamic ARP Inspection Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dynamic ARP Inspection (DAI) is a security feature that rejects invalid or malicious ARP packets. The feature prevents a class of man-in-the-middle attacks, where an unfriendly station intercepts traffic for other stations by poisoning the ARP caches of its neighbors. The attacker sends ARP requests or responses mapping another station IP address to its own MAC address.

DAI drops ARP packets whose sender MAC address and sender IP address do not match an entry in the DHCP Snooping bindings database.

arp ip access-list

Use the **arp access-list** command to create an ARP ACL. It will place the user in ARP ACL Configuration mode. Use the “no” form of this command to delete an ARP ACL.

Syntax

arp ip access-list *acl-name*

no arp ip access-list *acl-name*

- *acl-name* — A valid ARP ACL name (Range: 1–31 characters).

Default Configuration

There are no ARP ACLs created by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#arp access-list tier1
```

clear ip arp inspection statistics

Use the **clear ip arp inspection statistics** command to reset the statistics for Dynamic Address Resolution Protocol (ARP) inspection on all VLANs.

Syntax

clear ip arp inspection statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear ip arp inspection statistics
```

ip arp inspection filter

Use the **ip arp inspection filter** command to configure an ARP ACL to be used for a single VLAN or a range of VLANs to filter invalid ARP packets. Use the “no” form of this command to remove the ARP ACL.

Syntax

ip arp inspection filter *acl-name* **vlan** *vlan-list* [**static**]

no ip arp inspection filter *acl-name* **vlan** *vlan-list* [**static**]

- *acl-name* —The name of a valid ARP ACL. (Range: 1–31 characters)
- *vlan-list* —A list of VLAN identifiers. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

No ARP ACL is configured.

Command Mode

Global Configuration mode

User Guidelines

If the static keyword is given, packets that do not match a permit statement are dropped without consulting the DHCP snooping bindings.

Example

```
console(config)#ip arp inspection filter tier1 vlan 2-10 static
console(config)#ip arp inspection filter tier1 vlan 20-30
```

ip arp inspection limit

Use the **ip arp inspection limit** command to configure the rate limit and burst interval values for an interface.

Configuring **none** for the limit means the interface is not rate limited for Dynamic ARP Inspection.

Syntax

ip arp inspection limit {**none** | **rate** *pps* [**burst interval** *seconds*]}

no ip arp inspection limit

- **none** — To set no rate limit.
- *pps* — The number of packets per second (Range: 0–300).
- *seconds* — The number of seconds (Range: 1–15).

Default Configuration

The default rate limit is 15 packets per second.

The default burst interval is 1 second.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

If ARP packets are received on a port at a rate that exceeds the threshold for a specified time, that port will be diagnostically disabled. The threshold is configurable up to 300 pps, and the burst is configurable up to 15s long. The default is 15 pps and 1s burst.

Use the **no shut** command to bring the port back in to service.

Example

```
console(config-if-Gi1/0/1)#ip arp inspection limit none
console(config-if-Gi1/0/1)#ip arp inspection limit rate 100 burst interval 2
```

ip arp inspection trust

The **ip arp inspection trust** command configures an interface as trusted for Dynamic ARP Inspection. Use the no form of this command to configure an interface as untrusted.

Syntax

ip arp inspection trust

no ip arp inspection trust

Default Configuration

Interfaces are configured as untrusted by default.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

ARP responses received on a trusted interface are not checked against the DHCP snooping bindings. They are entered into the ARP cache without filtering.

Example

```
console(config-if-Gi1/0/3)#ip arp inspection trust
```

ip arp inspection validate

Use the **ip arp inspection validate** command to enable additional validation checks on received ARP packets.

Syntax

ip arp inspection validate {[**src-mac**] [**dst-mac**] [**ip**]}

no ip arp inspection validate {[**src-mac**] [**dst-mac**] [**ip**]}

- **src-mac**—For validating the source MAC address of an ARP packet.
- **dst-mac**—For validating the destination MAC address of an ARP packet.
- **ip**—For validating the IP address of an ARP packet.

Default Configuration

There is no additional validation enabled by default.

Command Mode

Global Configuration mode

User Guidelines

By default Dynamic ARP Inspection validates the source MAC address and source IP address in received ARP responses against the DHCP Snooping bindings. ARP responses that fail the check are discarded without updating the ARP cache. This command enables additional validation checks on ARP response packets before updating the ARP cache. Any combination of checks is allowed.

Each command invocation overrides the current configuration. For example, if the existing configuration enables source MAC address and destination MAC address validation and a command is issued to enable IP address validation only, the source MAC address and destination MAC address validations are disabled and IP address validation is enabled. Use the **no** form of this command to disable all additional validation checks.

Example

```
console(config)#ip arp inspection validate src-mac dst-mac ip
console(config)#ip arp inspection validate src-mac ip
console(config)#ip arp inspection validate dst-mac ip
console(config)#ip arp inspection validate ip
```

ip arp inspection vlan

Use the **ip arp inspection vlan** command to enable Dynamic ARP Inspection on a single VLAN or a range of VLANs. Use the **no** form of this command to disable Dynamic ARP Inspection on a single VLAN or a range of VLANs.

Syntax

ip arp inspection vlan *vlan-list* [**logging**]

no ip arp inspection vlan *vlan-list* [**logging**]

- *vlan-list* —A list of VLAN identifiers. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)
- **logging** — Use this parameter to enable logging of invalid packets.

Default Configuration

Dynamic ARP Inspection is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

Dynamic ARP Inspection validates the source MAC address and source IP address in received ARP responses against the DHCP Snooping bindings. ARP responses that fail the check are discarded without updating the ARP cache.

Example

```
console(config)#ip arp inspection vlan 200-300
console(config)#ip arp inspection vlan 200-300 logging
```

permit ip host mac host

Use the **permit ip host mac host** command to configure an IP address and MAC address combination used in ARP packet validation. Use the “no” form of this command to delete the ARP ACL rule.

Syntax

permit ip host *sender-ip* **mac host** *sender-mac*

no permit ip host *sender-ip* **mac host** *sender-mac*

- *sender-ip* — Valid IP address used by a host.
- *sender-mac* —Valid MAC address in combination with the above sender-ip used by a host.

Default Configuration

There are no ARP ACL rules created by default.

Command Mode

ARP Access-list Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(Config-arp-access-list)#permit ip host 1.1.1.1 mac host
00:01:02:03:04:05
```

show arp access-list

Use the **show arp access-list** command to display the configured ARP ACLs with the rules. Giving an ARP ACL name as the argument would display only the rules in that ARP ACL.

Syntax

show arp access-list [*acl-name*]

- *acl-name* — A valid ARP ACL name (Range: 1–31 characters).

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show arp access-list
ARP access list H2
    permit ip host 1.1.1.1 mac host 00:01:02:03:04:05
    permit ip host 1.1.1.2 mac host 00:03:04:05:06:07
ARP access list H3
ARP access list H4
    permit ip host 2.1.1.2 mac host 00:03:04:05:06:08
```

show ip arp inspection

Use the **show ip arp inspection** command to display the Dynamic ARP Inspection and status.

Syntax

show ip arp inspection [**interfaces** [*interface-id*] **|** **statistics** [**vlan** *vlan-list*] **|** **vlan** *vlan-list*]

- **interfaces** [*interface-id*]—Display the Dynamic ARP Inspection configuration on all the DAI enabled interfaces. Giving an interface argument, it displays the values for that interface only.
- **statistics** [vlan *vlan-list*]—Display the statistics of the ARP packets processed by Dynamic ARP Inspection. Given vlan-list argument, it displays the statistics on all DAI-enabled VLANs in that range. In the case of no argument, it lists the summary of the forwarded and dropped ARP packets.
- **vlan** *vlan-list*—Display the Dynamic ARP Inspection configuration on all the VLANs in the given VLAN list. It also displays the global configuration values for source MAC validation, destination MAC

validation and invalid IP validation. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed for each VLAN when a VLAN range is supplied:

Field	Description
VLAN	The VLAN-ID for each displayed row.
DHCP Drops	The number of packets dropped due to DHCP Snooping binding database match failure.
ACL Drops	The number of packets dropped due to ARP ACL rule match failure.
DHCP Permits	The number of packets permitted due to DHCP snooping binding database match.
ACL Permits	The number of packets permitted due to ARP ACL rule match.
Bad Src MAC	The number of packets dropped due to Source MAC validation failure.
Bad Dest MAC	The number of packets dropped due to Destination MAC validation failure.
Invalid IP	The number of packets dropped due to invalid IP checks.

Example

Following is an example of the **show ip arp inspection** command.

```
console#show ip arp inspection

Source MAC Validation................. Disabled
Destination MAC Validation............ Disabled
```

```
IP Address Validation................ Disabled

VLAN  Configuration Log Invalid          ACL Name                 Static flag
----  ------------- ----------- --------------------------------  ----------
1       Disabled      Enabled
```

Following is an example of the **show ip arp inspection interfaces** command.

```
console#show ip arp inspection interfaces

 Interface        Trust State   Rate Limit   Burst Interval
                                   (pps)        (seconds)
 ---------------  -----------   ----------  ---------------
 Gi1/0/1             Untrusted          15                1
 Gi1/0/2             Untrusted          10               10
```

Following is an example of the **show ip arp inspection statistics** command.

```
console#show ip arp inspection statistics

VLAN  Forwarded  Dropped
----  ---------  -------
  10         90       14
  20         10        3

console#show ip arp inspection statistics vlan 10,20

VLAN    DHCP      ACL        DHCP       ACL       Bad Src   Bad Dest   Invalid
        Drops     Drops      Permits    Permits       MAC        MAC        IP
---- ---------- ---------- ---------- ---------- ---------- ---------- ------
10           11          1         65         25          1          1      0
20            1          0          8          2          0          1      1
```

The following global parameters are displayed when no parameters are given:

Parameter	Description
Source Mac Validation	If Source Mac validation of ARP frame is enabled.
Destination Mac Validation	If Destination Mac validation of ARP Response frame is enabled.
IP Address Validation	If IP address validation of ARP frame is enabled.

The following fields are displayed for each VLAN:

Field	Description
VLAN	The VLAN-ID for each displayed row.
Configuration	Whether DAI is enabled on the VLAN.
Log Invalid	Whether logging of invalid ARP packets is enabled on the VLAN.
ACL Name	ARP ACL Name if configured on the VLAN.
Static flag	If the ARP ACL is configured static on the VLAN.

Example

```
console#show ip arp inspection vlan 10-12

Source Mac Validation      : Disabled
Destination Mac Validation : Disabled
IP Address Validation      : Disabled

 Vlan          Configuration    Log Invalid   ACL Name   Static flag
 ----          -------------    -----------   ---------  ----------
   10          Enabled          Enabled       H2         Enabled
   11          Disabled         Enabled
   12          Enabled          Disabled
```

Ethernet Configuration Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking switches support a variety of configuration options to optimize network operations. Features such as flow-control and jumbo frames are supported along with a variety of commands to display traffic statistics as well as limit the effects of network loops or other network issues.

Jumbo frame technology is employed in certain situations to reduce the task load on a server CPU and to transmit large amounts of data efficiently. Jumbo frames technology predominantly appears where certain applications would benefit from using a larger frame size, e.g. Network File System (NFS). The larger frame size eliminates some of the need for fragmentation, leading to greater throughput. The increase in throughput is particularly valuable on data center servers where the larger frame size increases efficiency of the system and allows processing of more requests. The Dell EMC Networking jumbo frames feature extends the standard Ethernet MTU (Max Frame Size) from 1518 (1522 with VLAN header) bytes to 9216 bytes. However, any device connecting to the same broadcast domain should support the same or larger MTU.

Flow control is a mechanism or protocol used to temporarily suspend transmission of data to a device to avoid overloading the device receive path. Dell EMC Networking switching implements the flow control mechanism defined in IEEE 802.3 Annexes 31A and 31B (formerly IEEE 802.3x). Dell EMC Networking switches implement receive flow control only. They never issue a flow control PAUSE frame when congested, but do respect flow control PAUSE frames received from other switches. Disabling flow control causes the switch to ignore received PAUSE frames. Flow control is enabled by default for all ports.

Storm control allows for rate limiting of specific types of packets through the forwarding plane. The administrator can configure the absolute rate in packets-per-second for the Storm control threshold. Each classified packet type (broadcast, multicast, or unicast) can be enabled/disabled per port, and the threshold level at which Storm-Control is active is also configurable per-port and per-type (as a percentage of interface speed).

On a storm control enabled interface, if the ingress rate of that type of packet (L2 broadcast, multicast, or unicast) is greater than the configured threshold level (as a percentage of port speed or as an absolute packets-per-second rate), the switch forwarding-plane discards the excess traffic.

The speed command controls interface link speeds and auto-negotiation. If speed is set to something other than auto, auto-negotiation is disabled on the interface. Auto-negotiation will link at the highest possible speed supported on the interface at full duplex.

clear counters

Use the **clear counters** command to clear statistics on an interface.

Syntax

clear counters [**vrf** *vrf-name* | **stack-ports** | **switchport** | *interface-id*]

- *vrf-name*—The name of the VRF instance on which the command operates.
- **stack-ports**—Clears stack-port statistics.
- **switchport**—Clear all the interface counters
- *interface-id*—An Ethernet or port-channel identifier. If specified, counters are cleared for the individual interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Use of the clear counters command with no parameters indicates that both switch and all interface statistics are to be cleared. This command clears the individual component counters. If a port-channel is specified, the command clears the port channel counters, including the flap counters.

The VRF identified in the parameter must have been previously created or an error is returned.

Example

In the following example, the counters for port Gi1/0/1 are cleared.

```
console#clear counters gigabitethernet 1/0/1
```

description

Use the **description** command in Interface Configuration mode to add a description to an interface. To remove the description use the **no** form of this command.

Syntax

description *string*

no description

- *string* — Comment or a description of the port attached to this interface. (Range: 1 to 64 characters)

Default Configuration

By default, the interface does not have a description.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example adds a description to the Ethernet port 5.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if-Gi1/0/5)# description RD_SW#3
```

default (interface)

Use the default interface command to configure the interface to the defaults.

Syntax

default [*interface-id*]

- interface-id—An Ethernet or port channel, loopback, tunnel or VLAN interface identifier.

Default Configuration

This command has no defaults.

Command Mode

Global Configuration mode

User Guidelines

This command returns an Ethernet, port channel, VLAN, tunnel or loopback interface to the interface defaults as follows:

- Trunk and general mode configuration is removed.
- The interface is set to access mode using VLAN 1.
- The port is removed from all access-groups.
- The port is removed from port-channels.
- Speed/duplex are set to defaults.
- Spanning tree is enabled.
- Loop protection, BFD, and UDLD are disabled.
- Port MAC locking is disabled.
- Static MAC address entries referencing the interface are removed.
- Private VLAN configuration is removed.

Use of this command may cause the interface to drop the link. This is particularly true when the port defaults to a 10G fiber port and the installed transceiver requires auto-negotiation to be enabled.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)#default gi1/0/1
```

duplex

Use the **duplex** command in Interface Configuration mode to configure the duplex operation of a given Ethernet interface. To restore the default, use the **no** form of this command.

Syntax

duplex {full | half | auto {full | half | both}}

no duplex

- **auto**—Enable auto-negotiation for the port and advertise the configured capabilities.
- **half**—Enable half-duplex operation.
- **full**—Enable full-duplex operation.
- **both**—Enable auto-negotiation of full and half duplex operation.

Default Configuration

Auto-negotiation is enabled by default on copper ports and for 1000BASE-X ports.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The duplex command is only available on the Dell EMC Networking N1500, and N2200 Series switches. Other switch models support full duplex operation only.

Configuration of auto-negotiation or fixed operation is performed by the speed command. Therefore, the speed command should be issued prior to setting the duplex configuration or the command may be rejected. Half-duplex is only supported for 10/100 speeds.

Copper ports configured for 1000BASE-T/2500BASE-T speed operate in full duplex mode only. Fiber ports operate in full duplex mode only, even if provisioned with an SFP or SFP+DAC cable. Auto-negotiation is required on 1G/2.5G/5G/10G/40G copper ports and 1G fiber ports.

To enable auto-negotiation on a port, and configure the speed or duplex, it is necessary to enter the speed or duplex command using the auto parameter. The port will negotiate the medium, speed, and duplex settings with the link partner.

To disable auto-negotiation on a port, it is necessary to enter the speed command without using the auto parameter. 10G/40G fiber ports do not support auto-negotiation and therefore require the operator to enter the speed command followed by the duplex full command and with the desired operating bandwidth if not already configured.

Example

The following example configures TenGigabit Ethernet port Te 1/0/5 to auto-negotiate full and half duplex capability and speed.

```
console(config)# interface te1/0/5
console(config-if-Te1/0/5)# speed auto 1000 100
console(config-if-Te1/0/5)# duplex auto both
```

flowcontrol

Use the **flowcontrol** command in Global Configuration mode to configure the flow control. To disable flow control, use the **no** form of this command.

Syntax

flowcontrol receive {on | off}

no flowcontrol receive

Default Configuration

Flow Control is enabled by default.

Command Mode

Global Configuration and Interface Configuration modes

User Guidelines

Dell EMC Networking switches implement receive flow control only. They never issue a flow control PAUSE frame when congested, but do respect received flow control PAUSE frames received from other switches. Disabling flow control causes the switch to ignore received PAUSE frames.

Interface specific configuration overrides any global configuration.

Changing the flow control setting on a copper port restarts auto-negotiation and causes a brief link-flap while auto-negotiation occurs. Changing the flow control setting on a fiber port may cause a brief link flap as the PHY is reset.

Enabling flow control on some ports and not others can lead to excessive packet loss in situations where some ports on the switch have been paused and the internal packet buffers are consumed. This situation may cause traffic loss on other ports that are not congested or flow controlled.

Example

```
console(config)#flowcontrol receive off
console(config)#flowcontrol receive on
```

forward-error-correction

Use this command to configure the forward error correction for 25G/50G/100G Ethernet interfaces.

Syntax

forward-error-correction { disable-fec | enable-fec-cl74 | enable-fec-cl91 | enable-fec-cl108 | inherit }

- *interface-id*—A configurable Ethernet interface identifier.

Default Configuration

The default setting is inherit.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command is only available on the N2200 and N3200 Series switches.

Inherit enables BASE FEC or RS-FEC for 25G/50G/100G DACs, based on the technology ability and FEC capability. Enabling FEC with auto-negotiation advertises the FEC capability in the (F2, F3, F0, F1) bits D44:D47 of the base link codeword and, additionally for 25G/50G interfaces, in the F1/F2/F3/F4 bits in the Unformatted Next Page (UP-1). For 100GBASE-CR4 and 100GBASE-SR4 interfaces, inherit advertises Clause 91 RS-FEC. Inherit disables FEC for 100GBASE-LR4 and 100GBASE-ER4 media as well as for 10G and 40G transceivers and does not advertise FEC capability. If AN is enabled, FEC is negotiated with the link partner, otherwise, FEC is set per the attached media (inherit mode) or per the configured setting.

Enable-fec-cl108 enables clause 108 RS-FEC on 50G or 25G links. Enable-fec-91 enables clause 91 RS-FEC on 100G interfaces. Enable-fec-74 enables clause 74 BASE FEC on 25G or 50G links. If AN is enabled, FEC is negotiated with the link partner. If FEC cannot be negotiated, or is manually configured differently on each end, the link may not come up. Auto-negotiation is not supported on 4x10Gbps and 4x25Gbps breakout copper ports.

Disable-fec disables FEC on an interface. AN does not advertise FEC capability in this setting.

If AN is enabled for any setting other than disable-fec, the results of the AN capabilities negotiation determine if FEC is enabled on the link and the flavor of FEC that is enabled.

Both ends of the link must have the same FEC settings. Use the **show interfaces <interface-id>** command to show the FEC configuration and operational state.

FEC can operate on the links in a LAG. The FEC configuration, however, is performed on the individual LAG links. It is strongly recommended that all links have the same FEC setting as FEC adds forwarding delay.

Command History

Syntax updated in firmware release 6.6.3.

interface

Use this command to configure parameters for Ethernet and port-channel interfaces. While in Global Configuration mode, enter the **interface** command with a specific interface. To exit to Global Configuration mode, enter **exit**. To return to Privileged Exec mode, press Ctrl-Z or enter **end**.

Additional forms of the interface command enable configuring VLANs, tunnels, the loopback interface, the out-of-band interface, and ranges of interfaces. See interface vlan, interface tunnel, interface loopback, and interface range.

Syntax

interface {**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **twentyfivegigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration, Interface Configuration

User Guidelines

Dell EMC Networking switches implement receive flow control only. They never issue a flow control PAUSE frame when congested, but will respect received flow control PAUSE frames received from other switches. Disabling flow control causes the switch to ignore received PAUSE frames.

Interface specific configuration overrides any global configuration.

Changing the flow control setting on a copper port will restart auto-negotiation and cause a brief link-flap while auto-negotiation occurs. Changing the flow control setting on a fiber port may cause a brief link flap as the PHY is reset.

Enabling flow control on some ports and not others can lead to excessive packet loss in situations where some ports on the switch have been paused and the internal packet buffers are consumed. This situation may cause traffic loss on other ports that are not congested or flow controlled. See http://www.ieee802.org/3/cm_study/public/september04/thaler_3_0904.pdf for more information.

Example

The following example enables Gigabit port 2 on stack member 1 for configuration.

```
console(config)# interface gigabitethernet 1/0/2
```

interface range

Use the **interface range** command in Global Configuration mode to execute a command on multiple ports at the same time.

NOTE: An additional form of this command enables configuring a range of VLANs. See interface range vlan.

Syntax

interface range {*interface-range*-specifier | *interface-type* **all**}

- *port-range*—A list of valid ports to configure. Separate non-consecutive ports with a comma and no spaces; use a hyphen to designate a range of ports. For more detailed information, see Command line parameters are entered by the user to choose an individual value or range of values for the specific command. Command line parameters are not syntax or range checked until the carriage return is entered. In some cases, the user may need to enter special characters, most often in a string parameter such as a password or a label. Special characters are one of the following characters (` ! $ % ^ & * ( ) _ - + = { [}] : ; @ ' " ~ # | \ < , > . /) or a blank. In these cases, it may be necessary to enclose the entire string in double or single quotes for the command line parser to properly interpret the parameter.. The command line buffer parses up to the maximum number of command line characters possible in the port-range parameter.
- *port-type*—Shows all interfaces of the specified type.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration, Interface Range and Interface modes

User Guidelines

Commands under the interface range context are executed independently on each active interface in the range. If the command returns an error on one of the active interfaces, it does not stop executing commands on other active interfaces.

If a range of interfaces is specified using the dash notation, the beginning range number (to the left of the hyphen) must be less than or equal to the last number (to the right of the hyphen).

Example

The following example shows how gigabitethernet ports 5/0/18 to 5/0/20 and 3/0/1 to 3/0/24 are ranged to receive the same command.

```
console(config)# interface range gigabitethernet 5/0/18-20,Gi3/0/1-24
console(config-if-range)#
```

The following example shows how all gigabitethernet ports can be configured at once.

```
console(config)# interface range gigabitethernet all
console(config-if-range)#
```

The following examples demonstrate various valid interface ranges:

```
console(config)#interface range gigabitEthernet 1/0/1-20
console(config)#interface range gi1/0/20-48
console(config)#interface range gi1/0/1,gi1/0/48
console(config)#interface range gi2/0/1-10,gi1/0/30
console(config)#interface range gi1/0/1-10,gi1/0/30-48
console(config)#interface range gi1/0/1,te1/1/1
console(config)#interface range gigabitEthernet 1/0/10,te1/1/2
```

link debounce time

Use the **link debounce time** command to configure the debounce timer for one or multiple interfaces. Use the **no** form of the command to set the link debounce time to the default (disabled).

Syntax

link debounce time [*timeout*]

no link debounce time

- *timeout*—An integer value in the range of 100–5000 milliseconds. The timeout value must be a multiple of 100.

Default Configuration

Ethernet interfaces do not have debounce enabled by default.

Command Mode

Interface (Ethernet) Configuration mode, Interface Range mode.

User Guidelines

The link bounce time configures a link bounce hysteresis on link loss of link. Loss of link signal starts a link bounce timer. If the link is restored prior to expiry of the timer, operation continues and the system is not notified that that link connectivity has been lost. Hysteresis can be used to mitigate link flaps caused by bad cabling or partially inserted optics or cables.

The debounce timer resolution is approximately 10 ms. Setting a value will start the timer when loss of link is detected.

Ports operating at lower speeds may benefit from debounce values larger than the default. Ports operating over fiber generally do not require larger debounce times.

Use the **show interfaces debounce** command to display the link debounce time or to display the link flap count (the number of notifications sent to the system that link signal was lost). The link flap count is also displayed by the **show interfaces** command (Link Debounce Flaps).

The link debounce counter is cleared by the **clear counters** command and the **clear counters** *interface-id* command.

In general, a debounce time above 300 ms is recommended for copper interfaces with link flaps.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example disables the link debounce timer for interface gi1/0/1.

```
switch# conf t
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#no link debounce time
```

The following example sets the link debounce timer for interface gi1/0/1 to 500 ms.

```
switch# conf t
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#link debounce time 500
```

rate-limit cpu

Use the **rate-limit cpu** command to reduce the amount of unknown unicast/multicast packets forwarded to the CPU. Use the **no** form of the command to set the rate limit to the default value.

Syntax

rate-limit cpu direction input pps *pps_value*

no rate-limit cpu direction input pps

- *pps_value*—The packets per second. The range is 5-1024 packets per second.

Default Configuration

The default ingress rate limit is 512 packets per second.

Command Modes

Global Configuration mode

User Guidelines

Unknown unicast and multicast packets are copied to the CPU on the lowest priority QoS queue. Unknown packets are those that do not have hardware forwarding entries. Known unicast/multicast packets are hardware forwarded and are not queued to the CPU. Control plane packets (e.g. spanning tree BPDUs) are copied or forwarded to the CPU on higher priority queues.

The rate limiting for unknown packets occurs on the internal CPU port and does not affect hardware based traffic routing/forwarding in any way. Typically, the switch examines the received packets in software to check if there is a forwarding entry, create a forwarding entry (e.g., add a L2 MAC address or ARP response), and then either discard the packet or software forward the packet (only occurs during the brief transitional period when the system is actively adding a hardware forwarding entry but the hardware is not yet updated). Processing delays for higher priority packets may occur when the internal CPU queue is continually kept busy handling low priority packets.

This command does not affect the rate limits for control plane packets. It is almost never necessary to use this command to change from the default value. The use of this command should be restricted to situations in which moderate to high rates of unknown unicast/multicast are continually sent to the switch CPU as evidenced by the **show process cpu** command and where the ipMapForwardingTask or bcmL2X task is showing high CPU usage. This occurs most frequently in networks where a high number of ARPs are continually received on untrusted ports, high numbers of L2 stations are timing out and reappearing or multicast flooding is occurring in the network. If problems with L2, L3 or multicast learning occur after changing this value, set the rate limit back to the default value and take other steps to correct or mitigate the underlying network issue directly.

Use the **show system internal pktmgr** command to show the configured value.

Example

The following example shows output with higher than normal CPU usage due to packets copied to the software forwarding task.

```
console#show process cpu

Memory Utilization Report

status bytes
------ ----------
free   1053933568
alloc   673873920

CPU Utilization:

PID        Name                  5 Secs  60 Secs 300 Secs
```

```
---------- ------------------- -------- -------- --------
1129       osapiTimer            0.00%    0.00%    0.01%
1133       _interrupt_thread     0.09%    0.01%    0.00%
1137       bcmCNTR.0             0.24%    0.31%    0.31%
1142       bcmRX                23.00%   27.01%   18.01%
1147       ipMapForwardingTas   32.97%   37.11%   29.92%
1155       bcmLINK.0             0.34%    0.36%    0.36%
1156       cpuUtilMonitorTask    0.09%    0.05%    0.04%
1170       nim_t                 0.09%    0.08%    0.07%
1208       dot1s_timer_task      0.00%    0.00%    0.01%
1222       snoopTask             0.00%    0.00%    0.01%
1291       RMONTask              0.00%    0.02%    0.03%
1293       boxs Req              0.00%    0.01%    0.01%
------------------------------ -------- -------- --------
Total CPU Utilization           27.31%    28.97%    31.01%
```

show interfaces

Use the **show interfaces** command to list the traffic statistics for one or multiple interfaces. If no parameter is given, all interfaces are shown.

Syntax

show interfaces [*interface-id*]

- *interface-id*—An Ethernet interface id (for example, a 1G interface) in standard interface format.

Default Configuration

There is no default configuration.

Command Mode

All modes, including Config mode and all config submodes.

User Guidelines

The **show interface** command shows the actual operational status of the interface, which is not necessarily the same as the configuration.

Input/output rate statistics are collected every 10 seconds.

The link status field shows the hardware status followed by the keepalive status. The hardware status show “Up” when link is detected, “Down” when no link is detected, “Err-disable” when the port is error-disabled, and “Shut” when the port is administratively shut down.

The keepalive status shows “None” when keepalives are disabled or the port is down, “Up” when keepalives are enabled and no loop is detected and “Down” when keepalives are enabled and a loop is detected. Some example values are:

```
Link Status:................................ Up/Up
```

Link detected, keepalives enabled, no loop detected

```
Link Status:................................ Shut/None
```

Port is administratively disabled

```
Link Status:................................ Down/None
```

No link detected

```
Link Status:................................ Err-disable/Down
```

Interface is error disabled due to loop detection

```
Link Status:................................ Err-disable/None
```

The interface is error disabled due to a cause other than loop detection.

The possible causes for error disabled interfaces are:

Term	Parameter	Description
ARP inspection	arp-inspection	ARP inspection auto-recovery.
BPDU Guard	bpduguard	BPDU guard auto-recovery.
Broadcast Storm	bcast-storm	Broadcast storm auto-recovery.
BPDU Storm	bpdustorm	BPDU storm auto-recovery.
Denial of Service	denial-of-service	Denial of Service auto-recovery.
DHCP Rate Limit	dhcp-rate-limit	DHCP rate limit auto-recovery.
Loop Protection	loop-protect	Loop protection auto-recovery.
Port MAC Locking	port-security	Port security MAC locking auto-recovery.

Term	Parameter	Description
Multicast Storm	mcast-storm	Multicast storm auto-recovery.
SFP Mismatch	sfp-mismatch	SFP mismatch auto-recovery.
SFP Plus Mismatch	sfpplus-mismatch	SFP+ transceiver inserted in SFP port auto-recovery.
Spanning Tree	spanning-tree	Spanning-tree auto-recovery.
UDLD	udld	UDLD auto-recovery.
Unicast Storm	ucast-storm	Unicast storm auto-recovery.

Command History

Introduced in version 6.2.0.1 firmware. Updated in version 6.3.0.1 firmware. Updated in version 6.5 firmware.

Example

The following example shows the output for a 1G interface:

```
console#show interfaces gi1/0/1

Interface Name: ............................. Gi1/0/1
SOC Hardware Info:........................... BCM56342_A0
Link Status: ................................ Up/Up
Keepalive Enabled............................ TRUE
Err-disable Cause: .......................... None
VLAN Membership Mode:........................ Trunk Mode
VLAN Membership:.............................(1),2-3,101-113,813,3232
MTU Size:.................................... 1518
Port Mode [Duplex]:.......................... Full
Port Speed:.................................. 1000
Link Flaps: ................................. 0
Link Debounce Flaps: ........................ 0
Auto-Negotation Status: ..................... Auto
Burned MAC Address: ......................... 001E.C9DE.B110
L3 MAC Address............................... 001E.C9DE.B112
Sample load interval: ....................... 300
Receive Rate Bits/Sec: ...................... 784
Receive Rate Packets/Sec: ................... 1
Receive Percent Utilization: ................ 0
Transmit Rate Bits/Sec: ..................... 1344
Transmit Rate Packets/Sec: .................. 1
```

```
Transmit Percent Utilization: ............... 9
Total Packets Received Without Errors......... 102792
Unicast Packets Received..................... 0
Multicast Packets Received................... 102792
Broadcast Packets Received................... 0
Total Packets Received with MAC Errors........ 0
Jabbers Received............................. 0
Fragments/Undersize Received................. 0
Alignment Errors............................. 0
FCS Errors................................... 0
Overruns..................................... 0
Total Received Packets Not Forwarded.......... 7
Total Packets Transmitted Successfully........ 147070
Unicast Packets Transmitted.................. 0
Multicast Packets Transmitted................ 147070
Broadcast Packets Transmitted................ 0
Transmit Packets Discarded................... 0
Total Transmit Errors........................ 0
Total Transmit Packets Discarded............. 0
Single Collision Frames...................... 0
Multiple Collision Frames.................... 0
Excessive Collision Frames................... 0

Time since counters last cleared:

console#show interfaces po1
Intf Ports                   Ch-Type  Hash Min-link Local Prf TX Util RX Util
---- ----------------------- -------- ---- -------- --------- ------- -------
Po1  Active: Te1/0/1, Te1/0/2 Dynamic  7    1        Disabled   432344   83782
Utilization is shown in Mbps.
Hash Algorithm Type
1 - Source MAC, VLAN, EtherType, source module and port Id
2 - Destination MAC, VLAN, EtherType, source module and port Id
3 - Source IP and source TCP/UDP port
4 - Destination IP and destination TCP/UDP port
5 - Source/Destination MAC, VLAN, EtherType, source MODID/port
6 - Source/Destination IP and source/destination TCP/UDP port
7 - Enhanced hashing mode
```

show interfaces advertise

Use the **show interfaces advertise** command to display information about auto-negotiation advertisement. The display includes the local configuration and link partner advertisement, in addition to the local advertisement.

Syntax

show interfaces advertise [{**gigabitethernet** unit/slot/port **|** **tengigabitethernet** unit/slot/port **|** **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The **priority** resolution field indicates the auto-negotiated link speed and duplex. The **clock** field indicates whether the local interface has auto-negotiated to clock primary or clock secondary. When the link is down, the field will show **No link**.

When the link is down, the **Oper Peer Advertisement** and **Priority Resolution** fields will show dashes.

Examples

The following examples display information about auto negotiation advertisement.

Example #1

```
console#show interfaces advertise

Port     Type                         Neg      Operational Link Advertisement
--------- ----------------------------- -------- --------------------------
----
Gi1/0/1   Gigabit - Level                Enabled  1000f, 100f, 10f
Gi1/0/2   Gigabit - Level                Enabled  1000f, 100f, 10f
Gi1/0/3   Gigabit - Level                Enabled  1000f, 100f, 10f
Gi1/0/4   Gigabit - Level                Enabled  1000f, 100f, 10f
Gi1/0/5   Gigabit - Level                Enabled  1000f, 100f, 10f
Gi1/0/6   Gigabit - Level                Enabled  1000f, 100f, 10f
```

Example #2

```
console#show interfaces advertise gi1/0/1
```

```
Port: Gi1/0/1
Type: Gigabit - Level
Link State: Down
Auto Negotiation: Enabled
802.3az EEE: Disabled
Clock: Primary

                                  10000f  1000f  1000h  100f   100h   10f    10h
                                 ------  -----  -----  -----  -----  -----  ----
Admin Local link Advertisement     no      yes    no     yes    no     yes    no
Oper Local link Advertisement      no      yes    no     yes    no     yes    no
Oper Peer Advertisement            no      yes    no     yes    no     yes    no
Priority Resolution                 -       -      -    yes     -      -      -
```

Example #3

```
console#show interfaces advertise Tw1/0/38

Port: Tw1/0/38
Type: TwentyFiveGigabit - Level
Link State: Detach
Auto Negotiation: Enabled
802.3az EEE: Enabled
Clock: No Link


                  25000f  10000f  5000f  2500f  1000f  1000h  100f   100h
                  ------  ------  -----  -----  -----  -----  -----  -----
Admin Local link
Advertisement     yes     yes     no     no     no     no     no     no

Oper Local link
Advertisement     yes     yes     no     no     no     no     no     no

Oper Peer
Advertisement      -       -       -      -      -      -      -      -

Priority
Resolution         -       -       -      -      -      -      -      -
```

Command History

Command output modified in version 6.6.2 firmware.

show interfaces configuration

Use the **show interfaces configuration** command in User Exec mode to display the configuration for all configured interfaces.

Syntax

show interfaces configuration [{**gigabitethernet** unit/slot/port| **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port / **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The displayed port configuration information includes the following:

Field	Description
Port	The port number.
Description	The port designated IEEE shorthand identifier. For example 1000Base-T refers to 1000 Mbps baseband signaling including both Tx and Rx transmissions.
Duplex	Displays the port Duplex status.
Speed	Refers to the port speed.
Neg	Describes the Auto-negotiation status.
MTU	The Maximum Transmission Unit.
Admin State	Displays whether the port is enabled or disabled.

Example

The following example displays the configuration for all configured interfaces:

```
console#show interfaces configuration gigabitethernet 1/0/1

Port      Description                      Duplex Speed   Neg  MTU   Admin
                                                                     State
--------- ----------------------------- ------ ------- ---- ----- -----
Gi1/0/1                                   Full 1000    Auto 1518  Up
```

show interfaces counters

Use the **show interfaces counters** command in User Exec mode to display traffic seen by the interface.

Syntax

show interfaces counters [**errors**] [**gigabitethernet** unit/slot/port **| port-channel** *port-channel-number* **| tengigabitethernet** unit/slot/port **| fortygigabitethernet** unit/slot/port]

- **errors**—Show the error counts (frame discards and reasons) in the in and out direction.
- **gigabitethernet**—Shows the traffic for the specified Gigabit Ethernet port.
- **port-channel**—Shows the traffic for the specified port channel port.
- **tengigabitethernet**—Shows the traffic for the specified 10-Gigabit Ethernet port.
- **fortygigabitethernet**—Shows the traffic for the specified 40-Gigabit Ethernet port.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the fields shown in the display:

Field	Description
InOctets	Counted received octets.
InUcastPkts	Counted received unicast packets.
InMcastPkts	Counted received multicast packets.
InBcastPkts	Counted received broadcast packets.
OutOctets	Counted transmitted octets.
OutUcastPkts	Counted transmitted unicast packets.
OutMcastPkts	Counted transmitted multicast packets.
OutBcastPkts	Counted transmitted broadcast packets.
Alignment Errors	A count of frames received that are not an integral number of octets in length and do not pass the FCS check.
FCS Errors	Counted frames received that are an integral number of octets in length but do not pass the FCS check.
Single Collision Frames	Counted frames that are involved in a single collision, and are subsequently transmitted successfully.
Multiple Collision Frames	A count of frames that are involved in a multiple collision, and are subsequently transmitted successfully
Late Collisions	Counted times that a collision is detected later than one slot time into the transmission of a packet.
Excessive Collisions	Counted frames for which transmission fails due to excessive collisions.
Received packets dropped > MTU	Count of received frames dropped due to frame length greater than the configured MTU.
Transmitted oversized packets	Count of frames transmission > 1518 octets.
Internal MAC Rx Errors	A count of frames for which reception fails due to an internal MAC sublayer receive error.
Received Pause Frames	A count of MAC Control frames received with an opcode indicating the PAUSE operation.

Field	Description
Transmitted Pause Frames	Counted MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation.
Received PFC Frames	A count of the received Priority Flow Control (PFC) frames.
Transmitted PFC Frames	A count of the transmitted PFC frames.
Receive Packets Discarded	Count of frames discarded on receipt due to any reason.
Transmit Packets Discarded	Count of packets queued for transmission and discarded for any reason.

When the errors parameter is provided, the following counters are displayed:

Counters	Description
Align-Err	Alignment errors—Alignment errors are the count of packets received which did not have an integral number of octets. See RFC1271 etherStatsCRCAlignErrors for further information. These are almost certainly physical impairments (transceiver or cable) on a 10m link. Replace the cable and transceivers.
FCS-Err	Frame Check Sequence errors—FCS errors are the count of packets received which did not have a valid CRC. See RFC1271 etherStatsCRCAlignErrors for further information. This indicates a physical impairment. Possible causes include bad cables, not fully inserted cables, failed transceivers, or incompatible settings (peers do not have compatible settings).
Xmit-Err	Total transmit errors—Transmit errors are the count of packets queued for transmit but had an error during transmission, such as jabber, FCS, fragment, or late collision. These errors may be seen in 10/100m legacy operation. Jabber, fragment and late collision are 10/100m specific errors.

Counters	Description
Rcv-Err	Total packets received with MAC errors—Receive errors is the count of packets received with a MAC error. This indicate a physical layer issue between the MAC and PHY or transceiver as the PHY should discard malformed packets.
UnderSize	Fragments/undersize packets received—Fragments/undersize is the count of packets received which are less than 64 octets in length. Fragments are an artifact of 10/100m shared media operation. These should never be seen on 1G and higher speed media.
OutDiscard	Total transmit packets discarded—Transmit discards are the count of packets discarded while queued/queuing for transmit for any reason.

Example

The following example displays traffic seen by the Ethernet interface:

```
console>show interfaces counters
Port      InTotalPkts      InUcastPkts      InMcastPkts      InBcastPkts
--------- ---------------- ---------------- ---------------- ---------------
-
Gi1/0/1                  0                0                0                0
Gi1/0/2                  0                0                0                0
Gi1/0/3                  0                0                0                0
Gi1/0/4                  0                0                0                0
Gi1/0/5                  0                0                0                0
Gi1/0/6                  0                0                0                0
Gi1/0/7                  0                0                0                0
Gi1/0/8                  0                0                0                0
Gi1/0/9                  0                0                0                0
Gi1/0/10                 0                0                0                0
Gi1/0/11                 0                0                0                0
Gi1/0/12                 0                0                0                0
Gi1/0/13             11447             6867             4580                0
Gi1/0/14                 0                0                0                0
Gi1/0/15                 0                0                0                0
Gi1/0/16             51119            12196            38917                6
Gi1/0/17                 0                0                0                0
Gi1/0/18                 0                0                0                0
```

```
Gi1/0/19                0                0                0                0
Gi1/0/20                0                0                0                0

Port      OutTotalPkts     OutUcastPkts     OutMcastPkts     OutBcastPkts
--------- ---------------- ---------------- ---------------- ---------------
-
Gi1/0/1                 0                0                0                0
Gi1/0/2                 0                0                0                0
Gi1/0/3                 0                0                0                0
Gi1/0/4                 0                0                0                0
Gi1/0/5                 0                0                0                0
Gi1/0/6                 0                0                0                0
Gi1/0/7                 0                0                0                0
Gi1/0/8                 0                0                0                0
Gi1/0/9                 0                0                0                0
Gi1/0/10                0                0                0                0
Gi1/0/11                0                0                0                0
Gi1/0/12                0                0                0                0
```

The following example displays counters for Ethernet port Te1/0/1.

```
console(config-if-Te1/0/1)#show interfaces counters tengigabitethernet
1/0/13

  Port      InTotalPkts      InUcastPkts      InMcastPkts      InBcastPkts
--------- ---------------- ---------------- ---------------- ---------------
Te1/0/13          21614369         21614360                9                0

  Port      OutTotalPkts     OutUcastPkts     OutMcastPkts     OutBcastPkts
--------- ---------------- ---------------- ---------------- ---------------
Te1/0/13          40620964         40620547               19              398

FCS Errors: .................................. 0
Single Collision Frames: ..................... 0
Late Collisions: ............................. 0
Excessive Collisions: ........................ 0
Multiple Collisions: ......................... 0
Received packets dropped > MTU: .............. 0
Transmitted oversized packets: ............... 40618318
Internal MAC Rx Errors: ...................... 0
Received Pause Frames: ....................... 0
Transmitted Pause Frames: .................... 0
Receive Packets Discarded: ................... 0
Transmit Packets Discarded: .................. 0
Received PFC Frames: ......................... 0
Transmitted PFC Frames: ...................... 0
```

show interfaces debounce

Use the **show interfaces debounce** command to list the debounce information for one or multiple interfaces. If no parameter is given, all Ethernet interfaces are shown.

Syntax

show interfaces debounce [*interface-id*]

- *interface-id*—An Ethernet interface identifier (i.e., a 1G, 10G, or 40G Ethernet interface) in standard interface format.

Default Configuration

Ethernet interfaces have a 100 ms debounce time enabled.

Command Mode

Exec mode, Privileged Exec, Global Configuration and all show modes.

User Guidelines

Use the **link debounce** time command to configure the debounce time for an interface.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example shows the output for representative interfaces.

```
console#show interfaces debounce
Interface Debounce Time (ms) Flaps
--------- ------------------ -------
Gi1/0/1   500                0
```

show interfaces description

Use the **show interfaces description** command in User Exec mode to display the description for all configured interfaces.

Syntax

show interfaces description [**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port]

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the description for all interfaces.

```
console>show interfaces description
Port    Description
----    ----------------------------------------------
Gi1/0/1 Port that should be used for management only
Gi2/0/1
Gi2/0/2

Port  Description
----- ----------------------------------------------------------------------
Po1
```

show interfaces detail

Use the **show interfaces detail** command to display detailed status and configuration of the specified interface.

Syntax

show interfaces detail ***interface-id***

- **interface-id**—An Ethernet interface identifier or port channel identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays detailed status and configuration of the specified interface.

```
console#show interfaces detail gi1/0/1
Port      Description                 Duplex Speed   Neg  MTU   Admin Link
                                                                State State
--------- --------------------------- ------ ------- ---- ----- ----- -----
Gi1/0/1                               N/A    Unknown Auto 1518  Up    Down
Port      Description
--------- ------------------------------------------------------------------
----
Gi1/0/1
Flow Control: Enabled
Port: Gi1/0/1
VLAN Membership mode: Access Mode
Operating parameters:
PVID: 1
Ingress Filtering: Enabled
Acceptable Frame Type: Admit All
Default Priority: 0
GVRP status: Disabled
Protected: Disabled
Port Gi1/0/1 is member in:
VLAN    Name                             Egress rule   Type
----    -------------------------------- -----------   --------
1       default                          Untagged      Default
Static configuration:
PVID: 1
Ingress Filtering: Enabled
Acceptable Frame Type: Admit All
Port Gi1/0/1 is statically configured to:
VLAN    Name                             Egress rule
```

```
----    -------------------------------- -----------
Forbidden VLANS:
VLAN    Name
----    --------------------------------
Port Gi1/0/1 Enabled
State: Disabled                             Role: Disabled
Port id: 128.1                              Port Cost: 0
Port Fast:  No (Configured: no )            Root Protection: No
Designated bridge Priority: 32768           Address: 1418.7715.2368
Designated port id: 0.0                     Designated path cost: 0
CST Regional Root: 80:00:14:18:77:15:23:68 CST Port Cost: 0
BPDUs: Sent: 0, Received: 0
```

show interfaces status

Use the **show interfaces status** command to display the status for all configured interfaces.

Syntax

show interfaces status

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Port channels are only displayed if configured. Use the show interfaces port-channel command to display configured and unconfigured port channels. Interfaces configured as stacking ports will show as detached in the output of the **show interfaces status** command.

The link state indicates the physical connectivity state of the link. It is possible that the link is connected physically yet frames are not able to pass over the link. Possible causes of this condition are speed or duplex mismatch.

The displayed port status information includes the following:

Field	Description
Port	The port or port channel number. **Oob** means Out-of-Band Management Interface.
Description	Description of the port. This field may be truncated in the command output.
Duplex	Displays the port Duplex status.
VLAN	The VLAN membership for the port is enclosed in parentheses. The currently active PVID and Voice VLAN ID, if any, are also shown. In some cases, the PVID assigned may not be the configured PVID, for example, when RADIUS assigns a PVID to the interface.
Speed	Refers to the port speed.
Neg	Describes the Auto-negotiation status.
Link State	Displays the Link status, either **Up, Down**, or **Disable. Disable** is displayed in the link status output for ports that are administratively or error disabled.
Flow Ctrl Status	Displays the Flow Control status, either **Active** or **Inactive**.

The following table displays the interface mode codes and VLAN output format for the interface mode:

Mode	VLAN
A – Access	Native
T – Trunk	(Native),List
D – Dot1q tunnel	Outer
P – Private VLAN Promiscuous	(Primary), Secondary List
H–Private VLAN Host	(Primary), Secondary
G– General	(PVID), All the tagged and untagged VLANs.

Example

The following example displays the status for all configured interfaces.

```
console(config-if-Po1)#show interfaces status
```

```
Port      Description     Duplex Speed   Neg  Link   Flow  M VLAN
                                              State  Ctrl
--------- --------------- ------ ------- ---- ------ ----- - ---------------
Gi1/0/1                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/2                   N/A    Unknown Auto Down   Off   T (11),1,3,5,7,9
                                                             15,19,25-4093
Gi1/0/3                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/4                   N/A    Unknown Auto Down   Off   G (1),2,4,6,8,10
                                                             14,16,20,22,24
Gi1/0/5                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/6                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/7                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/8                   N/A    Unknown Auto Down   Off   A 1
Gi1/0/9                   N/A    Unknown Auto Down   Off   A 1

Oob  Type                           Link
                                    State
---  ------------------------------ -----
oob  Out-Of-Band                    Up

Port    Description                   Link    M VLAN
Channel                               State
------- ----------------------------- ------- - -------------------
Po1                                   Detach  H (4),5
```

show interfaces transceiver

Use the **show interfaces transceiver** command to display the optic static parameters as well as the Dell EMC qualification.

Syntax

show interfaces transceiver [properties]

- properties—Displays the static parameters for the optics.

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec modes.

User Guidelines

This command only supports the display of 10G and 40G transceivers.

Example

The following example shows the qualifications status of the optics on the switch.

```
console#show interfaces transceiver

Port          Dell EMC Qualified
------------- ------------------
Te1/0/9       Yes
Te1/0/11      Yes
Te1/0/13      N/A
Te1/0/15      No
Te1/0/17      No
```

The following example shows static parameters of the optics along with the qualifications status.

```
console#show interfaces transceiver properties

Yes: Dell EMC Qualified       No: Not Qualified
N/A : Not Applicable
Port         Type    Media           Serial Number        Dell EMC Qualified
------------ ------- --------------- -------------------- ------------------
Te1/0/9      SFP+    10GBASE-LRM     ANF0L5J              Yes
Te1/0/11     SFP+    10GBASE-LRM     ANF0L5R              Yes
Te1/0/13     SFP     1GBASE-SX       PCC1PT5              N/A
Te1/0/15     SFP+    10GBASE-SR      AD1125A002R          No
Te1/0/17     SFP+    10GBASE-SR      AD0815E00PC          No
```

show interfaces trunk

Use the **show interfaces trunk** command to display active trunk interface information.

Syntax

show interfaces trunk [*interface-id*]

- *interface-id*—An Ethernet or port channel interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays Ethernet interfaces configured in trunk or general mode that are link up. Port channels are also shown if the port channel status is up.The fields displayed are as follows:

- Port—The Ethernet or port channel interface name.
- Description—The configured port description.
- Port Chnl—Shows the port channel if the Ethernet interface is a member of a port channel.
- M—The configured mode (T for trunk and G for General).
- Participating VLANs—The participating trunk VLANs with the native VLAN in parentheses. The output shows the port-channel participating VLANs for interfaces bundled in a port-channel.
- STP Forwarding VLANs—The VLANs in the spanning tree forwarding state.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)#show interfaces trunk

Port      Description     Port  M  Participating        STP Forwarding
                          Chnl     VLANs                VLANs
--------- --------------- ----- -- -------------------  --------------------
-
Gi1/0/1                         T  (1)1-32              1
Gi1/0/2                         T  (10)1-32             10,13,16,19
Gi1/0/3                         G  (11)33-64            11,33-64
Gi1/0/4                   Po1   T  (11)33-64            1
Gi1/0/5                   Po1   T  (11)33-64            11,33-64
```

```
Gi1/0/6                    Po1    T  (11)33-64          11,33-64
Po1                               T  (11)33-64          11,33-64
```

show statistics

Use the **show statistics** command to display detailed statistics for a specific port or for the internal CPU interface.

Syntax

show statistics {**gigabitethernet** unit/slot/port |**switchport** | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}

- *unit/slot/port*—A valid Ethernet interface identifier. See Interface Naming Conventions for interface representation.
- *port-channel-number*—A port channel identifier.
- **switchport**—Displays statistics for the internal switch CPU interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Statistics are only collected for Ethernet interfaces, port-channel interfaces, and the switch CPU interface.

Command History

Modified in version 6.5 firmware. Command output updated in version 6.6 firmware.

Examples

The following example shows statistics for port gi1/0/1.

```
console#show statistics gi1/0/1
Total Frames Received (Octets)................ 0
```

```
Frames Received 64 Octets..................... 0
Frames Received 65-127 Octets................. 0
Frames Received 128-255 Octets................ 0
Frames Received 256-511 Octets................ 0
Frames Received 512-1023 Octets............... 0
Frames Received 1024-1518 Octets.............. 0
Frames Received > 1518 Octets................. 0

Total Frames Received Without Errors.......... 0
Unicast Frames Received....................... 0
Multicast Frames Received..................... 0
Broadcast Frames Received..................... 0
Jumbo Frames Received ........................ 0
Receive Frames Discarded...................... 0

Total Frames Received with MAC Errors......... 0
Jabbers Received.............................. 0
Fragments/Undersize Received.................. 0
Alignment Errors.............................. 0
FCS Errors.................................... 0
Overruns...................................... 0
Unacceptable Frame Type....................... 0
Received Frames Dropped > MTU................. 0
URPF Discards................................. 6

Total Received Frames Not Forwarded........... 0
802.3x Pause Frames Received.................. 0

Total Frames Transmitted (Octets)............. 0
Frames Transmitted 64 Octets.................. 0
Frames Transmitted 65-127 Octets.............. 0
Frames Transmitted 128-255 Octets............. 0
Frames Transmitted 256-511 Octets............. 0
Frames Transmitted 512-1023 Octets............ 0
Frames Transmitted 1024-1518 Octets........... 0
Frames Transmitted > 1518 Octets.............. 0
Max Frame Size................................ 1518

Total Frames Transmitted Successfully......... 0
Unicast Frames Transmitted.................... 0
Multicast Frames Transmitted.................. 0
Broadcast Frames Transmitted.................. 0
Jumbo Frames Transmitted...................... 0
Total Transmit Frames Discarded............... 0

Total Transmit Errors......................... 0
Single Collision Frames....................... 0
```

```
Multiple Collision Frames..................... 0
Late Collision Frames......................... 0
Excessive Collision Frames.................... 0

Frames RX and TX 64 Octets.................... 0
Frames RX and TX 65-127 Octets................ 0
Frames RX and TX 128-255 Octets............... 0
Frames RX and TX 256-511 Octets............... 0
Frames RX and TX 512-1023 Octets.............. 0
Frames RX and TX 1024-1518 Octets............. 0
Frames RX and TX 1519-2047 Octets............. 0
Frames RX and TX 2048-4095 Octets............. 0
Frames RX and TX 4096-9216 Octets............. 0

GVRP PDUs received............................ 0
GVRP PDUs Transmitted......................... 0
GVRP Failed Registrations..................... 0
GMRP PDUs Received............................ 0
GMRP PDUs Transmitted......................... 0
GMRP Failed Registrations..................... 0
BPDUs Transmitted............................. 0
BPDUs Received................................ 0
EAPOL Frames Transmitted...................... 0
EAPOL Start Frames Received................... 0

Time since counters last cleared.............. 11 day 22 hr 28 min 22 sec
```

show statistics switchport

Use the **show statistics** command to display detailed statistics for a specific port or for the entire switch.

Syntax

show statistics {*interface-id* | **switchport**}

- *interface-id*—The interface ID. See Interface Naming Conventions for interface representation.
- **switchport**—Displays statistics for the entire switch.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

It is possible to enter interface configuration mode from global configuration mode or from interface configuration mode.

RFC Cross Reference

Textual Explanation	RFC 2863 MIB Identifier
Total Packets Received (Octets)	ifHCInOctets
Unicast Packets Received	ifHCInUcastPkts
Multicast Packets Received	ifHCInMulticastPkts
Broadcast Packets Received	ifHCInBroadcastPkts
Receive Packets Discarded	ifInDiscards
Octets Transmitted	ifHCOutOctets
Unicast Packets Transmitted	ifHCOutUcastPkts
Multicast Packets Transmitted	ifHCOutMulticastPkts
Broadcast Packets Transmitted	ifHCOutBroadcastPkts
Transmit Packets Discarded	ifOutDiscards

Example

The following example shows statistics for the CPU interface.

```
console#show statistics switchport

Total Packets Received (Octets)................ 0
Packets Received Without Error................. 0
Unicast Packets Received....................... 0
Multicast Packets Received..................... 0
Broadcast Packets Received..................... 0
Receive Packets Discarded...................... 0

Octets Transmitted............................. 0
```

```
Packets Transmitted Without Errors............. 0
Unicast Packets Transmitted.................... 0
Multicast Packets Transmitted.................. 0
Broadcast Packets Transmitted.................. 0
Transmit Packets Discarded..................... 0



Most Address Entries Ever Used................. 3
Address Entries Currently in Use............... 3

Maximum VLAN Entries........................... 1024
Most VLAN Entries Ever Used.................... 2
Static VLAN Entries............................ 2
Dynamic VLAN Entries........................... 0
VLAN Deletes................................... 0
Time Since Counters Last Cleared............... 0 day 18 hr 1 min 59 sec
```

show storm-control

Use the **show storm-control** command to display the configuration of storm control.

Syntax

show storm-control [**all** | {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following example shows storm control configurations for a Gigabit Ethernet port. The second example shows flow control mode status.

```
console#show storm-control

802.3x Flow Control Mode...................... Disable

console#show storm-control gigabitethernet 1/0/1

           Bcast    Bcast     Mcast    Mcast     Ucast    Ucast     Flow
Intf       Mode     Level     Mode     Level     Mode     Level     Ctrl
---------- -------- --------- -------- --------- -------- --------- --------
Gi1/0/1    Disable  5         Disable  5         Disable  5         Disabled

switch-top(config)#show storm-control all

           Bcast    Bcast     Mcast    Mcast     Ucast    Ucast     Flow
Port       Mode     Level     Mode     Level     Mode     Level     Ctrl
---------- -------- --------- -------- --------- -------- --------- --------
Gi1/0/1    Enable   90        Enable   5         Enable   10        Enabled
Gi1/0/2    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/3    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/4    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/5    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/6    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/7    Disable  5         Disable  5         Disable  5         Enabled
Gi1/0/8    Disable  5         Disable  5         Disable  5         Enabled
```

show storm-control action

Use the **show storm-control action** command to display the storm control action configuration for one or all interfaces.

Syntax

show storm-control action {**all** | *interface-id*}

- **all** —Show the storm control action configuration for all interfaces.
- *interface-id*—An Ethernet interface on which storm control is enabled.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode and all show modes

User Guidelines

This command has no user guidelines.

Examples

```
console#show storm-control action all
            Bcast       Mcast       Ucast
Port       Action      Action      Action
-------- ---------- ---------- ----------
Gi1/0/1  Shutdown
Gi1/0/2
Gi1/0/3
Gi1/0/4
Gi1/0/5
Gi1/0/6
Gi1/0/7
Gi1/0/8
```

shutdown

Use the **shutdown** command in Interface Configuration mode to disable an interface. To restart a disabled interface, use the **no** form of this command.

Syntax

shutdown

no shutdown

Default Configuration

The interface is enabled.

Command Mode

Interface Configuration (Ethernet, Port-Channel, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Examples

The following example disables Gigabit Ethernet port 1/0/5.

```
console(config)#interface gigabitethernet 1/0/5
```

```
console(config-if-Gi1/0/5)# shutdown
```

The following example reenables Gigabit Ethernet port 1/0/5.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if-Gi1/0/5)# no shutdown
```

speed

Use the **speed** command in Interface Configuration mode to configure the speed of a given Ethernet interface. To restore the default, use the **no** form of this command.

Syntax

speed 10 | 100 | 1000 | 10000 | 25000 | 40000 | 50000 | 100000

speed auto [10 | 100 | 1000 | 2500 | 5000 | 10000 | 25000 | 40000 | 50000 | 100000 [10 | 100 | 1000 | 2500 | 5000 | 10000| 25000 | 40000 | 50000 | 100000] … } }

no speed

- **auto**—Enable the port for auto-negotiation. Multiple speeds may be configured in conjunction with this parameter.
- 10—Enable the port for 10 Mbps operation.
- 100—Enable the port for 100 Mbps operation.
- 1000—Enable the port for 1 Gbps operation.
- 2500—Enable the port for 2.5 Gbps operation.
- 5000—Enable the port for 5 Gbps operation.
- 10000—Enable the port for 10 Gbps operation.
- 25000—Enable the port for 25 Gbps operation.
- 40000—Enable the port for 40 Gbps operation.
- 50000—Enable the port for 50 Gbps operation.
- 100000—Enable the port for 100 Gbps operation.

Default Configuration

Auto-negotiation is enabled by default on copper ports and SFP ports.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Not all interfaces are capable of supporting all speeds. Refer to the Hardware Overview section of the *Users Configuration Guide* for a description of the capabilities of a particular interface.

The speed command is only applicable to Ethernet ports. It gives an error if used on stacking ports or port-channels.

Use the auto parameter to enable auto-negotiation on an interface. Auto-negotiation on copper interfaces selects a clock primary, performs link training to tune the pre-emphasis settings to the individual switch and cable, negotiates the internal media, and may enable a decision feedback equalizer (DFE) to correct burst errors if the PHY has the capability. To disable auto-negotiation on a port, it is necessary to enter the `speed` command without using the `auto` parameter. Disabling auto-negotiation on 1G copper ports may lead to random frame loss as the clock primary and media have not been arbitrated by the auto-negotiation process. Auto-negotiation is required on 2.5G/5G/10G/40G copper ports and is always recommended for copper ports regardless of the speed setting. SFP+ ports utilizing a copper DAC cable are considered copper ports. Auto-negotiation is also required on 1000Base-X ports (including SFP fiber ports.)

If using combinations of the 10, 100, 1000, 2500, 5000, 10000, 25000, 40000, 50000, or 100000 keywords with the **auto** keyword, the port only advertises the specified speeds. Not all speeds or combination of speeds are available on all platforms or ports. Entering an unsupported speed will produce the following error message `An invalid interface has been used for this function.`

Fiber ports (other than 1000Base-X) do not support auto-negotiation and therefore require the operator to enter the speed command with the desired operating rate. The link partner must be similarly configured. SFP+/QSFP fiber ports using fiber media do not support auto-negotiation, although it must be enabled when using Direct Attach Copper cables if the link partner also supports auto-negotiation. 1G SFP fiber ports should have auto-negotiation enabled. SFP transceivers in an SFP+ port should have auto-negotiation enabled. The default behavior is to enable auto-negotiation when an SFP transceiver is inserted into an SFP+ port, unless a fixed speed is configured.

Likewise, SFP+ ports connected via copper Direct Attach Cables must have auto-negotiation enabled if the link partner is also capable of performing auto-negotiation. If the link partner cannot perform auto-negotiation, then a fixed speed must be utilized. In all cases, the link partners need compatible settings, e.g., both sides must be set to use auto-negotiation or a fixed speed. In the case of a fixed speed link, both sides must be set to the same speed.

Failure to set both sides of a link to the same speed/duplex values (auto-negotiation disabled) or compatible speed/duplex values (auto-negotiation enabled) may give a false link-up indication when configured or when the link is brought up (no shut). Setting one end of a link to auto-negotiate and the link partner to a fixed speed is not supported. Disabling auto-negotiation on interfaces that require it, for example, 1000BASE-X or 1G/10G copper interfaces, is not supported.

Example

The following example configures Gigabit Ethernet port 1/0/5 to advertise 100-Mbps operation only via auto-negotiation.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if)#speed auto 100
```

Command History

The **speed 10000** syntax was introduced in the 6.3.6 release.

The 2500 and 5000 speeds were introduced in the 6.3.5 release. The description was updated in the 6.4 release.

Syntax updated in firmware release 6.6.1 and 6.6.2.

switchport protected

Use the **switchport protected** command in Interface Configuration mode to configure a protected port. The *groupid* parameter identifies the set of protected ports to which this interface is assigned. You can only configure an interface as protected in one group. You are required to remove an interface from one group before adding it to another group.

Port protection occurs within a single switch. Protected port configuration does not affect traffic between ports on two different switches. No traffic forwarding is possible between two protected ports. Ports in a protected group will not forward traffic to other ports in the group.

Syntax

switchport protected *groupid*

no switchport protected

- *groupid*–Identifies which group this port will be protected in. (Range: 0-2)

Default Configuration

No protected switchports are defined.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

When an interface is enabled for routing using the interface vlan command, the port will no longer be operationally enabled as a protected port on the interface. Likewise, making an interface a member of a LAG or a probe (monitor session or RSPAN destination) port operationally disables port protection.

Example

The following example configures Ethernet port 1/0/1 as a member of protected group 1.

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#switchport protected 1
```

switchport protected name

Use the **switchport protected name** command in Global Configuration mode to adds the port to the protected group 1 and also sets the group name to “protected”.

Syntax

switchport protected *groupid* **name** *name*

no switchport protected *groupid* **name**

- *groupid* — Identifies which group the port is to be protected in. (Range: 0–2)
- *name* — Name of the group. (Range: 0-32 characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example assigns the name “protected” to group 1.

```
console(config)#switchport protected 1 name protected
```

show switchport protected

Use the **show switchport protected** command to display the status of all the interfaces, including protected and unprotected interfaces.

Syntax

show switchport protected *groupid*

- *groupid* — Identifies which group the port is to be protected in. (Range: 0–2)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example identifies test as the protected group.

```
console#show switchport protected 0
Name......................................... test
```

show system mtu

Use the show system mtu command to display the configured MTU. The MTU is set using the global **system jumbo mtu** command. This command deprecates the **show interfaces mtu** command.

Syntax

show system mtu

Default Configuration

The default mtu size is 1518 bytes (1522 bytes for VLAN tagged frames).

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no usage guidelines.

Example

```
console #show system mtu

System Jumbo MTU size is 9216 bytes
```

system jumbo mtu

Use the **system jumbo mtu** command to globally configure the link Maximum Transmission Unit (MTU) on all interfaces, IP/IPv6 interfaces, VLAN interfaces, and port channel interfaces for forwarded and system-generated frames. The link MTU is the size of the largest Ethernet frame that can be transmitted on an interface without fragmentation. Frames received on an interface are dropped if they exceed the link MTU. Frames larger than this size generated by the system are fragmented before transmission.

This command deprecates the **mtu**, **ip mtu**, and **ipv6** mtu commands.

Use the **no** form of the command to reset the MTU to the default.

Syntax

system jumbo mtu *frame size*

no system jumbo mtu

- *frame size* —The maximum frame size, in bytes, received by the system which is not forwarded.

Default Configuration

The default MTU size is 1518 bytes (1522 bytes for VLAN tagged frames).

Command Modes

Global Configuration mode

User Guidelines

Dell EMC Networking N-Series switches do not fragment received packets.

The IPv4 and IPv6 MTU are set to the link MTU minus 18 bytes. IP packets forwarded in software are dropped if they exceed the IP MTU. Packets originated on the router, such as OSPF packets, may be fragmented by the IP stack. OSPF advertises the IP MTU in the Database Description packets it sends to its neighbors during database exchange. If two OSPF neighbors advertise different IP MTUs, they will not form an adjacency (unless OSPF has been instructed to ignore differences in IP MTU with the **ip ospf mtuignore** command).

The allowed range is 1298 to 9216. This allows for configuration of an IPv4 and IPv6 MTU of 1280 to 9198.

In conformance with RFC 2460, the system performs IPv6 path MTU discovery for IPv6 packets originated by the switch. This may result in individual connections using an IPv6 MTU less than that configured by the network operator.

Ethernet CFM Commands

Dell EMC Networking N1500/N2200/N3200 Series Switches

Connectivity Fault Management (CFM) is the OAM Protocol provision for end-to-end service layer OAM in carrier Ethernet networks. CFM provides mechanisms to support the operator in performing connectivity checks, fault detection, fault verification and isolation, and fault notification per service in the network domain of interest. Unlike Ethernet OAM defined in IEEE 802.3ah, where the faults are detected and notified on a single point-to-point IEEE Std. 802.3 LAN, this capability deals with the fault diagnosis at service layer across networks comprising multiple LANs, including LANs other than 802.3 media. Refer to IEEE 802.1ag for an explanation of CFM. Typically, the MEP ID and maintenance association levels are assigned by the top level network service provider.

Dell EMC Networking CFM is available on the N1500/N2200/N3200-ON series switches. CFM is not compatible with iSCSI optimization. Disable iSCSI optimization before enabling CFM.

Dell EMC Networking CFM supports the following functionality:

- Path discovery (linktrace message)
- Fault detection (continuity check message)
- Fault verification and isolation (loopback and linktrace messages)
- Fault notification (alarm indication signal or SNMP trap)

ethernet cfm domain

Use the **ethernet cfm domain** command in Global Configuration mode to enter into Maintenance Domain Configuration mode for an existing domain. Use the optional level parameter to create a domain and enter into maintenance domain Configuration mode. In maintenance domain Configuration mode, maintenance associations are created and per-maintenance domain services can be configured. Use the **no** form of the command to delete a maintenance domain.

Syntax

ethernet cfm domain *domain-name* [**level** *0-7*]

- *domain-name*—Name of the maintenance domain. Alphanumeric string of up to 43 characters.

Default Configuration

No CFM domains are preconfigured.

Command Mode

Global Configuration mode

User Guidelines

Each domain must have a unique name and level, for example, one cannot create a domain qwerty at level 2 if domain qwerty already exists at level 1. Likewise, one cannot create a domain dvorak at level 2 if a domain of any name exists at level 2.

Example

In this example, a domain "vin" is created at level 1.

```
console(config)#ethernet cfm domain vin level 1
console(config-cfm-mdomain)#
```

service

Use the **service** command in Maintenance Domain Configuration mode to associate a VLAN with a maintenance domain. Use the **no** form of the command to remove the association.

Syntax

service *service-name* **vlan** *vlan-id*

- *service-name*—Unique service identifier.
- *vlan-id*—VLAN ID representing a service instance that is monitored by this maintenance association. The range is 1-4093.

Default Configuration

No VLANs are associated with a maintenance domain by default.

Command Mode

Maintenance Domain Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config-cfm-mdomain)#service serv1 vlan 10
```

ethernet cfm cc level

Use the **ethernet cfm cc level** command in Global Configuration mode to initiate sending continuity checks (CCMs) at the specified interval and level on a VLAN monitored by an existing domain. Use the **no** form of the command to cease send CCMs.

Syntax

ethernet cfm cc level *0-7* **vlan** *vlan-id* **interval** *msecs*

- *vlan-id*—VLAN ID representing a service instance that is monitored by this maintenance association. The range is 1-4093.
- *msecs*—Time interval between successive transmissions for all MEPs in the Maintenance Association. The possible values are 3.3, 10, 100, 1000, 10000, 60000, and 600000 milliseconds.

Default Configuration

CCMs are not sent by default. The default CCM interval is 3.3milliseconds, except on the N3200 Series switches, where it is 1000 milliseconds.

Command Mode

Global Configuration mode

User Guidelines

The N3200 Series switches do not support hardware-based Connectivity Fault Management. The lowest configurable value for the Continuity Check Message interval is one thousand milliseconds. Therefore, ERP failover on the N3200 platform is on the order of multiple seconds.

Example

```
console(config)#ethernet cfm cc level 1 vlan 15 interval 10
```

Command History

Command introduced in firmware release 6.6.1.

ethernet cfm mep level

Use the **ethernet cfm mep level** command in Interface Configuration mode to create a Maintenance End Point (MEP) on an interface at the specified level and direction. MEPs are configured per Maintenance Association per Maintenance Domain. Use the **no** form of the command to delete a MEP.

Syntax

ethernet cfm mep level *0-7* **direction** *up|down* **mpid** *1-8191* **vlan** *vlan-id*

- **level**—Maintenance association level
- **direction**—**Up** indicates the MEP is facing towards Bridge Relay Entity. **Down** indicates the MEP is facing towards the LAN.
- **mpid**—Maintenance entity identifier
- **vlan-id**—VLAN on which the MEP operates. The range is 1-4093.

Default Configuration

No MEPs are preconfigured.

Command Mode

Interface Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example creates a maintenance endpoint at level 1 with mpid 1010 on vlan 10.

```
console(config-if-Gi1/0/3)#ethernet cfm mep level 1 direction up mpid 1010
vlan 10
```

ethernet cfm mep enable

Use the **ethernet cfm mep enable** command in Interface Configuration mode to enable a MEP at the specified level and direction. Use the **no** form of the command to disable the MEP.

Syntax

ethernet cfm mep enable level *0-7* **vlan** *vlan-id* **mpid** *1-8191*

- **level**—Maintenance association level
- **mpid**—Maintenance entity identifier
- **vlan**—VLAN on which the MEP operates. The range is 1-4093.

Default Configuration

No MEPs are preconfigured.

Command Mode

Interface Configuration mode

User Guidelines

The maintenance domain must exist for it to be enabled.

Example

The following example enables a maintenance endpoint at level 1 with mpid 1010 on vlan 10.

```
console(config-if-Gi1/0/3)#ethernet cfm mep enable level 1 vlan 10 mpid 1010
```

ethernet cfm mep active

Use the **ethernet cfm mep active** command in Interface Configuration mode to activate a MEP at the specified level and direction. Use the **no** form of the command to deactivate the MEP.

Syntax

ethernet cfm mep active level *0-7* **vlan** *vlan-id* **mpid** *1-8191*

- **level**—Maintenance association level

- **mpid**—Maintenance entity identifier
- **vlan**—VLAN on which the MEP operates. The range is 1-4093.

Default Configuration

No MEPs are preconfigured.

Command Mode

Interface Configuration

User Guidelines

This command has no user guidelines.

ethernet cfm mep archive-hold-time

Use the **ethernet cfm mep archive-hold-time** command in Interface Configuration mode to maintain internal information on a missing MEP. Use the **no** form of the command to return the interval to the default value.

Syntax

ethernet cfm mep archive-hold-time *hold-time*

- *hold-time*—The time in seconds to maintain the data for a missing MEP before removing the data. The default value is 600 seconds.

Default Configuration

No MEPs are preconfigured.

Command Mode

Interface Configuration

User Guidelines

The hold time should generally be less than the CCM message interval.

Example

The following example sets the hold time for maintaining internal information regarding a missing MEP.

```
console(config)#ethernet cfm mep archive-hold-time 1200
```

ethernet cfm mip level

Use the **ethernet cfm mip level** command in Interface Configuration mode to create a Maintenance Intermediate Point (MIP) at the specified level. The MEPs are configured per Maintenance Domain per interface. Use the **no** form of the command to delete a MIP.

Syntax

ethernet cfm mip level *0-7*

- **level**—Maintenance association level

Default Configuration

No MIPs are preconfigured.

Command Mode

Interface Configuration

User Guidelines

Refer to IEEE 802.1ag for an explanation of maintenance association levels. Typically, this value is assigned by the top level network service provider.

Example

```
console(config-if-Gi1/0/1)# ethernet cfm mip level 7
```

ping ethernet cfm

Use the **ping ethernet cfm** command to generate a loopback message (LBM) from the configured MEP.

Syntax

ping ethernet cfm {**mac** *mac-addr*| **remote-mpid** *1-8191*} {**domain** *domain name* | **level** *0-7*} **vlan** *vlan-id* **mpid** *1-8191* [**count** *1-255*]

- **level**—Maintenance association level

- *mac-addr*—The destination MAC address for which the connectivity needs to be verified. Either MEP ID or the MAC address option can be used.
- **remote-mpid**—The MEP ID for which connectivity is to be verified; i.e. the destination MEP ID.
- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).
- *vlan-id*—A VLAN associated with the maintenance domain. Range: 1-4093.
- **mpid**—The MEP ID from which the loopback message needs to be transmitted.
- **count**—The number of LBMs to be transmitted. The default number is 1.

Default Configuration

By default, this command will transmit one loopback message with a time-out of five seconds.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

Example

```
console #ping ethernet cfm mac 00:11:22:33:44:55 level 1 vlan 10 mpid 1 count
10
```

traceroute ethernet cfm

Use the **traceroute ethernet** command to generate a link trace message (LTM) from the configured MEP.

Syntax

traceroute ethernet cfm {**mac** *mac-addr*| **remote-mpid** *1-8191*} {**domain** *domain name* | **level** *0-7*} **vlan** *vlan-id* **mpid** *1-8191* [**ttl** *1-255*]

- **level**—Maintenance association level

- *mac-addr*—The destination MAC address for which the connectivity needs to be verified. Either MEP ID or the MAC address option can be used.
- **remote-mpid**—The MEP ID for which connectivity is to be verified; i.e. the destination MEP ID.
- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).
- *vlan-id*—A VLAN associated with the maintenance domain. Range: 1-4093.
- **mpid**—The MEP ID from which the loopback message needs to be transmitted.
- **ttl**—The number of hops over which the LTM is expected to be transmitted. The default number is 64.

Default Configuration

By default, the traceroute command will send loopback trace messages with a TTL of 64.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

Example

```
console # traceroute ethernet cfm remote-mpid 32 level 7 vlan 11 mpid 12
```

show ethernet cfm errors

Use the **show ethernet cfm errors** command to display the cfm errors.

Syntax

show ethernet cfm errors {**domain** *domain-id* | **level** *0-7*}

- **level**—Maintenance association level
- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

- Level—The maintenance association level
- SVID—The service identifier
- MPID—The maintenance endpoint identifier
- DefRDICcm—A remote MEP reported the RDI bit in a CCM.
- DefMACStatus—Some remote MEP reported its Interface Status TLV as something other then isUp.
- DefRemoteCCM—The MEP did not receive valid CCMs from at least one of the remote MEPs
- DefErrorCCM—The MEP has received at least one invalid CCM whose CCM interval has not yet timed out.
- DevXconCCM—The MEP has received at least one CCM from either another MAID or a lower MD level whose CCM interval has not yet timed out.

Example

```
console#show ethernet cfm errors

----- ---- ---- --------- ------------ ------------ ----------- ----------
Level SVID MPID DefRDICcm DefMACStatus DefRemoteCCM DefErrorCCM DefXconCCM
----- ---- ---- --------- ------------ ------------ ----------- ----------
```

show ethernet cfm domain

Use the **show ethernet cfm domain** command to display the configured parameters in a maintenance domain.

Syntax

show ethernet cfm domain {brief | *domain-id***}**

- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

```
Example
console # show Ethernet cfm domain domain1

Domain Name    : domain1
Level          : 1
Total Services : 1
---- ----------------------------------- ------------------
VLAN ServiceName                         CC-Interval (secs)
---- ----------------------------------- ------------------
10   serv1                               1
```

show ethernet cfm maintenance-points local

Use the **show ethernet cfm maintenance-points local** command to display the configured local maintenance points.

Syntax

show ethernet cfm maintenance-points local {**level** *0-7* | **interface** *interface-id* | **domain** *domain-name*}

- **level**—Maintenance association level
- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).
- *interface-id*—Show all MPs associated with the interface. This command accepts Ethernet interface identifiers and port channel interface identifiers.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

Refer to IEEE 802.1ag for an explanation of the maintenance association level and MEP ID. Typically, these are assigned by the top level network service provider.

- MPID—The maintenance endpointoint identifier
- Level—The MEP level
- Type—Maintenance endpoint (MEP) or maintenance intermediate point (MIP)
- VLAN—The configured VLAN id
- Port—The port on which the MEP association is configured
- Direction—(Up)stream or (Do)wnstream
- CC Transmit—Continuity check enabled
- MEP-Active—The MEP administrative status
- Operational Status—The MEP operational status
- MAC—The MAC address associated with the MEP.

Example

```
show ethernet cfm maintenance-points local level 1
---- ----- ---- ---- ------ ----- -------- ------ ----------- -----
MPID Level Type VLAN  Port    Dire- CC       MEP-   Operational MAC
                              ction Transmit Active Status
---- ----- ---- ---- ------   ----- -------- ------ ----------- -----
1    1     MEP  10    Gi1/0/1 UP    Enabled  True   00:02:bc:02:02:02

----- ---- ------ -----------------
Level Type  Port        MAC
----- ---- ------ -----------------
```

show ethernet cfm maintenance-points remote

Use the **show ethernet cfm maintenance-points remote** command to display the configured remote maintenance points.

Syntax

show ethernet cfm maintenance-points remote {**level** *0-7* | **domain** *domain-name* | **detail** [**mac** *mac-address* | **mep** *mpid*] [**domain** *domain-name* | **level** *0-7*] [**vlan** *vlan-id*]}

- **domain**—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).
- **level**—Maintenance association level
- *mac-addr*—The destination MAC address for which the connectivity needs to be verified. Either MEP ID or the MAC address option can be used.
- *vlan-id*—A VLAN associated with the maintenance domain. Range: 1-4093.
- *mpid*—The MEP ID from which the loopback message needs to be transmitted.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

Refer to IEEE 802.1ag for an explanation of the maintenance association level and MEP ID. Typically, these are assigned by the top level network service provider.

- MEP Id—Local MEP identifier
- RMep Id—Remote MEP identifier
- Level—Connectivity association level
- MAC—Destination MAC address
- VLAN—VLAN on which the MEP is configured
- Expiry timer—The configured MEP expiry timer

- Service Id—The configured service identifier

Example

```
console# show ethernet cfm maintenance-points remove level 1

------ ------- ----- ----------------- ---- ----------------- -----------
MEP Id RMEP Id Level        MAC        VLAN Expiry Timer(sec) Service Id
------ ------- ----- ----------------- ---- ----------------- -----------
1      2       1     00:11:22:33:44:55 10   25                serv1
```

show ethernet cfm statistics

Use the **show ethernet cfm maintenance-points remote** command to display the CFM statistics.

Syntax

show ethernet cfm statistics [**domain** *domain-name* | **level** *0-7*]

- *domain-name*—Name of the maintenance domain (an alphanumeric string of up to 43 characters in length).
- **level**—Maintenance association level

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

Refer to IEEE 802.1ag for an explanation of the maintenance association level. Typically, maintenance levels are assigned by the top level network service provider.

- Out-of-sequence CCM's received—Count of the out-of-sequence continuity check messages (CCM's) received
- CCM's transmitted—Count of the CCMs transmitted
- In order Loopback replies received—Count of the in order loopback replies received

- Bad MSDU Loopback Replies received—Count of the number of loopback replies received with a MAC Service Data Unit that did not match the corresponding LBM
- Unexpected LTR's received—A count of the number of Link Trace Replies fore which no LTM was sent

Example

```
show Ethernet cfm statistics [domain <domain-name> | level <0-7>]

Console# show ethernet cfm statistics

------------------------------------------------------------------
Statistics for 'Domain: domain1, Level: 1, Vlan: 11, MEP Id: 1'
------------------------------------------------------------------
Out-of-sequence CCM's received        : 0
CCM's transmitted                     : 259
In-order Loopback Replies received    : 5
Out-of-order Loopback Replies received: 0
Bad MSDU Loopback Replies received    : 0
Loopback Replies transmitted          : 5
Unexpected LTR's received             : 0

------------------------------------------------------------------
Statistics for 'Domain: domain1, Level: 1, Vlan: 11, MEP Id: 2'
------------------------------------------------------------------
Out-of-sequence CCM's received        : 0
CCM's transmitted                     : 1
In-order Loopback Replies received    : 5
Out-of-order Loopback Replies received: 5
Bad MSDU Loopback Replies received    : 0
Loopback Replies transmitted          : 0
Unexpected LTR's received             : 0

------------------------------------------------------------------
Statistics for 'Domain: domain1, Level: 1, Vlan: 11, MEP Id: 3'
------------------------------------------------------------------
Out-of-sequence CCM's received        : 0
CCM's transmitted                     : 1
In-order Loopback Replies received    : 0
Out-of-order Loopback Replies received: 0
Bad MSDU Loopback Replies received    : 0
Loopback Replies transmitted          : 5
Unexpected LTR's received             : 0
```

Ethernet Ring Protection Commands

Dell EMC Networking N1500/N2200/N3200 Series Switches only

The Ethernet Ring Protection (ITU-T G.8032/Y.1344 (08/15) feature is a highly reliable and stable protection switching mechanism and a protocol for Ethernet layer network rings. Ethernet rings allow a wide-range of multipoint connectivity that is highly economic due to their reduced number of links.

ethernet ring g8032 profile

This command creates Ethernet ring profile and enters Ethernet ring profile configuration mode.

Syntax

ethernet ring g8032 profile *profile-name*

no ethernet ring g8032 profile *profile-name*

- *profile-name*—The name of an Ethernet ring profile to be configured (up to 32 characters).

Default Configuration

By default, the switch has an unnamed internal profile that is used if no profile is associated with the Ethernet ring instance. The default internal profile uses the default profile values for timers and revertive behavior.

Command Mode

Global Configuration mode

User Guidelines

An Ethernet ring profile can be mapped to an Ethernet ring using the **profile** command in Ethernet Ring Instance Configuration mode. In Ethernet Ring Profile mode, the administrator can define the timer values and the revertive/non-revertive operational mode.

Up to eight profiles may be defined.

Ethernet Ring Protection does not support Non-Stop Forwarding. A stack failover is destructive to the ring, even when configured on stack units that are not rebooted during the stack failover.

Fault detection depends on the configured CCM transmission period. Fault detection may occur in milliseconds depending on the value of the CCM transmission period.

Ethernet Ring Protection does not operate in a stack configuration. Do not configure Ethernet Ring Protection in a stack. Stack failover is not compatible with Ethernet Ring Protection. The N3200 Series switches do not support hardware-based Connectivity Fault Management. The lowest configurable value for the Continuity Check Message interval is one thousand milliseconds. Therefore ERP failover on the N3200 platform is on the order of multiple seconds.

Example

```
console (config)# ethernet ring g8032 profile profile1
console (config-erp-profile1)#
```

Command History

Command introduced in firmware release 6.6.1.

timer

This command configures the timer expiry values for an Ethernet ring profile. Use the **no** form of the command to reset the timers to the defaults.

Syntax

timer {guard *milliseconds* | hold-off *milliseconds* | wtr *minutes*}

no timer {guard | hold-off | wtr }

- **guard timer**—The guard timer is used to prevent ring nodes from acting upon outdated R-APS messages and prevents the possibility of forming a closed loop. Range: 10ms to 2000 ms in steps of 10ms.
- **hold-off timer**—When a new defect or more severe defect occurs, this event will not be reported immediately to protection switching if the provisioned hold-off timer value is non-zero. Instead, the hold-off timer will be started. When the hold-off timer expires, it will be checked whether

a defect still exists on the trail that started the timer. If it does, that defect will be reported to protection switching. Range: 0 to 10000 ms in increments of 100 ms, for example, a value of 500 implies 500 milliseconds.

- **wait-to-restore timer**—When a fault condition is cleared, the traffic channel reverts after the expiry of a WTR timer (if no fault condition is present). This timer is used to avoid toggling protection states in case of intermittent defects. Range: 1 to 12 minutes.

Default Configuration

The defaults are:

- guard timer: 500 ms
- hold-off timer: 0 ms
- wait-to-restore timer: 5 minutes

Command Mode

Ethernet Ring Profile Configuration mode

User Guidelines

See parameter descriptions above.

Example

This example sets the hold-off timer to 500 milliseconds for profile1.

```
console (config)# ethernet ring g8032 profile profile1
console (config-erp-profile1)#timer hold-off 500
```

Command History

Command introduced in firmware release 6.6.1.

non-revertive

This command enables non-revertive mode for an Ethernet ring profile. Use the **no** form of the command to reset the profile to revertive mode.

Syntax

non-revertive

no non-revertive

Default Configuration

The default operational mode is revertive.

Command Mode

Ethernet Ring Profile Configuration mode

User Guidelines

Two operational modes are supported: revertive and non-revertive. In revertive mode, when all failures in the link are removed, traffic is restored to the working transport entity and the Ring Protection Link (RPL) is blocked. In non-revertive mode, the RPL continues to be used for traffic, even after all switch conditions have been resolved.

Example

This example sets non-revertive mode for profile1.

```
console (config)# ethernet ring g8032 profile profile1
console (config-erp-profile1)#non-revertive
```

Command History

Command introduced in firmware release 6.6.1.

This command enables non-revertive mode for an Ethernet ring profile. Use the **no** form of the command to reset the profile to revertive mode.

ethernet ring g8032

This command creates an Ethernet ring and enters Ethernet Ring Configuration mode. Use the **no** form of the command to delete an Ethernet ring.

Syntax

ethernet ring g8032 *ring-name*

no ethernet ring g8032 *ring-name*

- *ring-name*—The name of an Ethernet ring to be configured (up to 32 characters)

Default Configuration

By default, no Ethernet rings are defined.

Command Mode

Global Configuration mode

User Guidelines

Map an Ethernet ring profile to an Ethernet ring using the **profile** command in Ethernet Ring Configuration mode.

Configure the East/West links using the **Port0/Port1** commands respectively.

Set the ring scope using the **ring-scope** command.

Use the **instance** command to instantiate an Ethernet ring protection instance and enter into Ethernet Ring Protection Instance Configuration mode. Map an Ethernet ring profile to an Ethernet ring instance using the **profile** command in Ethernet Ring Instance Configuration mode.

Up to eight rings may be configured. Each ring may participate in up to two instances.

Example

```
console (config)# ethernet ring g8032 profile profile1
console (config-erp-profile1)#
```

Command History

Command introduced in firmware release 6.6.1.

port0

Use the **port0** command to configure a link to participate in Ethernet ring protection as an East ring link. Use the **no port0** command to remove the East ring link configuration.

Syntax

port0 interface *interface-id*

no port0 interface

- *interface-id*—A physical (Ethernet) interface identifier.

Default Configuration

By default, there is no port0 configuration.

Command Mode

Ethernet Ring Configuration mode

User Guidelines

This command enables an Ethernet link to participate in Ethernet ring protection. In the ITU-T G.8032 standard, port0 and port1 are referred to as East and West ring links, respectively. The port0 interface should be an interface connected to a G.8032 ring. This command enables the G.8032 ring mode for the interface.

Only physical Ethernet interfaces are supported for Ring Protection. Port-channels are not supported.

Example

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
```

Command History

Command introduced in firmware release 6.6.1.

port1

Use the **port1** command to configure a link to participate in Ethernet ring protection as a West ring link. Use the **no port1** command to remove the West ring link configuration.

Syntax

port1 { interface *interface-id* | none }

no port1

- *interface-id*—A physical (Ethernet) interface identifier.
- **none**—Configure the West interface as a local endpoint for an open ring.

Default Configuration

No port1 configuration is present by default.

Command Mode

Ethernet Ring Configuration mode

User Guidelines

This command enables an Ethernet link to participate in Ethernet ring protection. In the ITU-T G.8032 standard, port0 and port1 are referred to as East and West ring links, respectively. Use the **none** parameter to configure West protection in a sub-ring as the endpoint of an open ring.

Only physical Ethernet interfaces are supported for Ring Protection. Port-channels are not supported.

Example

This example configures G.8032 West connectivity for interface Te1/0/2.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
```

Command History

Command introduced in firmware release 6.6.1.

open-ring

Use the **open-ring** command to configure a protection ring as a sub-ring. Use the **no open-ring** command to remove the sub-ring configuration.

Syntax

open-ring

no open-ring

Default Configuration

Rings are closed by default.

Command Mode

Ethernet Ring Configuration mode

User Guidelines

This command configures the Ethernet ring as sub-ring. In a sub-ring, only one ring port may be configured per node. This command must be configured on every ring node in the sub-ring, not just on the interconnected nodes of the ring.

Example

This example configures an open ring node for interface Te1/0/1.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 none
console (config-erp-ring1)#open-ring
```

Command History

Command introduced in firmware release 6.6.1.

instance

Use the instance command to configure an Ethernet ring instance and enter Ethernet Ring Instance Configuration mode. Use the no instance command to remove the Ethernet ring instance configuration.

Syntax

instance *instance-id*

no instance *instance-id*

- *instance-id*—The ID of the protection instance. Range is 1 to 2.

Default Configuration

There are no instances configured by default.

Command Mode

Ethernet Ring Configuration mode

User Guidelines

Each ring node can participate in eight physical rings and each ring can have up to two Ethernet Ring Protection (ERP) instances. The total number of instances supported on a ring node are two. Each ERP instance is uniquely identified by the combination of instance ID and R-APS VLAN ID. All the ring nodes that are part of a logical ring should have the same instance ID and R-APS VLAN ID. The instance ID is copied into the last octet of destination MAC address of a Standard L2/L3 frame which is used to carry R-APS PDUs in Ethernet networks.

Example

This example configures a closed ring node for interface Te1/0/1.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
console (config-erp-inst-1)#inclusion-list vlan-ids 101-103
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

Command History

Command introduced in firmware release 6.6.1.

profile

Use the **profile** command to associate an Ethernet ring protection profile with an Ethernet Ring Instance Configuration mode. Use the **no profile** command to remove the Ethernet ring protection profile association and revert to the internal default profile.

Syntax

profile ***profile-name***

no profile ***profile-name***

- ***profile-name***—The name of an existing Ethernet ring protection profile. The maximum length of a profile name is 32 characters.

Default Configuration

There are no associated profiles by default.

Command Mode

Ethernet Ring Instance Configuration mode

User Guidelines

This command associates the Ethernet ring protection properties from the named profile with the Ethernet Ring instance. This command is optional. The default profile properties are configured if no profile is associated with the ERP instance or if the mapped profile does not exist.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds.

```
console (config)# ethernet ring g8032 profile profile1
console (config-erp-profile1)#timer hold-off 500
console (config-erp-profile1)#exit
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#profile profile1
```

Command History

Command introduced in firmware release 6.6.1.

rpl

Use the **rpl** command to configure the Ethernet Ring Protection Link (RPL) and role of the associated ring node. Use the **no rpl** command to remove the RPL association.

Syntax

rpl {port0 | port1} {owner | neighbor}

no rpl

- **port0**—Configure the East port as owner or neighbor.
- **port1**—Configure the West port as RPL owner or neighbor.
- **neighbor**—Assign port0 or port1 and the RPL owner.
- **owner**—Assign port0 or port1 as the RPL owner.

Default Configuration

There are no associated RPLs by default.

Command Mode

Ethernet Ring Instance Configuration mode

User Guidelines

This command configures the Ethernet Ring Protection Link (RPL) and role. The administrator must ensure that only one RPL Owner is configured per ring and that the RPL port role is configured as RPL Neighbor on the connecting link of the adjacent switch.

- RPL Owner: The owner is responsible for the RPL's blocking and forwarding states. This ensures that no loops are formed in the ring. There can be only one RPL owner in a ring.
- RPL Neighbor: The Ethernet ring node connected to the RPL owner node. It is responsible for blocking its end of the RPL when no failures are present. This configuration is optional.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#timer hold-off 500
```

```
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
```

On the adjacent switch:

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#timer hold-off 500
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port0 neighbor
```

Command History

Command introduced in firmware release 6.6.1.

inclusion-list

Use the **inclusion-list** command to select the VLANs protected by the Ethernet ring protection instance. Use the **no inclusion-list** command to remove VLANs from protection.

Syntax

inclusion-list vlan-ids { *vlan-id* [, *vlan-id*]… | *vlan-range*]

no inclusion-list vlan-ids { *vlan-id* [, *vlan-id*]… | *vlan-range*]

- *vlan-id*—The VLAN identifier of an existing VLAN to be protected.
- *vlan-range*—A range of VLANs to be protected.

Default Configuration

There are no VLANs protected by an instance by default.

Command Mode

Ethernet Ring Instance Configuration mode

User Guidelines

This command configures the list of VLANs that are protected by the ERP instance. Only VLANs that are participating in both the ring ports of an instance are monitored by the ERP instance. A VLAN may only be configured for one instance. Configuring a VLAN in more than one ERP instance causes undefined behavior.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2 using data VLANs 101-103. It assumes that VLANs 100-103 are already created. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions. VLANs 101-103 are protected. VLAN 100 is used as the Automatic Protection Switching (APS) VLAN.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#timer hold-off 500
console (config-erp-ring1)#inclusion-list vlan-ids 101-103
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

On the adjacent switch:

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#timer hold-off 500
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port0 neighbor
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

Command History

Command introduced in firmware release 6.6.1.

ethernet tcn-propagation

Use the **ethernet tcn-propagation** command to enable topology change notification from a sub-ring to the major ring. Use the **no** form of the command to disable TCN propagation.

Syntax

ethernet tcn-propagation g8032 to g8032

Default Configuration

TCN propagation is disabled by default.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command enables topology change propagation from sub-ring to a major ring. If TCN is enabled globally, it is applied to all the instances configured on the switch. If the global and instance mode configured value is the same, this command is not shown in the instance mode section in running-config.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2 using data VLANs 101-103. It assumes that VLANs 100-103 are already created. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions. VLANs 101-103 are protected. VLAN 100 is used as the Automatic Protection Switching (APS) VLAN. Only Ethernet CFM messages at maintenance level 7 are monitored.

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 none
console (config-erp-ring1)#open-ring
console (config-erp-ring1)#exit
console (config)#interface Te1/0/2
console (config-if-Te1/0/2)#switchport mode trunk
```

```
console (config-if-Te1/0/2)#ethernet tcn-propagation g8032 to g8032
```

Command History

Command introduced in firmware release 6.6.1.

aps-channel

Use the **aps-channel** command to enter into Ethernet Ring Protection APS-channel Configuration mode. Use the exit command to exit the APS-Channel Configuration mode.

Syntax

aps-channel

Default Configuration

This command has no default configuration.

Command Mode

Ethernet Ring Instance Configuration mode

User Guidelines

This command enters into Ethernet Ring Protection APS-channel Configuration mode. The APS VLAN and CFM message level are specified in Ethernet Ring Protection APS-channel Configuration mode.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2 using data VLANs 101-103. It assumes that VLANs 100-103 are already created. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions. VLANs 101-103 are protected. VLAN 100 is used as the Automatic Protection Switching (APS) VLAN. Only Ethernet CFM messages at maintenance level 7 are monitored.

```
console (config)#vlan 100-103
console (config-vlan100-103)#exit
```

```
console (config)#interface te1/0/1
console (config-if-Te1/0/1)#switchport mode trunk
console (config-if-Te1/0/1)#interface Te1/0/2
console (config-if-Te1/0/2)#switchport mode trunk
console (config-if-Te1/0/2)#exit
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
console (config-erp-inst-1)#inclusion-list vlan-ids 101-103
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

Command History

Command introduced in firmware release 6.6.1.

level

Use the **level** command to select the maintenance level of Continuity Check Messages (CCMs) to be monitored. Use the **no** form of the command to remvoe the level selection.

Syntax

level ***level-id***

no level *level-id*

- ***level-id***—The maintenance level of the CCMs to be monitored. Range 0 to 7.

Default Configuration

This command has no default configuration.

Command Mode

Ethernet Ring Instance Configuration APM mode

User Guidelines

It is necessary to configure an Ethernet Maintenance CFM domain and associated MEPs between the links to be protected. Connectivity Fault Management CCMs must be configured to operate at the specified maintenance level to achieve protection switching from causes other than an interface down event.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2 using data VLANs 101-103. It assumes that VLANs 100-103 are already created. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions. VLANs 101-103 are protected. VLAN 100 is used as the Automatic Protection Switching (APS) VLAN. Only Ethernet CFM messages at maintenance level 7 are monitored.

```
console (config)#vlan 100-103
console (config-vlan100-103)#exit
console (config)#interface te1/0/1
console (config-if-Te1/0/1)#switchport mode trunk
console (config-if-Te1/0/1)#interface Te1/0/2
console (config-if-Te1/0/2)#switchport mode trunk
console (config-if-Te1/0/2)#exit
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
console (config-erp-inst-1)#inclusion-list vlan-ids 101-103
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

Command History

Command introduced in firmware release 6.6.1.

raps-vlan

Use the **raps-vlan** command to associate the VLAN to be used for R-APS messages for the ERP instance. Use the **no** form of the command to disassociate the ERP instance from the VLAN.

Syntax

raps-vlan *vlan-id*

no raps-vlan *vlan-id*

- ***vlan-id***—The ID of an existing VLAN.

Default Configuration

This command has no default configuration.

Command Mode

Ethernet Ring Instance APS Configuration mode

User Guidelines

It is strongly recommended that no other traffic be configured to use the APS VLAN.

Example

This example configures a closed ring node for interface Te1/0/1 and Te1/0/2 using data VLANs 101-103. A single instance is created and associated with ERP profile1. The profile sets the hold-off timer to 500 milliseconds. Interface Te1/0/2 is configured in the Owner role. Interface Te1/0/2 connects to an adjacent switch port Te1/0/1. Traffic is blocked on these two ports under normal conditions. VLANs 101-103 are protected. VLAN 100 is used as the Automatic Protection Switching (APS) VLAN. Only Ethernet CFM messages at level 7 are monitored.

```
console (config)#vlan 100-103
console (config-vlan100-103)#exit
console (config)#interface te1/0/1
console (config-if-Te1/0/1)#switchport mode trunk
console (config-if-Te1/0/1)#interface Te1/0/2
console (config-if-Te1/0/2)#switchport mode trunk
console (config-if-Te1/0/2)#exit
```

```
console (config)# ethernet ring g8032 ring1
console (config-erp-ring1)#port0 interface te1/0/1
console (config-erp-ring1)#port1 interface te1/0/2
console (config-erp-ring1)#instance 1
console (config-erp-inst-1)#rpl port1 owner
console (config-erp-inst-1)#inclusion-list vlan-ids 101-103
console (config-erp-inst-1)#aps-channel
console (config-erp-inst-1-aps)#level 7
console (config-erp-inst-1-aps)#raps-vlan 100
```

Command History

Command introduced in firmware release 6.6.1.

g8032

Use the **g8032** command for controlling protection switching transitions and faults manually.

Syntax

g8032 command {**forced** | **manual**} *ring-name* **instance** *instance-id* {**port0** | **port1**}

g8032 command clear *ring-name* **instance** *instance-id*

- ***ring-name***—The name of an Ethernet ring to be configured (up to 32 characters).
- **port0**—The East port.
- **port1**—The West port.
- ***instance-id***—The ID of the protection instance. Range is 1 to 2.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command can perform the following operations: clear, forced switch and manual switch.

- Clear—The Clear command:
  - **a** Clears an active local administrative command (for example, forced switch or manual switch).
  - **b** Triggers reversion before the Wait-to-Restore (WTR) or Wait-to-Block (WTB) timer expires in case of revertive operation.
  - **c** Triggers reversion in case of a non-revertive operation.
- Forced switch—This action command attempts to forcefully cause a ring protection switch by applying a block on the ring port on the local switch.
- Manual switch—In the absence of a failure or a forced switch, this command forces a block on the ring port on the local switch.

Example

This example attempts to cause a protection switch by blocking the ring port on the local switch for instance 1 of ring1.

```
console #g8032 command manual ring1 instance 1
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 configuration

Use the **show ethernet ring g8032 configuration** command to show the Ethernet Ring Protection configuration.

Syntax

show ethernet ring g8032 configuration [*ring-name*] [**instance** [>*instance-id*]]

- ***ring-name***—The Ethernet ring name.
- ***instance***—The Ethernet ring instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following information is shown:

Table 3-3. show ethernet ring g8032 configuration command output

Field	Description
Ethernet ring	Ethernet ring name
Port0	Ethernet ring link interface number
Port1	Ethernet ring link interface number
Open-ring	Open-ring (sub-ring) or closed ring (major-ring)
Instance	Instance Identifier
Inclusion-list VLAN IDs	List of protected VLANs
RPL	RPL port and RPL node role
Level	R-APS channel level
RAPS-VLAN	R-APS VLAN

Example

```
console#show ethernet ring g8032 configuration
Ethernet ring……………………ring1
Port0……………………………1
Port1……………………………2
Open-ring: no
Instance ………………………..1
Profile…………………………..profile1
RPL……………………………..port0 RPL Owner
Inclusion-list VLAN IDs………1000-1299
APS channel
Level……………………………6
RAPS-VLAN…………………...10
OperState………………………TRUE

Instance………………………..2
Profile………………………….erp
RPL…………………………….None
```

```
Inclusion-list VLAN IDs.........1500-1799
APS channel
Level................................5
RAPS-VLAN........................20
Oper State..........................TRUE

console#show ethernet ring g8032 configuration
Ethernet ring........................ring1
Port0................................0/1
Port1................................0/2
Open-ring: no
Instance ............................1
Profile.............................profile1
RPL................................port0 RPL Owner
Inclusion-list VLAN IDs.........1000-1299
APS channel
Level................................6
RAPS-VLAN.......................10
OperState..........................TRUE

Instance............................2
Profile.............................erp
RPL................................None
Inclusion-list VLAN IDs.........1500-1799
APS channel
Level................................5
RAPS-VLAN.......................20
Oper State..........................TRUE
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 brief

Use the **show ethernet ring g8032 brief** command to show the operational overview of Ethernet ring protection.

Syntax

show ethernet ring g8032 brief [*ring-name*] [**instance** [*instance-id*]]

- ***ring-name***—The Ethernet ring name.
- ***instance-id***—The Ethernet ring instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed:

Table 3-4. show ethernet ring g8032 brief command output

Field	Description
RingName	Ethernet ring name
Instance	Instance Identifier
Node Type	Ring node role (Owner, Neighbor, or None)
Node State	State of the ring node (Init, Idle, Protection, Pending, ForcedSwitch, and ManualSwitch).
Port0	State of the interface for handling data traffic.
Port1	State of the interface for handling data traffic.

Example

```
console#show ethernet ring g8032 brief ring1 instance 1

R: Interface is the RPL-link
F: Interface is faulty
B: Interface is blocked
UB: Interface is unblocked
FS: Local forced switch
MS: Local manual switch
RingName      Inst     NodeType       NodeState     Port0        Port1
--------------------------------------------------------------------------
ring1           1      Owner          Idle          R,B
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 status

Use the show ethernet ring g8032 status command to show the status of Ethernet ring protection.

Syntax

show ethernet ring g8032 status [*ring-name*] [**instance** [*instance-id*]]

- ***ring-name***—The Ethernet ring name.
- ***instance-id***—The Ethernet ring instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed:

Table 3-5. show ethernet ring g8032 status command output

Field	Description
Ethernet Ring	Ethernet ring name
Instance	Instance Identifier
Node Type	Ring node role (Owner, Neighbor, or None)
Node State	State of the ring node (Init, Idle, Protection, Pending, ForcedSwitch, and ManualSwitch).
Port0	Ethernet ring link interface number
APS-Channel	R-APS VLAN
Status	Status displays whether the interface is the RPL, and whether the interface has been blocked.
Remote R-APS	The node ID and Blocked port reference pair that is last received on the ring port.

Table 3-5. show ethernet ring g8032 status command output

Field	Description
R-APS Level	Level that is used in R-APS messages.
Profile	Profile that is mapped for the instance. If the profile is not configured, the command output displays Not Configured. Also displays the default values for timers and revertive mode.

Example

```
console#show ethernet ring g8032 status ring1 instance 1
Ethernet ring……………………..ring1
Instance…………………………1
Node Type ………………… ….Owner
Node State………………………Idle
Open ring…………………………No
Port0…………………………….0/1
APS-Channel…………………. 10
Status…………………………. RPL, blocked
Remote R-APS……………….. NodeId 00:90:56:26:45:12, BPR: 0
Port1…………………………….0/2
APS-Channel…………………10
Status……………………………Non-RPL
Remote R-APS………………….NodeId 00:0a:f7:94:e4:0a, BPR: 0
R-APS Level……………………6
Profile……………………………profile1
WTR interval………………….. 1 minutes
Guard interval…………………..2000 milliseconds
HoldOffTimer………………….0 seconds
Revertive mode………………..Enabled

console#show ethernet ring g8032 status ring1 instance 1
Ethernet ring……………………..ring1
Instance…………………………1
Node Type ………………… ….Owner
Node State………………………Idle
Open ring…………………………No
Port0…………………………….0/1
APS-Channel…………………. 10
Status…………………………. RPL, blocked
Remote R-APS……………….. NodeId 00:90:56:26:45:12, BPR: 0
Port1…………………………….0/2
APS-Channel…………………10
Status……………………………Non-RPL
```

```
Remote R-APS…………………….NodeId 00:0a:f7:94:e4:0a, BPR: 0
R-APS Level………………………6
Profile………………………………profile1
WTR interval…………………….. 1 minutes
Guard interval……………………..2000 milliseconds
HoldOffTimer…………………….0 seconds
Revertive mode…………………..Enabled
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 port status

Use the **show ethernet ring g8032 port status** command to show the status of Ethernet ring protection for the selected interface.

Syntax

show ethernet ring g8032 port status *interface-id*

- ***interface-id***—The Ethernet interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed for Port0 and Port1:

Table 3-6. show ethernet ring g8032 port status command output

Field	Description
Port	The related interface identifier
Ethernet Ring	Ethernet ring name
Instance	Instance Identifier

Table 3-6. show ethernet ring g8032 port status command output

Field	Description
Protected VLAN list	A list of the protected VLANs.
State	State of the ring node (Init, Idle, Protection, Pending, ForcedSwitch, and ManualSwitch).

Example

```
console#show ethernet ring g8032 port status interface gigabitethernet 1/0/10

Port0........................................ Gi1/0/10
Ethernet Ring................................ r1
Instance..................................... 1
  Protected VLAN list........................ 10
  State...................................... unblocked
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 profile

Use the **show ethernet ring g8032 profile** command to display the configuration for the named profile.

Syntax

show ethernet ring g8032 profile [profile name]

- **profile name**—The name of a configured Ethernet ring profile.

Default Configuration

If no profile name parameter is given, all profiles are displayed.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed:

Table 3-7. show ethernet ring g8032 profile command output

Field	Description
Profile name	The name of the profile.
WTR interval	When all faults are cleared, the period to wait before restoring the original traffic channel.
Guard interval	The period to wait before invoking a protection switch.
Holdoff interval	The period to wait before reporting a defect to protection switching.
Revertive mode	If enabled, revert to the original traffic channel when all faults are cleared.
Guard timer	The guard timer is used to prevent ring nodes from acting upon outdated R-APS messages and prevents the possibility of forming a closed loop. Range: 10 ms to 2000 ms in steps of 10 ms.
Hold-off timer	When a new defect or more severe defect occurs, this event will not be reported immediately to protection switching if the provisioned hold-off timer value is non-zero. Instead, the hold-off timer will be started. When the hold-off timer expires, the system checks whether a defect still exists on the trail that started the timer. If it does, that defect will be reported to protection switching. Range: 0 to 10000 ms in increments of 100 ms, for example, a value of 500 implies 500 milliseconds.
Wait-to-Restore timer	When a fault condition is cleared, the traffic channel reverts after the expiry of a WTR timer (if no fault condition is present). This timer is used to avoid toggling protection states in case of intermittent defects. Range: 1 to 12 minutes.

Example

```
console#show ethernet ring g8032 profile

Ethernet ring profile name..................... p1
  WTR interval................................. 8 minutes
  Guard interval............................... 30 milliseconds
  Holdoff interval............................. 0 milliseconds
  Revertive mode............................... Disabled
```

```
console#show ethernet ring g8032 profile p1

Ethernet ring profile name.................... p1
  WTR interval............................... 8 minutes
  Guard interval............................. 30 milliseconds
  Holdoff interval........................... 0 milliseconds
  Revertive mode............................. Disabled
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 statistics

Use the **show ethernet ring g8032 statistics** command to show the status of Ethernet ring protection.

Syntax

show ethernet ring g8032 statistics [*ring-name*] [**instance** [*instance-id*]]

- ***ring-name***—The Ethernet ring name.
- ***instance-id***—The Ethernet ring instance.

Default Configuration

If no ring or instance is given, all rings and instances are displayed.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed:

- FOP PM detected – Failure Of Protocol – Provisioning Mismatch
- FOP TO detected – Failure Of Protocol – Time Out

The following R-APS message counts are displayed for both Port0 and Port1:

- NR—R-APS no request
- NR,RB—R-APS no request, RPL blocked

- FS—force switch
- MS—manual switch
- SF—R-APS signal fail

Example

```
console#show ethernet ring g8032 statistics

Statistics for Ethernet ring r1 instance 1
FOP PM detected:  0
FOP TO detected:  1
R-APS Message Type     Port0(Tx/Rx)    Port1(Tx/Rx)
---------------------- --------------- ---------------
NR                     566/770         546/766
NR,RB                  0/0             0/0
FS                     0/0             0/0
MS                     0/0             0/0
SF                     29/28           9/9

console#
console#show ethernet ring g8032 statistics r1 instance 1

Statistics for Ethernet ring r1 instance 1
FOP PM detected:  0
FOP TO detected:  1
R-APS Message Type     Port0(Tx/Rx)    Port1(Tx/Rx)
---------------------- --------------- ---------------
NR                     568/770         548/766
NR,RB                  0/0             0/0
FS                     0/0             0/0
MS                     0/0             0/0
SF                     29/28           9/9
```

Command History

Command introduced in firmware release 6.6.1.

show ethernet ring g8032 summary

Use the show ethernet ring g8032 summary command to show the status of Ethernet ring protection.

Syntax

show ethernet ring g8032 summary

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode, and all Configuration submodes

User Guidelines

The following fields are displayed:

Table 3-8. show ethernet ring g8032 summary command output

Field	Description
NodeID	The MAC address of the RPL owner node.
Init	The number of times the node entered the Init state.
Idle	The number of times the node entered the Idle state.
Protection	The number of times the node entered the Protection state.
Manual Switch	The number of times the node entered the Manual Switch state.
Forced Switch	The number of times the node entered the Forced Switch state.
Pending	The number of times the node entered the Pending state.

Example

```
console#show ethernet ring g8032 summary

NodeId 14:18:77:0c:9e:da
States                 Count
---------------------- ----------
Init                   0
Idle                   0
Protection             0
```

```
Manual Switch        0
Forced Switch        0
Pending              1
```

Command History

Command introduced in firmware release 6.6.1.

Green Ethernet Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking switches support various Green Ethernet modes, i.e., power saving modes, namely:

- Energy-Detect Mode
- Energy Efficient Ethernet

These modes can enable significant operational cost reductions through direct power savings and reducing cooling costs. Green mode commands are only valid for copper Ethernet interfaces.

Energy-Detect Mode

With this mode enabled, when the port link is down the PHY automatically goes down for short periods of time and then wakes up periodically to check for link pulses. This reduces power consumption when no link partner is present. This feature is currently available only on GE copper ports. It is not available on the N2200 Series switches.

Energy Efficient Ethernet

Energy Efficient Ethernet (EEE) combines the MAC with a family of PHYs that support operation in a Low Power Mode as defined by the IEEE 802.3az Energy Efficient Ethernet Task Force. Lower Power Mode enables both the send and receive sides of the link to disable some functionality for power savings when lightly loaded. Transition to Low Power Mode does not change the link status. Frames in transit are not dropped or corrupted in transition to and from Low Power Mode. Transition time is transparent to upper layer protocols and applications. LLDP must be enabled in order to EEE to operate on a link. This feature is currently available only on copper ports. It is not available on the N2200 Series switches.

green-mode energy-detect

This command enables a Dell EMC proprietary mode of power reduction on ports that are not connected to another interface. Use the **no** form of the command to disable energy-detect mode on the interface(s).

Syntax

green-mode energy-detect

no green-mode energy-detect

Default Configuration

On N1100-ON, N1500, N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON switches, energy-detect is enabled by default on the 1G copper interfaces.

Command Mode

Interface Configuration mode

User Guidelines

Use the **green-mode energy-detect** command in Interface Configuration mode to enable energy on an interface. Energy detect powers off interfaces that are not connected to another device.

On combo ports, it is possible to configure energy-detect mode even if the fiber port is enabled. If enabled, energy-detect mode will become active when the copper port is used.

Cable diagnostics (**show copper-ports tdr** command) may give misleading results if green mode is enabled on the port. Disable green mode prior to running any cable diagnostics. EEE and energy-detect modes are only supported on N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON 1G copper ports. An error message (`Unable to set energy-detect mode`) will be displayed if the user attempts to configure energy-detect on a 10G port on a N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON series switch.

green-mode eee

Use the **green-mode eee** command mode to enable EEE low power idle mode on an interface.

Use the **no** form of the command to disable the feature.

Syntax

green-mode eee

no green-mode eee

Default Configuration

EEE is enabled by default on capable interfaces.

Command Mode

Interface Configuration

User Guidelines

The command enables both send and receive sides of a link to disable some functionality for power savings when lightly loaded. The transition to Low Power Idle mode does not change the link status. Frames in transit are not dropped or corrupted in transition to and from Low Power Idle mode.

On combo ports, EEE mode can be enabled even if the port is using the fiber interface. If enabled, EEE mode is only active when the copper interface is active.

This command is available in Ethernet interface configuration mode. Cable diagnostics (**show copper-ports** commands) may give misleading results if green mode is enabled on the port. Disable green mode prior to running any cable diagnostics. EEE mode is supported on N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON 1G copper interfaces.

green-mode eee { tx-idle-time | tx-wake-time}

Use the **green-mode eee** {**tx-idle-time** | **tx_wake-time**} command in Interface Configuration mode to control the transmit idle and wake time parameters on an interface.

Use the **no** form of the command to return the configuration to the default.

Syntax

green-mode eee tx-idle-time <600-4294967295>

green-mode eee tx-wake-time <0-65535>

no green-mode eee {tx-idle-time|tx-wake-time}

Default Configuration

By default, the transmit idle time is 600 micro-seconds and the transmit wake time is 8 micro-seconds.

Command Mode

Interface Configuration mode, Interface Range Configuration mode

User Guidelines

The tx-idle-time parameter sets the amount of time the link must be idle before transitioning to the low power idle state. The tx-wake-time configures the delay before transitioning to the active state (and transmitting the pending packet) after transmitting a wake symbol to the link partner. The transmit idle time and transmit wake time are configured in micro-seconds.

The default values are recommended unless there is good reason to adjust them. Excessive wake times may cause link congestion. Excessive idle times will reduce the savings from low power idle mode.

This command is available in Ethernet interface configuration mode for copper ports that are EEE capable. Configuring the values on interfaces that do not support EEE will return an error.

Command History

Syntax added in 6.4 release.

clear green-mode statistics

Use the **clear green-mode statistics** command to clear:

- The EEE LPI event count, and LPI duration

- The EEE LPI history table entries
- The Cumulative Power savings estimates

for a specified interface or for all the interfaces based upon the argument.

Syntax

clear green-mode statistics {*interface-id* | **all**}

- *interface-id*—An Ethernet interface identifier. See Interface Naming Conventions for interface representation.
- **all**—All Ethernet interfaces.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

green-mode eee-lpi-history

Use the **green-mode eee-lpi-history** command in Global Configuration mode to configure the Global EEE LPI history collection interval and buffer size.

Syntax

green-mode eee-lpi-history {**sampling-interval** *30 sec – 36000 sec*| **max-samples** *1 - 168*}

- **sampling-interval**—The interval in seconds at which power consumption data needs to be collected.
- **max-samples**—Maximum number of samples to keep.

Default Configuration

The sampling-interval default value is 3600 seconds and the max-samples default value is 168.

Command Mode

Global Configuration

User Guidelines

This value is applied globally on all interfaces on the stack. LPI history is only collected on combo ports when the copper port is enabled. Use the **no** form of the command to set the sampling interval or max-samples values to the default.

Examples

Use the command below to set the EEE LPI History sampling interval to the default.

```
console(config)# no green-mode eee-lpi-history sampling-interval
```

Use the command below to set the EEE LPI History max-samples to the default.

```
console(config)#no green-mode eee-lpi-history max-samples
```

show green-mode *interface-id*

Use the **show green-mode *interface-id*** command to display the green-mode configuration and operational status of the port.

Syntax

show green-mode *interface-id*

- *interface-id*—An Ethernet interface identifier. See Interface Naming Conventions for interface representation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command is also used to display the per port configuration and operational status of the green-mode. The status is shown only for the modes supported on the corresponding hardware platform whether enabled or disabled.

This command output provides the following information.

Term	Description
Energy Detect	
Energy-detect admin mode	Energy-detect mode is enabled or disabled.
Energy-detect operational status	Energy detect mode is currently active or inactive. The energy detect mode may be administratively enabled, but the operational status may be inactive. The reasons for the operational status are described below.
Reason for Energy-detect current operational status	The energy detect mode may be administratively enabled, but the operational status may be inactive. The possible reasons are: **1** Port is currently operating in the fiber mode **2** Link is up. If the energy-detect operational status is active, then the reason field shows up as: **1** No energy Detected
EEE	
EEE Admin Mode	EEE Admin Mode is enabled or disabled.
Rx Low Power Idle Event Count	This field is incremented each time MAC RX enters LP IDLE state. Shows the total number of Rx LPI Events since EEE counters are last cleared.
Rx Low Power Idle Duration (μSec)	This field indicates duration of Rx LPI state in 10us increments. Shows the total duration of Rx LPI since the EEE counters are last cleared.
Tx Low Power Idle Event Count	This field is incremented each time MAC TX enters LP IDLE state. Shows the total number of Tx LPI Events since EEE counters are last cleared.

Term	Description
Rx Low Power Idle Duration (μSec)	This field indicates duration of Tx LPI state in 10us increments. Shows the total duration of Tx LPI since the EEE counters are last cleared.
Tw_sys_tx (μSec)	Integer that indicates the value of Tw_sys that the local system can support. This value is updated by the EEE DLL Transmitter state diagram. This variable maps into the aLldpXdot3LocTxTwSys attribute.
Tw_sys Echo (μSec)	Integer that indicates the remote system's Transmit Tw_sys that was used by the local system to compute the Tw_sys that it wants to request from the remote system. This value maps into the aLldpXdot3LocTxTwSysEcho attribute.
Tw_sys_rx (μSec)	Integer that indicates the value of Tw_sys that the local system requests from the remote system. This value is updated by the EEE Receiver L2 state diagram. This variable maps into the aLldpXdot3LocRxTwSys attribute.
Tw_sys_rx Echo (μSec)	Integer that indicates the remote systems Receive Tw_sys that was used by the local system to compute the Tw_sys that it can support. This value maps into the aLldpXdot3LocRxTwSysEcho attribute.
Fallback Tw_sys (μSec)	Integer that indicates the value of fallback Tw_sys that the local system requests from the remote system. This value is updated by the local system software.
Remote Tw_sys_tx (μSec)	Integer that indicates the value of Tw_sys that the remote system can support. This value maps from the aLldpXdot3RemTxTwSys attribute.
Remote Tw_sys Echo (μSec)	Integer that indicates the value Transmit Tw_sys echoed back by the remote system. This value maps from the aLldpXdot3RemTxTwSysEcho attribute.
Remote Tw_sys_rx (μSec)	Integer that indicates the value of Tw_sys that the remote system requests from the local system. This value maps from the aLldpXdot3RemRxTwSys attribute.
Remote Tw_sys_rx Echo (μSec)	Integer that indicates the value of Receive Tw_sys echoed back by the remote system. This value maps from the aLldpXdot3RemRxTwSysEcho attribute.

Term	Description
Remote Fallback Tw_sys (μSec)	Integer that indicates the value of fallback Tw_sys that the remote system is advertising.This attribute maps to the variable RemFbSystemValue as defined in 78.4.2.3.
Tx_dll_enabled	Initialization status of the EEE transmit Data Link Layer management function on the local system.
Tx_dll_ready	Data Link Layer ready: This variable indicates that the tx system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV. This variable is updated by the local system software.
Rx_dll_enabled	Status of the EEE capability negotiation on the local system.
Rx_dll_ready	Data Link Layer ready: This variable indicates that the rx system initialization is complete and is ready to update/receive LLDPDU containing EEE TLV. This variable is updated by the local system software.
Power Saving (%)	Percentage of Power saved by enabling EEE on the interface since EEE counters are last cleared.
Time Since Counters Last Cleared	Time Since Counters Last Cleared (since the time of power up, or after **clear eee counters** is executed)

Example

```
console#show green-mode gi1/0/1
Energy Detect Admin Mode........... Enabled
Operational Status................. Active
Reason............................. No Energy Detected

Short Reach Feature................ Not Available

EEE Admin Mode..................... Enabled
Rx Low Power Idle Event Count....... 0
Rx Low Power Idle Duration (uSec)... 0
Tx Low Power Idle Event Count.... 0
Tx Low Power Idle Duration (uSec) 0
Tw_sys_tx (usec)..................17
Tw_sys_tx Echo(usec)..............17
Tw_sys_rx (usec)..................17
Tw_sys_tx Echo(usec)..............17
Fallback Tw_sys (usec)............17
Remote Tw_sys_tx (usec)...........21
```

```
Remote Tw_sys_tx Echo(usec).......21
Remote Tw_sys_rx (usec)...........21
Remote Tw_sys_tx Echo(usec).......21
Remote fallback Tw_sys (usec).....21
Tx DLL enabled....................Yes
Tx DLL ready......................Yes
Rx DLL enabled....................Yes
Rx DLL ready......................Yes
Cumulative Energy Saving (W * H)..2.37
Time Since Counters Last Cleared..1 day 20 hr 47 min 34 sec
```

show green-mode

Use the **show green-mode** command to display the green-mode configuration for the whole system.

Syntax

show green-mode

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The status is shown only for the modes supported on the corresponding hardware platform regardless of whether the feature is enabled or disabled.

This command output provides the following information.

Term	Description
Energy Detect	
Energy-detect Config	Energy-detect Admin mode is enabled or disabled.
Energy-detect Opr	Energy detect mode is currently active or inactive. The energy detect mode may be administratively enabled, but the operational status may be inactive.

Term	Description
	EEE
EEE Config	EEE Admin Mode is enabled or disabled.

Example

```
console#show green-mode

Current Power Consumption (mW)................. 11545
Power Saving /Stack (%)........................ 3
Cumulative Energy Saving /Stack (W * H)........ 17

Unit Green Ethernet Features Supported
---- -----------------------------------------------------------------------
1    Energy-Detect EEE LPI-History LLDP-Cap-Exchg Pwr-Usg-Est

Interface     Energy-Detect        Short-Reach-Config     Short-Reach    EEE
             Config       Opr      Auto         Forced       Opr          Config
---------  ---------  ---------  ---------  ---------  -----------   --------
Gi1/0/1    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/2    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/3    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/4    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/5    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/6    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/7    Enabled    Active     Enabled    Disabled   In-Active     Enabled
Gi1/0/8    Enabled    Active     Enabled    Disabled   In-Active     Enabled
```

show green-mode eee-lpi-history interface

Use the **show green-mode eee-lpi-history interface** command to display the interface green-mode EEE LPI history.

Syntax

show green-mode eee-lpi-history interface *interface-id*

- *interface-id*—An Ethernet interface identifier. See Interface Naming Conventions for interface representation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

On combo ports, samples are only collected on the copper ports when enabled.

The following fields are displayed by this command.

Term	Description
Sampling Interval	Interval at which EEE LPI statistics is collected.
Total No. of Samples to Keep	Maximum number of samples to keep.
Percentage LPI Time per Stack	Percentage of total time spent in LPI mode by all ports in the stack when compared to total time since reset.
Sample No.	Sample index.
Sample Time	Time since last reset.
%Time Spent in LPI Mode Since Last Sample	Percentage of time spent in LPI mode on this port when compared to sampling interval.
%Time Spent in LPI Mode Since Last Reset	Percentage of total time spent in LPI mode on this port when compared to time since reset.

Example

This example is on a platform capable of providing power consumption details.

```
console#show green-mode eee-lpi-history interface gi1/0/1

Sampling Interval (sec)....................... 30
Total No. of Samples to Keep.................. 10
Percentage LPI time per stack................. 0


                             Percentage of    Percentage of
Sample     Time Since        Time spent in    Time spent in
 No.       The Sample        LPI mode since   LPI mode since
          Was Recorded       last sample      last reset
```

```
------ -------------------- -------------- --------------
3       00:00:00:09          3              3
2       00:00:00:40          4              7
1       00:00:01:11          3              10
```

GMRP Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The GARP Multicast Registration Protocol (GMRP) provides a mechanism that allows networking devices to dynamically register (and deregister) Group membership information with the MAC networking devices attached to the same segment, and for that information to be disseminated across all networking devices in the bridged LAN that support Extended Filtering Services. The operation of GMRP relies upon the services provided by the Generic Attribute Registration Protocol (GARP). GMRP is supported as described below.

The information registered, deregistered and disseminated via GMRP is in the following forms:

1. Group Membership information: This indicates that there exists one or more GMRP participants which are members of a particular Group, and carry the group MAC addresses associated with the Group.
2. Group service requirements information: This indicates that one or more GMRP participants require Forward all Groups or Forward Unregistered to be the default filtering behavior.

NOTE: The Group Service capability is not supported.

Registration of group membership information allow networking devices to be made aware that frames destined for that group MAC address concerned should be forwarded in the direction of registered members of the group. Forwarding of frames destined for that group MAC address occur on ports on which such membership registration has been received.

Registration of group services requirement information allow networking devices to be made aware that any of their ports that can forward frames in the direction from which the group service requirement information has been received should modify their default group behavior in accordance with the group service requirement expressed.

The registration and deregistration of membership results in the multicast table being updated with a new entry or the existing entry modified.

This ensures that the networking device receives multicast frames from all ports but forwards them through only those ports for which GMRP has created Group registration entry (for that multicast address). Registration entries created by GMRP ensures that frames are not transmitted on LAN segments which neither have registered GMRP participants nor are in the path through the active topology between the sources of the frames and the registered group members.

gmrp enable

Use the **gmrp enable** command in Global Configuration mode to enable GMRP globally or Interface Configuration mode to enable GMRP on a port.

Syntax

gmrp enable

no gmrp enable

Default Configuration

GMRP is disabled by default.

Command Mode

Global Configuration and Interface Configuration modes

User Guidelines

IGMP snooping is incompatible with GMRP and must be disabled on any VLANs running GMRP.

Example

In this example, GMRP is globally enabled.

```
console(config)#gmrp enable
```

clear gmrp statistics

Use the **clear gmrp statistics** command to clear all the GMRO statistics information.

Syntax

clear gmrp statistics [{**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example clears all the GMRP statistics information on port Gi1/0/8.

```
console# clear gmrp statistics gigabitethernet 1/0/8
```

show gmrp configuration

Use the **show gmrp configuration** command in Global Configuration mode and Interface Configuration mode to display GMRP configuration.

Syntax

show gmrp configuration

Default Configuration

GMRP is disabled by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show gmrp configuration

Global GVRP Mode: Disabled
               Join         Leave       LeaveAll      Port      VLAN
Interface     Timer        Timer       Timer      GVRP Mode   Create Register
             (centisecs)  (centisecs)  (centisecs)              Forbid Forbid
-----------  -----------  -----------  -----------  ----------- ------ ------
Gi1/0/1      20           60           1000         Disabled
Gi1/0/2      20           60           1000         Disabled
Gi1/0/3      20           60           1000         Disabled
Gi1/0/4      20           60           1000         Disabled
Gi1/0/5      20           60           1000         Disabled
Gi1/0/6      20           60           1000         Disabled
Gi1/0/7      20           60           1000         Disabled
Gi1/0/8      20           90           1000         Enabled              X
Gi1/0/9      20           60           1000         Disabled
Gi1/0/10     20           60           1000         Disabled
Gi1/0/11     20           60           1000         Disabled
Gi1/0/12     20           60           1000         Disabled
Gi1/0/13     20           60           1000         Disabled
Gi1/0/14     20           60           1000         Disabled
Gi1/0/15     20           60           1000         Disabled
Gi1/0/16     20           60           1000         Disabled
Gi1/0/17     20           60           1000         Disabled
```

GVRP Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

GARP VLAN Registration Protocol (GVRP) is used to propagate VLAN membership information throughout the network. GVRP is based on the Generic Attribute Registration Protocol (GARP), which defines a method of propagating a defined attribute (that is, VLAN membership) throughout the network. GVRP allows both end stations and the networking device to issue and revoke declarations relating to membership in VLANs. End stations that participate in GVRP register VLAN membership using GARP Protocol Data Unit (GPDU) messages. Networking devices that implement the GVRP protocol and enable GVRP then process the GPDUs. The VLAN registration is made in the context of the port that receives the GPDU. The networking device propagates this VLAN membership on all of its other ports in the active topology. Thus, the end station VLAN ID is propagated throughout the network. GVRP is an application defined in the IEEE 802.1p standard that allows for the control of 802.1Q VLANs.

clear gvrp statistics

Use the **clear gvrp statistics** command to clear all the GVRP statistics information.

Syntax

clear gvrp statistics [interface-id]

- *interface-id*—An Ethernet interface identifier or a port channel identifier

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example clears all the GVRP statistics information on interface Gi1/0/8.

```
console# clear gvrp statistics gigabitethernet 1/0/8
```

garp timer

Use the **garp timer** command in Interface Configuration mode to adjust the GARP application join, leave, and leaveall GARP timer values. To reset the timer to default values, use the **no** form of this command.

Syntax

garp timer {**join** | **leave** | **leaveall**} *timer_value*

no garp timer

- **join** — Indicates the time in centiseconds that PDUs are transmitted.
- **leave** — Indicates the time in centiseconds that the device waits before leaving its GARP state.
- **leaveall** — Used to confirm the port within the VLAN. The time is the interval between messages sent, measured in centiseconds.
- *timer_value* — Timer values in centiseconds. The range is 10-100 for **join**, 20-600 for **leave**, and 200-6000 for **leaveall**.

Default Configuration

The default timer values are as follows:

- Join timer — 20 centiseconds
- Leave timer — 60 centiseconds
- Leaveall timer — 1000 centiseconds

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode and port channel interface configuration mode. The following *relationships* for the various timer values must be maintained:

- Leave time must be greater than or equal to three times the join time.
- Leaveall time must be greater than the leave time.

Set the same GARP timer values on all Layer 2-connected devices. If the GARP timers are set differently on Layer 2-connected devices, the GARP application will not operate successfully.

The *timer_value* setting must be a multiple of 10.

Example

The following example sets the leave timer for port 1/0/8 to 90 centiseconds.

```
console (config)# interface gigabitethernet 1/0/8
console (config-if-Gi1/0/8)# garp timer leave 90
```

gvrp enable (Global Configuration)

Use the **gvrp enable (global)** command in Global Configuration mode to enable GVRP globally on the switch. To disable GVRP globally on the switch, use the **no** form of this command.

Syntax

gvrp enable

no gvrp enable

Default Configuration

GVRP is globally disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example globally enables GVRP on the device.

```
console(config)#gvrp enable
```

gvrp enable (Interface Configuration)

Use the **gvrp enable** command in Interface Configuration mode to enable GVRP on an interface. To disable GVRP on an interface, use the **no** form of this command.

Syntax

gvrp enable

no gvrp enable

Default Configuration

GVRP is disabled on all interfaces by default.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode and port channel interface configuration mode. An Access port cannot join dynamically to a VLAN because it is always a member of only one VLAN.

Membership in untagged VLAN would be propagated in a same way as a tagged VLAN. In such cases it is the administrator's responsibility to set the PVID to be the untagged VLAN VID.

Example

The following example enables GVRP on Gigabit Ethernet 1/0/8.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#gvrp enable
```

gvrp registration-forbid

Use the **gvrp registration-forbid** command in Interface Configuration mode to deregister all VLANs on a port and prevent any dynamic registration on the port. To allow dynamic registering for VLANs on a port, use the **no** form of this command.

Syntax

gvrp registration-forbid

no gvrp registration-forbid

Default Configuration

Dynamic registering and deregistering for each VLAN on the port is not forbidden.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode and port channel interface configuration mode.

Example

The following example shows how default dynamic registering and deregistering is forbidden for each VLAN on port 1/0/8.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#gvrp registration-forbid
```

gvrp vlan-creation-forbid

Use the **gvrp vlan-creation-forbid** command in Interface Configuration mode to disable dynamic VLAN creation. To enable dynamic VLAN creation, use the **no** form of this command.

Syntax

gvrp vlan-creation-forbid

no gvrp vlan-creation-forbid

Default Configuration

By default, dynamic VLAN creation is enabled.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command is available in Ethernet interface configuration mode and port channel interface configuration mode.

Example

The following example disables dynamic VLAN creation on port 1/0/8.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#gvrp vlan-creation-forbid
```

show gvrp configuration

Use the **show gvrp configuration** command to display GVRP configuration information. Timer values are displayed. Other data shows whether GVRP is enabled and which ports are running GVRP.

Syntax

show gvrp configuration [*interface-id*]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is valid for Ethernet and port-channel interfaces. If no interface-id parameter is given, all interfaces are shown.

Example

The following example shows how to display GVRP configuration information:

```
console# show gvrp configuration
Global GVRP Mode: Disabled
Join          Leave       LeaveAll      Port       VLAN
Interface      Timer        Timer        Timer      GVRP Mode   Create Register
             (centisecs)  (centisecs)  (centisecs)              Forbid Forbid
-----------  -----------  -----------  -----------  ----------- ------ ------
Gi1/0/1         20           60           1000         Disabled
Gi1/0/2         20           60           1000         Disabled
Gi1/0/3         20           60           1000         Disabled
Gi1/0/4         20           60           1000         Disabled
Gi1/0/5         20           60           1000         Disabled
Gi1/0/6         20           60           1000         Disabled
Gi1/0/7         20           60           1000         Disabled
Gi1/0/8         20           60           1000         Disabled
Gi1/0/9         20           60           1000         Disabled
Gi1/0/10        20           60           1000         Disabled
Gi1/0/11        20           60           1000         Disabled
Gi1/0/12        20           60           1000         Disabled
Gi1/0/13        20           60           1000         Disabled
Gi1/0/14        20           60           1000         Disabled
```

show gvrp error-statistics

Use the **show gvrp error-statistics** command in User Exec mode to display GVRP error statistics.

Syntax

show gvrp error-statistics [*interface-id*]

- *interface-id*—An Ethernet interface identifier or a port channel interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If no interface-id parameter is given, all interfaces are shown.

Example

The following example displays GVRP error statistics information.

```
console>show gvrp error-statistics

GVRP error statistics:
----------------
Legend:

INVPROT: Invalid Protocol Id  INVATYP: Invalid Attribute Type
INVALEN: Invalid Attribute Length INVAVAL: Invalid Attribute Value
INVEVENT: Invalid Event

Port INVPROT    INVATYP     INVAVAL    INVALEN    INVEVENT
---- -------    -------     -------    -------    --------
Gi1/0/1    0          0           0          0          0
Gi1/0/2    0          0           0          0          0
Gi1/0/3    0          0           0          0          0
Gi1/0/4    0          0           0          0          0
```

show gvrp statistics

Use the **show gvrp** statistics command in User Exec mode to display GVRP statistics.

Syntax

show gvrp statistics [*interface-id*]

- *interface-id* —An Ethernet interface identifier or a port channel interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

This example shows output of the **show gvrp statistics** command.

```
console>show gvrp statistics

GVRP statistics:
------------------------------
Legend:

rJE  : Join Empty Received            rJIn : Join In Received
rEmp : Empty Received                 rLIn : Leave In Received
rLE  : Leave Empty Received           rLA  : Leave All Received
sJE  : Join Empty Sent                JIn  : Join In Sent
sEmp : Empty Sent                     sLIn : Leave In Sent
sLE  : Leave Empty Sent               sLA  : Leave All Sent

Port   rJE  rJIn  rEmp  rLIn  rLE   rLA  sJE  sJIn  sEmp  sLIn  sLE  sLA
----   ---  ----  ----  ----  ---   ---  ---  ---   ---   ----  ---- ---
Gi1/0/1    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/2    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/3    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/4    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/5    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/6    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/7    0    0    0      0     0    0    0    0     0     0      0    0
Gi1/0/8    0    0    0      0     0    0    0    0     0     0      0    0
```

IGMP Snooping Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Snooping of Internet Group Management Protocol (IGMP) messages is a feature that allows Dell EMC Networking switches to forward multicast traffic intelligently on the switch. Multicast traffic is traffic that is destined to a host group. Host groups are identified by the destination MAC address, i.e. the range 01:00:5e:00:00:00-01:00:5e:7f:ff:ff:ff for IPv4 multicast traffic or 33:33:xx:xx:xx:xx for IPv6 multicast traffic. Based on the IGMP query and report messages, the switch forwards traffic only to the ports that request the multicast traffic. This prevents the switch from broadcasting the traffic to all ports and possibly affecting network performance.

IGMP snooping switches build forwarding lists by monitoring for, and in some cases intercepting, IGMP messages. Although the software processing the IGMP messages could maintain state information based on the full IP group addresses, the forwarding tables in Dell EMC Networking are mapped to link layer addresses.

The Multicast Forwarding Database (MFDB) manages the forwarding address table for Layer 2 multicast protocols, such as IGMP Snooping.

The IGMP Snooping code in the CPU ages out IGMP entries in the MFDB. If a report for a particular group on a particular interface is not received within a certain time interval (query interval), the IGMP Snooping code deletes that interface from the group. The value for query interval time is configurable using management.

If an IGMP Leave Group message is received on an interface, the IGMP Snooping code sends a query on that interface and waits a specified length of time (maximum response time). If no response is received within that time, that interface is removed from the group. The value for maximum response time is configurable using management.

In addition to building and maintaining lists of multicast group memberships, the snooping switch also maintains a list of multicast routers. When forwarding multicast packets, they should be forwarded on ports that have joined using IGMP and also on ports on which multicast routers are attached. The reason for this is that in IGMP there is only one active query mechanism. This means that all other routers on the network are suppressed and thus not detectable by the switch. If a query is not received on an interface within a specified length of time (multicast router present expiration time), that interface is removed from the list of interfaces with multicast routers attached. The multicast router present expiration time is configurable using management. The default value for the multicast router expiration time is zero, which indicates an infinite time-out (that is, no expiration).

ip igmp snooping

Use the **ip igmp snooping** command in Global Configuration mode without parameters to globally enable Internet Group Management Protocol (IGMP) snooping. Use the **vlan** form of the command to enable IGMP snooping on a specific VLAN. Use the **no** form of this command to disable IGMP snooping globally.

Syntax

ip igmp snooping [**vlan** *vlan-id*]

no ip igmp snooping [**vlan** *vlan-id*]

- *vlan-id*—Specifies a VLAN ID value.

Default Configuration

IGMP snooping is enabled globally and on all VLANs by default.

Command Mode

Global Configuration mode

User Guidelines

Use this command without parameters to globally enable IGMP snooping. Use the no form of the command to disable IGMP snooping. Use the vlan parameter to enable IGMP snooping on a specific VLAN. GMRP is incompatible with IGMP snooping and should be disabled on any VLANs on which IGMP snooping is enabled. It is recommended that MLD snooping should be enabled whenever IGMP snooping is enabled to ensure that unwanted pruning of multicast protocol packets used by other protocols does not occur.

Enabling IGMP snooping on a VLAN in which L3 multicast is enabled is recommended. If a multicast source is connected to a VLAN on which both L3 multicast and IGMP/MLD snooping are enabled, the multicast source is forwarded to the mrouter ports, including the internal mrouter port. If IGMP snooping is disabled, multicast data plane packets are flooded in the VLAN.

IGMP snooping (and IGMP querier) validates IGMP packets. As part of the validation, IGMP checks for the router alert option. If other devices in the network do not send IGMP packets with the router alert option, IGMP snooping (and snooping querier) will discard the packet. Use the **no ip igmp snooping router-alert-check** command to disable checking for the router alert option. IGMP packets are intended to be confined to the local link, IGMP snooping validates that the IP TTL is 1 and discards packets with other values.

Example

```
console(config)#ip igmp snooping
console(config)#no ip igmp snooping vlan 1
```

Command History

Revised in 6.3.5 release.

show ip igmp snooping

Use the **show ip igmp snooping** command to display the IGMP snooping configuration and SSM statistics.

Syntax

show ip igmp snooping [**vlan** *vlan-id*]

- *vlan-id*—Specifies a VLAN ID value.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console(config)#show ip igmp snooping

Admin Mode...................................... Enable
IGMP Router-Alert check......................... Enabled
Multicast Control Frame Count................... 0
SSM FDB Capacity................................ 0
SSM FDB Current Entries......................... 0
SSM FDB High Water Mark. ....................... 0
Flooding Unregistered to All Ports............. Disabled

Vlan 1:
--------
IGMP Snooping Admin Mode....................... Enabled
Immediate Leave Mode........................... Disabled
Group Membership Interval...................... 260
Last Member Query Interval..................... 10
Multicast Router Expiry Time................... 300
Report Suppression Mode........................ Enabled
```

show ip igmp snooping groups

Use the **show ip igmp snooping groups** command in User Exec mode to display the multicast groups learned by IGMP snooping and IGMP SSM entries.

Syntax

show ip igmp snooping groups [**vlan** *vlan-id*] [**address** *ip-multicast-address*]

- *vlan-id* — Specifies a VLAN ID value.
- *ip-multicast-address* — Specifies an IP multicast address.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

To see the full multicast address table (including static addresses) use the show mac address-table command.

Example

This example shows IGMPv2 snooping entries

```
console(config)#show ip igmp snooping groups

Vlan        Group                  Type                    OIFs
----  -----------------------  -------  ------------------------------------
1     224-239.129|1.2.3        Dynamic           Te1/0/1,Te1/0/17


IGMP SSM Entries:
-------------------

VLAN Group                  Reporter          Filter  IIF        Source Address
---- ------------------ ----------------- ------- ---------- ---------------
1    224.2.2.2          192.168.10.2      include Te1/0/1    1.1.1.2
                                                             2.2.2.2
1    224.3.3.3          192.168.10.2      include Te1/0/1    4.4.4.4


VLAN Group                     Reporter          Filter  IIF        Source Address
---- --------------------- ----------------- ------- ---------- -----------
1    224.2.2.2              192.168.10.2      include Te1/0/1    1.1.1.2

console(config)#show ip igmp snooping

Admin Mode..................................... Enable
IGMP Router-Alert check........................ Disabled
Multicast Control Frame Count.................. 6847
SSM FDB Capacity............................... 128
SSM FDB High Water Mark........................ 1
SSM FDB Current Entries........................ 1
```

```
Flooding Unregistered to All Ports............ Disabled

Vlan 1:
--------
IGMP Snooping Admin Mode...................... Enabled
Immediate Leave Mode.......................... Disabled
Group Membership Interval..................... 260
Last Member Query Interval.................... 10
Multicast Router Expiry Time.................. 300
Report Suppression Mode........................ Enabled
```

show ip igmp snooping mrouter

Use the **show ip igmp snooping mrouter** command to display information on dynamically learned multicast router interfaces.

Syntax

show ip igmp snooping mrouter

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows IGMP snooping mrouter information.

```
console#show ip igmp snooping mrouter
VLAN ID   Port
-------   -----------
10        Gi2/0/1
```

ip igmp snooping vlan immediate-leave

This command enables or disables IGMP Snooping immediate-leave mode on a selected VLAN.

Syntax

ip igmp snooping vlan *vlan-id* **immediate-leave**

no ip igmp snooping vlan *vlan-id* **immediate-leave**

- *vlan id* — A VLAN identifier (range 1-4093).

Default Configuration

IGMP snooping immediate-leave mode is disabled on VLANs by default.

Command Mode

Global Configuration mode

User Guidelines

Enabling immediate-leave allows the switch to immediately remove the Layer 2 LAN interface from its forwarding table entry upon receiving an IGMP leave message for that multicast group without first sending out MAC-based general queries to the interface. The **no** form of this command disables IGMP Snooping immediate-leave mode on a VLAN.

Enable immediate-leave admin mode only on VLANs where only one host is connected to each layer 2 LAN port. This setting prevents the inadvertent dropping of the other hosts that were connected to the same Layer 2 LAN port, but were still interested in receiving multicast traffic directed to that group. Also, immediate-leave processing is supported only with IGMP version 2 hosts.

Example

The following example enables IGMP snooping immediate-leave mode on VLAN 2.

```
console(config)#ip igmp snooping vlan 2 immediate-leave
```

ip igmp snooping vlan groupmembership-interval

This command sets the IGMP Group Membership Interval time on a VLAN.

Syntax

ip igmp snooping vlan *vlan-id* **groupmembership-interval** *time*

no ip igmp snooping vlan *vlan-id* **groupmembership-interval**

- *vlan-id* — A VLAN identifier (Range 1-4093).
- time — IGMP group membership interval time in seconds. (Range: 2–3600)

Default Configuration

The default group membership interval time is 260 seconds.

Command Mode

Global Configuration mode

User Guidelines

The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the IGMPv3 Maximum Response time value. The range is 2 to 3600 seconds. The **no** form of this command sets the IGMPv3 Group Membership Interval time to the default value.

Example

The following example configures an IGMP snooping group membership interval of 1500 seconds on VLAN 2.

```
console(config)#ip igmp snooping vlan 2 groupmembership-interval 1500
```

ip igmp snooping vlan last-member-query-interval

This command sets the last-member-query interval on a particular VLAN.

Syntax

ip igmp snooping vlan *vlan-id* **last-member-query-interval** *time*

no ip igmp snooping vlan *vlan-id* **last-member-query-interval**

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *time* — Number of seconds after which a host is considered to have left the group. (Range: 1-25)

Default Configuration

The default maximum response time is 10 seconds.

Command Mode

Global Configuration mode

User Guidelines

The last-member-query-interval is the amount of time in seconds after which a host is considered to have left the group. This value must be less than the IGMP Query Interval time value. The range is 1 to 25 seconds. The **no** form of this command sets the last-member-query-interval on the VLAN to the default value. When using IGMP Snooping Querier, this parameter should be less than the value for the IGMP Snooping Querier query interval.

Example

The following example sets the maximum response time to 7 seconds on VLAN 2.

```
console(config)#ip igmp snooping vlan 2 last-member-query-interval 7
```

ip igmp snooping vlan mcrtrexpiretime

This command sets the multicast router present expiration time. The time is set on a particular VLAN. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 1–2147483647 seconds. A value of 0 indicates an infinite time-out (no expiration). The **no** form of this command sets the multicast router present expiration time to 0.

Syntax

ip igmp snooping vlan *vlan-id* **mcrtexpiretime** *time*

no ip igmp snooping vlan *vlan-id* **mcrtexpiretime**

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *time*— Multicast router present expiration time. (Range: 1–3600)

Default Configuration

The default multicast router present expiration time is 300 seconds.

Command Mode

Global Configuration mode

User Guidelines

The expiry time is configured for an individual VLAN. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 1–2147483647 seconds. A value of 0 indicates an infinite time-out (no expiration). The **no** form of this command sets the multicast router present expiration time to 0.The mcrexpiretime should be less than the group membership interval.

Example

The following example sets the multicast router present expiration time on VLAN 2 to 60 seconds.

```
console(config)#ip igmp snooping vlan 2 mcrtrexpiretime 1500
```

ip igmp snooping report-suppression

This command enables IGMP report suppression on a specific VLAN. The **no** form of this command disables report suppression.

Syntax

ip igmp snooping vlan *vlan-id* **report-suppression**

no ip igmp snooping vlan *vlan-id* **report-suppression**

- *vlan-id* — A VLAN identifier (Range 1-4093).

Default Configuration

Report suppression is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

When IGMP report suppression is enabled, the switch only sends the first report received for a group in response to a query. Report suppression is only applicable to IGMPv1 and IGMPv2.

Example

The following example sets the snooping report suppressions time to 10 seconds.

```
console(config)#ip igmp snooping vlan 10 report-suppression
```

ip igmp snooping unregistered floodall

This command enables flooding of unregistered multicast traffic to all ports in the VLAN. Use the **no** form of this command to only flood unregistered multicast traffic to multicast router ports.

Syntax

ip igmp snooping unregistered floodall

no ip igmp snooping unregistered floodall

Default Configuration

Unregistered multicast traffic is only flooded to router ports by default. If no mrouter ports are configured, or IGMP snooping cannot identify a multicast router, then unregistered multicast is flooded to all ports in the VLAN.

Command Mode

Global Configuration mode.

User Guidelines

There is no equivalent MLD command since this setting applies to both protocols.

Example

```
console(config)#ip igmp snooping unregistered floodall
```

ip igmp snooping vlan mrouter

This command statically configures a port as connected to a multicast router for a specified VLAN. Use the **no** form of this command to remove the static binding.

Syntax

ip igmp snooping vlan *vlan-id* **mrouter interface** *interface-id*

no ip igmp snooping vlan *vlan-id* **mrouter interface** *interface-id*

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *interface-id*—The next-hop interface to the multicast router. Ethernet interface identifiers and port channel identifiers are allowed.

Default Configuration

There are no multicast router ports configured by default.

Command Mode

Global Configuration mode.

User Guidelines

It is preferable to configure mrouter ports for IGMP snooping as opposed to configuring a static MAC address entry for the router. A static MAC address entry is tied to a specific port whereas an mrouter configuration will dynamically learn the MAC address of the router. Multiple mrouter ports may be configured for a VLAN.

IGMP snooping will consider that an mrouter is active if an mrouter port is defined in the VLAN, regardless of whether the mrouter port is up or not. If an mrouter port is defined, IGMP snooping will not flood unregistered multicast packets received in the VLAN. This behavior can be used to ensure that IGMP snooping will selectively forward IPv4 multicast data traffic in a VLAN even if no dynamically discovered IPv4 multicast router has been discovered.

Multicast data plane traffic from multicast sources in a VLAN is always forwarded to the mrouter ports in the VLAN. Multicast control plane packets (those addressed to the reserved 224.0.0.X address) are always flooded to all ports in the VLAN, regardless of whether an mrouter port is defined or not.

Example

```
console(config)#ip igmp snooping vlan 10 mrouter interface Gi1/0/2
```

IGMP Snooping Querier Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The IGMP Snooping Querier is an extension to the IGMP Snooping feature. IGMP Snooping Querier allows the switch to simulate an IGMP router in a Layer 2-only network, thus removing the need to have an IGMP Router to collect and refresh the multicast group membership information. The querier function simulates a small subset of the IGMP router functionality. IGMP Snooping Querier is not recommended for networks in which a multicast router is reachable.

In a network with IP multicast routing, an IP multicast router acts as the IGMP querier. However, if it is required that the IP-multicast traffic in a VLAN be switched and no multicast router is present in the network, the Dell EMC Networking switch can be configured as an IGMP querier. When IGMP Snooping Querier is enabled, the Querier sends out periodic IGMP General Queries that trigger the multicast listeners/members to send their joins to the querier so as to receive the multicast data traffic. IGMP snooping listens to these reports to establish the appropriate L2 forwarding table entries.

The Dell EMC Networking supports version IGMP V1 and 2 for snooping IGMP queries.

ip igmp snooping querier

This command enables IGMP Snooping Querier on the system (Global Configuration mode) or on a VLAN.

Syntax

ip igmp snooping querier [**vlan** *vlan-id*] [**address** *ip-address*]

no ip igmp snooping querier [**vlan** *vlan-id*] [**address**]

- *vlan-id* — A valid VLAN number.
- *ip-address* — An IPv4 address used for the source address.

Default Configuration

The IGMP Snooping Querier feature is globally disabled on the switch. When enabled, the IGMP Snooping Querier stops sending queries if it detects IGMP queries from a multicast-enabled router. The Snooping Querier periodically (querier timer expiry) wakes up and listens for IGMP queries, and if found, goes back to sleep. If no IGMP queries are heard, then the Snooping Querier will resume querying.

Command Mode

Global Configuration mode

User Guidelines

Using this command, you can specify the IP address that the snooping querier switch should use as the source address when generating periodic queries. The **no** form of this command disables IGMP Snooping Querier on the system. Use the optional address parameter to set or reset the querier address.

If a VLAN has IGMP Snooping Querier enabled, and IGMP Snooping is operationally disabled on the VLAN, IGMP Snooping Querier functionality is disabled on that VLAN. IGMP Snooping Querier functionality is reenabled if IGMP Snooping becomes operational on the VLAN. The IGMP Snooping Querier application sends periodic general queries on the VLAN to solicit membership reports.

When using the command in Global Configuration mode to configure a snooping querier source address, the IPv4 address is the global querier address. When using the command in VLAN Configuration mode to configure a snooping querier source address, the IPv4 address is the querier address for the VLAN. If there are no global or VLAN querier addresses configured, then the management IP address is used as the IGMP snooping querier source address. Using all zeros for the querier IP address disables it. The VLAN IP address takes precedence over the global IP address when both are configured. IGMP Querier does not detect when the local switch is configured as a multicast router. It is not recommended to configure both L3 multicast routing and IGMP Querier on the same switch.

IGMP snooping (and IGMP querier) validates IGMP packets. As part of the validation, IGMP checks for the router alert option. If other devices in the network do not send IGMP packets with the router alert option, IGMP snooping (and snooping querier) will discard the packet. Use the **no ip igmp snooping router-alert-check** command to disable checking for the router alert option.

Example

The following example enables IGMP snooping querier in Global Configuration mode.

```
console(config)#ip igmp snooping querier vlan 1 address 10.19.67.1
```

ip igmp snooping querier election participate

This command enables the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Snooping Querier in the VLAN.

Syntax

ip igmp snooping querier election participate *vlan-id*

no ip igmp snooping querier election participate *vlan-id*

Parameters

- *vlan-id*—The VLAN identifier on which the querier is expected to operate. Range 1-4093.

Default Configuration

The snooping querier is configured to not participate in the querier election by default.

Command Mode

Global Configuration mode

User Guidelines

When election mode is enabled, if the Snooping Querier finds that the other Querier source address is numerically higher than the Snooping Querier address, it stops sending periodic queries. The Snooping Querier with the numerically lower IP address wins the election, and continues sending periodic queries. The **no** form of this command sets the snooping querier not to participate in the querier election but to stop sending queries as soon as it discovers the presence of another querier in the VLAN. If the switch detects another querier in the VLAN, it will cease sending queries for the querier timeout period.

Example

The following example configures the snooping querier to participate in the querier election on VLAN 10.

```
console(config)#ip igmp snooping querier election participate 10
```

ip igmp snooping querier query-interval

This command sets the IGMP Querier Query Interval time, which is the amount of time in seconds that the switch waits before sending another periodic query. The **no** form of this command sets the IGMP Querier Query Interval time to its default value.

Syntax

ip igmp snooping querier query-interval *interval-count*

no ip igmp snooping querier query-interval

- *interval–count* — Amount of time in seconds that the switch waits before sending another general query. (Range: 1-1800)

Default Configuration

The query interval default is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

The value of this parameter should be larger than the IGMP Max Response Time value inserted into general query messages by the querier. The default IGMP Max Response Time is defined in RFC 3376 as 10 seconds. Dell EMC Networking queriers use this value when sending general query messages.

Use the show ip igmp snooping querier vlan command to display the operational max response time value.

Example

The following example sets the query interval to 1800:

```
console(config)#ip igmp snooping querier query-interval 1800
```

ip igmp snooping querier timer expiry

This command sets the IGMP querier timer expiration period which is the time period that the switch remains in non-querier mode after it has discovered that there is a multicast querier in the network. The **no** form of this command sets the IGMP querier timer expiration period to its default value.

Syntax

ip igmp snooping querier timer expiry *seconds*

no ip igmp snooping querier timer expiry

- *seconds* — The time in seconds that the switch remains in Non-Querier mode after it has discovered that there is a multicast querier in the network. The range is 60–300 seconds.

Default Configuration

The query interval default is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the querier timer expiry time to 100 seconds.

```
console(config)#ip igmp snooping querier timer expiry 100
```

ip igmp snooping querier version

This command sets the IGMP version of the query that the snooping switch is going to send periodically. The **no** form of this command sets the IGMP Querier Version to its default value.

Syntax

ip igmp snooping querier version *version*

no ip igmp snooping querier version

- *version* — IGMP version. (Range: 1–2)

Default Configuration

The querier version default is 2.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the IGMP version of the querier to 1.

```
console(config)#ip igmp snooping querier version 1
```

show ip igmp snooping querier

This command displays IGMP Snooping Querier information. Configured information is displayed whether or not IGMP Snooping Querier is enabled. If a querier is active in the network and IGMP snooping querier is enabled, the querier's IP address is shown in the Last Querier Address field.

Syntax

show ip igmp snooping querier [**detail** | **vlan** *vlan-id*]

- *vlan-id* —Specifies a VLAN ID value.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all submodes

User Guidelines

When the optional argument *vlan-id* is not used, the command shows the following information.

Parameter	Description
IGMP Snooping Querier	Indicates whether or not IGMP Snooping Querier is active on the switch.
IGMP Version	Indicates the version of IGMP that will be used while sending out the queries.
Querier Address	Shows the IP address that is used in the IPv4 header when sending out IGMP queries. It can be configured using the appropriate command.
Querier Query Interval	Shows the amount of time in seconds that a Snooping Querier waits before sending out the periodic general query.
Querier Expiry Interval	Displays the amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When a value is given for *vlan-id*, the following information appears.

Parameter	Description
IGMP Snooping Querier VLAN Mode	Indicates whether IGMP Snooping Querier is active on the VLAN.
Operational State	Indicates whether IGMP Snooping Querier is in the Querier or Non-Querier state. When the switch is in Querier state it sends out periodic general queries. When in Non-Querier state it waits for moving to Querier state and does not send out any queries.

Parameter	Description
VLAN Operational Max Response Time	Indicates the time to wait before removing a Leave from a host upon receiving a Leave request. This value is calculated dynamically from the Queries received from the network. If the Snooping Switch is in Querier state, then it is equal to the configured value.
Querier Election Participate Mode	Indicates whether the IGMP Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Last Address	Indicates the IP address of the most recent Querier from which a Query was received.
Operational Version	Indicates the IGMP version of the most recent Querier from which a Query was received on this VLAN.
Elected Querier	Indicates the IP address of the Querier that has been designated as the Querier based on its source IP address. This field will be 0.0.0.0 when Querier Election Participate mode is disabled.

If no querier has been elected, the Elected Querier output is not shown. If the querier has not received any queries, then the Last Querier Address information is not shown. When the optional argument detail is used, the command shows the global information and the information for all Querier enabled VLANs.

Example

The following example shows querier information for VLAN 1.

```
console#show ip igmp snooping querier vlan 1

Vlan 1   :   IGMP Snooping querier status
----------------------------------------------
IGMP Snooping Querier Vlan Mode................ Enable
Querier Election Participate Mode............. Disable
Querier Vlan Address........................... 10.19.67.1
Operational State.............................. Querier
Operational version............................ 1
```

Interface Error Disable and Auto Recovery Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Interface error disable automatically disables an interface when an error is detected; no traffic is allowed until the interface is either manually re-enabled or, if auto recovery is configured, the configured auto recovery time interval has passed.

For interface error disable and auto recovery, when an error condition is detected for an interface, the interface is placed in a diagnostic disabled state by shutting down the interface. The error disabled interface does not allow any traffic until the interface is re-enabled. The error disabled interface can be manually enabled using the **no shutdown** command. Alternatively administrator can enable auto recovery feature. Dell EMC Networking Auto Recovery re-enables the interface after the expiry of configured time interval.

errdisable recovery cause

Use the **errdisable recovery cause** command to enable automatic recovery of any interface when disabled from the listed cause. Use the no form of the command to disable auto-recovery globally or for a specific cause.

Syntax

errdisable recovery cause {**all**|**arp-inspection**|**authmgr**| **bcast-storm** |**bpduguard**|**bpdustorm**|**coa**|**denial-of-service**|**dhcp-rate-limit**|**link-flap** |**loop-protect**|**mcast-storm**|**port-security**|**sfp-mismatch**|**sfpplus-mismatch** |**spanning-tree**|**ucast-storm**|**udld** }

- All — Recovery for all possible causes is enabled.
- authmgr— Authentication Manager auto-recovery.
- bpduguard — BPDU Guard auto-recovery.
- bcast-storm — Broadcast storm auto-recovery.
- bpdustorm — BPDU Storm auto-recovery.
- denial-of-service — Denial of Service auto-recovery.

- link-flap — Link flap recovery.
- loop-protect — Loop Protection auto-recovery.
- port-security — Port security MAC locking auto-recovery.
- mcast-storm — Multicast Storm auto-recovery.
- sfp-mismatch — SFP mismatch auto-recovery.
- sfpplus-mismatch — SFP+ transceiver inserted in SFP port auto-recovery.
- spanning-tree — Spanning-tree auto-recovery.
- udld — UDLD auto-recovery.
- ucast-storm — Unicast Storm auto-recovery.

Default Configuration

No recovery causes are enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Error disabled interfaces indicate that a problem occurred that must be resolved by the administrator. This could be a configuration problem or a physical problem (wiring) and does not necessarily indicate a problem with the switch.

This command enables auto-recovery of an interface for the specified cause (e.g., bpduguard) or all causes. An interface in the disabled state due to the configured cause is recovered (link up) when the recovery interval expires. If the interface continues to encounter errors (from any listed cause), it may be placed back in the diag-disable state and the interface will be disabled (link down).

Interfaces in the disabled state due to a listed cause may be manually recovered by entering the no shutdown command for the interface.

Interfaces in the disabled state may be manually shut down. These interfaces will not be recovered.

Auto-recovery applies to Ethernet interfaces and link aggregation groups.

Command History

Implemented in version 6.3.0.1 firmware. Additional causes added in version 6.5 firmware. Updated in version 6.6 firmware to add 802.1x auto-recovery.

Example

The following example enables auto-recovery for all causes.

```
console(config)#errdisable recovery cause all
```

errdisable recovery interval

Use the **errdisable recovery interval** command to configure the interval for error recovery of interfaces disabled due to any cause. Use the **no** form of the command to reset the interval to the default.

Syntax

errdisable recovery interval *interval*

- *interval* — The interval in seconds. The range is 30-3600 seconds. The default is 300 seconds.

Default Configuration

The default interval is 300 seconds. Range 30-3600 seconds.

No recovery causes are enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Error disabled interfaces indicate that a problem that must be resolved by the administrator. This could be a configuration problem or a physical problem and does not necessarily indicate a problem with the switch.

When the interval expires, the system examines the error disabled interfaces and recovers them if recovery for the indicated cause is enabled. Only a single timer is used and recovery occurs when the timer expires, not when the interface time expires.

Interfaces recovered by auto-recovery issue a log message indicating that recovery is being attempted.

```
<13> Sep 25 14:38:32 10.130.135.107-1 UDLD[nim_t]: udld_util.c(1829) 87 %%
Interface Gi1/0/1 is restored from the error disabled state.
```

Command History

Implemented in version 6.3.0.1 firmware.

Example

The following example sets the error recovery timer to 30 seconds.

```
console(config)#errdisable recovery interval 30
```

show errdisable recovery

Use the **show errdisable recovery** command to display the error disable configuration for each possible cause.

Syntax

show errdisable recovery

Default Configuration

By default, no recovery causes are enabled.

Command Mode

Global Configuration mode

User Guidelines

Error disabled interfaces indicate that a problem that must be resolved by the administrator. This could be a configuration problem or a physical problem and does not necessarily indicate a problem with the switch.

When the interval expires, the system examines the error disabled interfaces and recovers them if recovery for the indicated cause is enabled. Only a single timer is used and recovery occurs when the timer expires, not when the interface time expires.

Interfaces recovered by auto-recovery issue a log message indicating that recovery is being attempted.

```
<13> Sep 25 14:38:32 10.130.135.107-1 UDLD[nim_t]: udld_util.c(1829) 87 %%
Interface Gi1/0/1 is restored from the error disabled state.
```

The following information is displayed.

Term	Parameter	Description
ARP inspection	arp-inspection	ARP inspection auto-recovery.
BPDU Guard	bpduguard	BPDU guard auto-recovery.
Broadcast Storm	bcast-storm	Broadcast storm auto-recovery.
BPDU Storm	bpdustorm	BPDU storm auto-recovery.
Denial of Service	denial-of-service	Denial of Service auto-recovery.
DHCP Rate Limit	dhcp-rate-limit	DHCP rate limit auto-recovery.
Loop Protection	loop-protect	Loop protection auto-recovery.
Port MAC Locking	port-security	Port security MAC locking auto-recovery.
Multicast Storm	mcast-storm	Multicast storm auto-recovery.
SFP Mismatch	sfp-mismatch	SFP mismatch auto-recovery.
SFP Plus Mismatch	sfpplus-mismatch	SFP+ transceiver inserted in SFP port auto-recovery.
Spanning Tree	spanning-tree	Spanning-tree auto-recovery.
UDLD	udld	UDLD auto-recovery.
Unicast Storm	ucast-storm	Unicast storm auto-recovery.
Denial of Service	denial-of-service	Denial of Service auto-recovery.
Time Interval	time interval	Time interval for auto-recovery in seconds.

Command History

Implemented in version 6.3.0.1 firmware. Modified in version 6.5 firmware.

Example

```
console(config)#show errdisable recovery
```

```
Reason                  Auto-recovery Status
------------------     ---------------------
ARP Inspection            Disabled
BPDU Guard                Disabled
Broadcast Storm           Disabled
BPDU Storm                Disabled
Denial of Service         Disabled
DHCP Rate Limit           Disabled
Keep Alive                Disabled
Loop Protection           Disabled
Port Security             Disabled
Multicast Storm           Disabled
SFP Mismatch              Disabled
SFP Plus Mismatch         Disabled
Spanning Tree             Disabled
UDLD                      Disabled
Unicast Storm             Disabled

Interval for auto-recovery of error disabled interfaces: 300 seconds
```

show interfaces status err-disabled

Use the **show interfaces status err-disabled** command to display the interfaces that are error disabled by the system.

Syntax

show interfaces status err-disabled

Default Configuration

No recovery causes are enabled by default.

Command Mode

EXEC mode, Privileged Exec mode, and all submodes.

User Guidelines

Error disabled interfaces indicate that a problem that must be resolved by the administrator. This could be a configuration problem or a physical problem and does not necessarily indicate a problem with the switch.

When the interval expires, the system examines the error disabled interfaces and recovers them if recovery for the indicated cause is enabled. Only a single timer is used and recovery occurs when the timer expires, not when the interface time expires. The recovery delay time indicates the number of seconds until the interface is eligible for recovery if auto-recovery is enabled for the indicated cause.

Interfaces recovered by auto-recovery issue a log message indicating that recovery is being attempted.

```
<13> Sep 25 14:38:32 10.130.135.107-1 UDLD[nim_t]: udld_util.c(1829) 87 %%
Interface Gi1/0/1 is restored from the error disabled state.
```

The possible causes for error disabled interfaces are:

Term	**Parameter**	**Description**
ARP inspection	arp-inspection	ARP inspection auto-recovery.
BPDU Guard	bpduguard	BPDU guard auto-recovery.
Broadcast Storm	bcast-storm	Broadcast storm auto-recovery.
BPDU Storm	bpdustorm	BPDU storm auto-recovery.
Denial of Service	denial-of-service	Denial of Service auto-recovery.
DHCP Rate Limit	dhcp-rate-limit	DHCP rate limit auto-recovery.
Loop Protection	loop-protect	Loop protection auto-recovery.
Port MAC Locking	port-security	Port security MAC locking auto-recovery.
Multicast Storm	mcast-storm	Multicast storm auto-recovery.
SFP Mismatch	sfp-mismatch	SFP mismatch auto-recovery.
SFP Plus Mismatch	sfpplus-mismatch	SFP Plus mismatch auto-recovery.
Spanning Tree	spanning-tree	Spanning-tree auto-recovery.
UDLD	udld	UDLD auto-recovery.
Unicast Storm	ucast-storm	Unicast storm auto-recovery.

Command History

Implemented in version 6.3.0.1 firmware. Modified in version 6.5 firmware.

Example

The following example

```
console#show interfaces status err-disabled

Interface      Reason                 Recovery Delay
----------     -----------------      --------------
Gi1/0/1        UDLD                   279
Gi1/0/2        BPDU Guard             285
Gi1/0/3        BPDU Storm             291
```

IP Device Tracking Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

ip device tracking

Use the **ip device tracking** command to enable device tracking for IPv4 hosts.

Syntax

ip device tracking

no ip device tracking

Default Configuration

IP device tracking is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

IP device tracking (IPDT) maintains a table of attached IPv4 host addresses. The attached IPv4 host addresses are learned via DHCP snooping or ARP. ARP probes are sent periodically to determine if any new hosts are present or if a host has left the LAN segment or gone quiescent (sleep mode).

IPDT requires DHCP Snooping to be enabled in order to trigger the ARP learning process. Inconsistent results will occur if DHCP Snooping is disabled.

The IPDT table is populated with the IPv4 address, MAC address, VLAN, and interface for each host. DHCP snooping already provides a mapping from the host IP address to a port on the switch for the IP address acquired via DHCP. But DHCP snooping cannot track statically configured hosts nor can it detect the movement of the hosts in a VLAN.

For each device entry in the IPDT table, ARP probe is sent periodically to check the reachability of the device. If there are no ARP responses received for the configured number of retransmit ARP probes, the device entry is marked inactive.

IPDT does not send ARP probes for entries already present in the ARP table until they age out and ARP packets are exchanged. When IPDT is enabled for the first time, it may take up to 20 minutes (or the configured ARP timeout) for the IPDT table to populate.

IPDT is supported for physical (Ethernet) interfaces and for port-channels. IPDT configuration for Ethernet interfaces is ignored for interfaces which are part of a port-channel. Configure IPDT on the port-channel instead.

An ARP probe is transmitted on the physical port or port-channel in the VLAN associated with the device in the IPDT table, with the following fields set:

- **a** The source MAC address is set to the L3 interface MAC on routed VLANs and to the L2 interface MAC on switched VLANs.
- **b** The destination MAC is set to device entry MAC address.
- **c** On L3 routed VLANs, the source IPv4 address is set based on the matching IPv4 subnet on the VLAN interface if it exists or else it is set to 0.0.0.0. On L2-only switched VLANs, the source IPv4 is set to 0.0.0.0.
- **d** The target IPv4 address is set to the IP address of the device entry.

The probe retransmit interval is configurable, with a default value of 30 seconds.

The first probe timeout for each device entry is sequentially distributed from 1 sec to the probe-retransmit-interval value. This is done for pacing the number of probes that are sent out every second, for performance reasons.

When an interface transitions to the forwarding state, an ARP probe is sent for all the interface device entries. To avoid duplicate IP conflicts, transmission of the initial ARP probe is delayed by the probe delay interval after the interface transitions to the forwarding state. It is possible that a DHCP client may obtain a DHCP lease before the interval expires.

If the device entry is modified during that delay interval, the initial probe delay timer is canceled and the probe retransmit timer is started. Whenever the device entry is updated from ARP Snooping or DHCP Snooping, the probe retransmit timer is restarted.

Entries in the IPDT table are added on the following events:

- ARP snooping detected a new device.
- DHCP snooping issued a new address binding.
- Device entries detected by DHCP snooping are added into the IPDT table even though the interface is in INACTIVE state. This can happen when the interface is in the process of authorization.

Entries in the table are deleted on the following operations/events:

- ARP snooping detected a new device.
- DHCP snooping issued a new address binding.
- Device entries detected by DHCP snooping are added into the IPDT table even though the interface is in INACTIVE state. This can happen when the interface is in the process of authorization.

Entries in the table are deleted on the following operations/events:

- Administratively disabling the IPDT feature.
- A clear command is issued by the administrator.
- The interface on which the entries are learned is either detached or deleted.
- The interface on which the entries are learned is enabled for port-based routing.
- If interface is no longer member of a VLAN, the entries matching that VLAN and interface are removed.
- When the entry is in inactive state for 72 hours.
- When the IPDT table capacity is reached, all the INACTIVE entries learned from ARP snooping are deleted. Also, entries learned from DHCP snooping are deleted if they are not present in the DHCP snooping database.

Entries in the IPDT table are moved from ACTIVE to INACTIVE on the following events:

- The state of associated interface changes from forwarding to non-forwarding.
- If DHCP snooping is disabled, entries added via DHCP snooping are marked INACTIVE.
- The DHCP lease associated with the table entry is terminated or deleted.

Only ARP packets that are validated by Dynamic ARP Inspection (if enabled) are processed by IPDT.

The Authentication Manager utilizes the IP/MAC device entries in the IPDT table to populate the source IP address in Dynamic Access Control Lists while authenticating clients. In this case, DHCP snooping must be enabled and properly configured by the administrator. DHCP snooping is able to snoop DHCP packets on 802.1X unauthenticated ports configured in 802.1X auto mode.

The administrator can configure the maximum number of host entries that can be added to the tracking table per interface. When adding a new entry, if the number of entries on an interface exceeds the configured limit, all entries associated with the interface are deleted from the table.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IP Device Tracking and DHCP snooping on VLAN1. IPDT relies on DHCP snooping and ARP probes to populate its bindings table. The DHCP server is reachable from interface Te1/0/1.

```
console(config)#ip device tracking
console(config)#ip dhcp snooping
console(config)#ip dhcp snooping vlan 1
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#ip dhcp snooping trust
console(config-if-Te1/0/1)#exit
```

ip device tracking probe

Use the **ip device tracking probe** command to enable sending of ARP probes for IP device tracking.

Syntax

ip device tracking probe

no ip device tracking probe

Default Configuration

IP device tracking probes are enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Invoking the **no** form of the command (**no ip device tracking probe**) causes all the ACTIVE state entries in the IPDT table to remain in the ACTIVE state until the port moves to non-forwarding state or lease of those entries are removed.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally disables sending of ARP probes. IPDT will use DHCP snooping information if DHCP snooping is enabled.

```
console(config)#ip device tracking probe
```

ip device tracking probe interval

Use the **ip device tracking probe interval** command to enable sending of ARP probes for IP device tracking.

Syntax

ip device tracking probe interval *seconds*

no ip device tracking probe

- *seconds*—The minimum time between two ARP probes for each entry in IPv4DT database in seconds. The range is 30 to 300 seconds.

Default Configuration

The default probe interval is 30 seconds.

Command Mode

Global Configuration mode

User Guidelines

Systems with a large number of ports should consider the use of a larger probe interval.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IPDT and sets the probe interval to 1 minute.

```
console(config)#ip device tracking
console(config)#ip device tracking probe interval 60
```

ip device tracking probe count

Use the **ip device tracking probe count** command to configure the number of missed responses after which an IPDT table entry is marked INACTIVE. Use the **no** form of the command to set the missed count to the default.

Syntax

ip device tracking probe count *number*

no ip device tracking probe count

- *number*—The number of consecutive ARP missed which will transition the IPDT table entry to the INACTIVE status. The range is 1 to 255.

Default Configuration

The default transition occurs after three missed responses.

Command Mode

Global Configuration mode

User Guidelines

Systems with a large number of ports should consider the use of a larger missed response count.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IPDT and sets the missed probe count to 6.

```
console(config)#ip device tracking
console(config)#ip device tracking probe count 6
```

ip device tracking probe delay

Use the **ip device tracking probe delay** command to configure the time to wait after a link up event before sending an ARP probe. Use the **no** form of the command to set the missed count to the default.

Syntax

ip device tracking probe delay *seconds*

no ip device tracking probe delay

- *seconds*—The number of seconds to wait before sending an ARP probe when a port transitions from a non-forwarding state to a forwarding state. The range is 1 to 255 seconds.

Default Configuration

The default transition delay is 30 seconds.

Command Mode

Global Configuration mode

User Guidelines

Reducing the delay allows IPDT to discover devices more quickly. Reducing the delay to too small of a value may cause IPDT to query a device during the quiet period after the host has sent a gratuitous ARP. The ARP probe may confuse the host and require the host interface to be reset. Use of the **ip device tracking probe auto-source fallback** may help to ameliorate this issue.

Some network implementations have had good results with the delay set to around 10 seconds.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IPDT and sets the transition delay to 10 seconds.

```
console(config)#ip device tracking
console(config)#ip device tracking probe delay 10
```

ip device tracking probe auto-source fallback

Use the **ip device tracking probe auto-source fallback** command to configure the source IP address sent in ARP probes. Use the **no** form of the command to use the default IP address in ARP probes.

Syntax

ip device tracking probe auto-source fallback *host-ip mask* override

no ip device tracking probe auto-source fallback

- *host-ip*—An IPv4 host address in dotted quad notation. Only non-masked bits should be set in the IP address (e.g., 0.0.0.1).
- *mask*—An IPv4 mask used for source IP of the IPDT entries in dotted quad notation (e.g., 255.255.0.0). The ARP probe destination IP address is the inverse of the mask AND'd with the host-ip address parameter which is then OR'd with the destination IP address AND'd with the mask.

Default Configuration

The source IP address in the probe packet for non-routing interfaces is set to the 0.0.0.0 address.

Command Mode

Global Configuration mode

User Guidelines

This command only applies to non-routed interfaces.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IPDT and sets the source IP address in the ARP packet destined to 10.5.5.20 to 10.5.5.1.

```
console(config)#ip device tracking
console(config)#ip device tracking probe auto-source fallback 0.0.0.1
255.255.255.0 override
```

ip device tracking maximum

Use the **ip device tracking maximum** command to configure the maximum number of IPDT table entries per interface. Use the **no** form of the command to use the default limit.

Syntax

ip device tracking maximum *number*

no ip device tracking maximum

- *number*—The number of entries learned on an interface by IPv4DT. The range is 0 to 10.

Default Configuration

There is no default limit.

Command Mode

Interface (Ethernet or Port-Channel) Configuration mode

User Guidelines

Invoking the normal form of the command (**ip device tracking maximum** *value*) clears all the entries learned on a specified interface and sets the maximum entries to be learned on that interface. Configuring the maximum limit to 0 effectively disables IPDT on the interface.

For interfaces with an administrator-specified limit, if the number of entries on an interface exceeds the configured limit, all entries associated with the interface are deleted from the table.

Administrators should set the maximum entries to 0 on ports which do not need to be tracked (inter-switch links, uplinks, …) to reduce CPU load and avoid overflowing the IPDT table.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example globally enables IPDT and disables IPDT on an uplink interface.

```
console(config)#ip device tracking
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#ip device tracking maximum 0
```

clear ip device tracking

Use the **clear ip device tracking** command to clear entries present in the IPDT table.

Syntax

clear ip device tracking {**all** | **interface** *if-name* | **ip** *ipv4-address* | **mac** *mac-address*}

- **all**—Clears the entire IPDT table.
- **interface** *if-name*—Clears the entries matching the host ipv4-address.

- **mac** *mac-address*—Clears the entries matching the mac-address.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

After clearing the table entries, ARP probes are sent to repopulate the table.

Command History

Command introduced in version 6.6.0 firmware.

Example

This example clears the IPDT entries on interface Gi1/0/1.

```
console#clear ip device tracking interface gi1/0/1
```

show ip device tracking

Use the **show ip device tracking** command to display entries in the IP device tracking table.

Syntax

show ip device tracking {**all** [**active** | **inactive** | **count**] | **interface** *if-name* | **ip** *ipv4-address* | **mac** *mac-address*}

- **all**—Displays the entire IPDT table.
- **active**—(Optional) Display only the ACTIVE status entries.
- **inactive**—(Optional) Display only the INACTIVE status entries.
- **count**—(Optional) Display the sum of each type of table entry.
- **interface** *if-name*—Display the entries matching the host ipv4-address parameter.
- **mac** *mac-address*—Display the entries matching the MAC address parameter.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The following fields are displayed:

Field	Description
IP Address	Learned IPv4 address of the device.
MAC Address	MAC address associated with the learned IPv4 address.
VLAN	VLAN identifier associated with an interface on which device is learned.
Interface	Interface name on which device is learned.
Time left to inactive	The number of seconds before the reachable device transitions to INACTIVE.
Time since inactive	The number of seconds since the INACTIVE device was last reachable.
State	The table entry state (ACTIVE or INACTIVE).
Source	The source of the tables (ARP or DHCP or Static).

Command History

Command introduced in version 6.6.0 firmware.

Example

The examples below display the various invocations of the command:

```
console #show ip device tracking all

IP Device Tracking for clients........................ Enable
IP Device Tracking Probe Generation................... Enable
IP Device Tracking Probe Count........................ 3
IP Device Tracking Probe Interval......................30
IP Device Tracking Probe Delay Interval................30
```

```
--------------------------------------------------------------------------------
---
IP Address  MAC Address     Vlan Interface Time-left   Time-since State
Source
                                           to inactive inactive
--------------------------------------------------------------------------------
---
10.21.1.1  01:02:03:04:05:06  2  Gi1/0/1      30          0      ACTIVE   ARP

Total number interfaces enabled: 1

Enabled interfaces:
   Gi1/0/1

console#show ip device tracking all count

IP Device Tracking ARP Entries Count .......... 40
IP Device Tracking DHCP Entries Count ......... 0

IP Device Tracking ACTIVE Entries Count ....... 30
IP Device Tracking INACTIVE Entries Count ..... 10

IP Device Tracking Total Entries Count ........ 40

console#show ip device tracking ip 10.21.1.1

IP Device Tracking for clients......................... Enable
IP Device Tracking Probe Generation.................... Enable
IP Device Tracking Probe Count......................... 3
IP Device Tracking Probe Interval.......................30
IP Device Tracking Probe Delay Interval.................30
--------------------------------------------------------------------------------
---
IP Address  MAC Address     Vlan Interface Time-left   Time-since State
Source
                                           to inactive inactive
--------------------------------------------------------------------------------
---
10.21.1.1  01:02:03:04:05:06  2  Gi1/0/1      50          0      ACTIVE   ARP
10.21.1.1  01:02:03:04:05:07  2  Gi1/0/2      50          0      ACTIVE   ARP

console#show ip device tracking mac 01:02:03:04:05:06

IP Device Tracking for clients......................... Enable
IP Device Tracking Probe Generation.................... Enable
IP Device Tracking Probe Count......................... 3
IP Device Tracking Probe Interval.......................30
IP Device Tracking Probe Delay Interval.................30
```

```
-----------------------------------------------------------------------------
---
IP Address  MAC Address     Vlan Interface Time-left   Time-since State
Source
                                           to inactive inactive
-----------------------------------------------------------------------------
---
10.21.1.1  01:02:03:04:05:06  2  Gi1/0/1      50           0      ACTIVE   ARP
20.21.1.1  01:02:03:04:05:06  2  Gi1/0/1      50           0      ACTIVE   ARP
```

IPv6 Access List Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Access to a switch or router can be made more secure through the use of Access Control Lists (ACLs) to control the type of traffic allowed into or out of specific ports. An ACL consists of a series of rules, each of which describes the type of traffic to be processed and the actions to take for packets that meet the classification criteria. Rules within an ACL are evaluated sequentially until a match is found, if any. Every ACL is terminated by an implicit deny all rule, which covers any packet not matching a preceding explicit rule. ACLs can help to ensure that only authorized users have access to specific resources while blocking out any unwarranted attempts to reach network resources.

ACLs may be used to restrict contents of routing updates, decide which types of traffic are forwarded or blocked and, above all, provide security for the network. ACLs are normally used in firewall routers that are positioned between the internal network and an external network, such as the Internet. They can also be used on a router positioned between two parts of the network to control the traffic entering or exiting a specific part of the internal network.

The Dell EMC Networking ACL feature allows classification of packets based upon Layer 2 through Layer 4 header information. An Ethernet IPv6 packet is distinguished from an IPv4 packet by its unique EtherType value; thus all IPv6 classifiers implicitly include the EtherType field.

Multiple ACLs per interface are supported. The ACLs can be combination of Layer 2 and/or Layer 3/4 ACLs. ACL assignment is appropriate for both Ethernet ports and LAGs. ACLs can also be time based.

deny | permit (IPv6 ACL)

This command creates a new rule for the current IPv6 access list. Each rule is appended to the list of configured rules for the list.

Syntax

[*sequence-number*] **deny | permit** (IPV6 ACL) [*sequence number*] {**deny** | **permit**} {**ipv6-protocol** | **number** | **every**} {*source-ipv6-prefix/prefix-length* | **any** | *host source-ipv6-address*} [{**range** {*portkey* | *startport*} {*portkey* | *endport*} | {**eq** | **neq** | **lt** | **gt**} {*portkey* | *0-65535*}] {*destination-ipv6-prefix/prefix-length* | **any** | **host** *destination-ipv6-address*} [{**range** {*portkey* | *startport*} {*portkey* | *endport*} | {**eq** | **neq** | **lt** | **gt**} {*portkey* | *0-65535*}] [**flag** [**+fin** | **-fin**] [**+syn** | **-syn**] [**+rst** | **-rst**] [**+psh** | **-psh**] [**+ack** | **-ack**] [**+urg** | **-urg**] [**established**]] [**flow-label** *value*] [**icmp-type** *icmp-type* [**icmp-code** *icmp-code*] | **icmp-message** *icmp-message*] [**routing**] [**fragments**] [**dscp** *dscp*]}} [**time-range** *time-range-name*] [**log**] [**assign-queue** *queue-id*] [{**mirror** | **redirect**} *interface-id*] [**rate-limit** *rate burst-size*]

no [*sequence-number*]

- *sequence-number* — Identifies the order of application of the permit/deny statement. If no sequence number is assigned, permit/deny statements are assigned a sequence number beginning at 1000 and incrementing by 10. Statements are applied in hardware beginning with the lowest sequence number. Sequence numbers only have applicability within an access group, i.e. the ordering applies within the access-group scope. The range for sequence numbers is 1– 2147483647.
- {**deny** | **permit**}–Specifies whether the IP ACL rule permits or denies the matching traffic.
- {*ipv6-protocol* | *number*| *every* }—Specifies the protocol to match for the IP ACL rule.
  - IPv6 protocols: icmpv6, ipv6, sctp, tcp and udp
  - **Every**: Match any protocol (don't care)
- *source-ipv6-prefix*/prefixlength | any | host *src-ipv6-address*—Specifies a source IP address and netmask to match for the IP ACL rule.
  - For IPv6 ACLs, "any" implies a 0::/128 prefix and a mask of all ones.
  - Specifying "host X::X" implies a prefix length as "/128" and a mask of 0::/128.
- [{range {*portkey* | *startport*} {*portkey* | *endport*} | {eq | neq | lt | gt} {*portkey* | *0-65535*}]—Specifies the layer 4 destination or source port match condition for the IP/TCP/UDP ACL rule. A source or destination port number, which ranges from 0-65535, can be entered, or a *portkey*, which can be one of the following keywords: bgp, domain, echo, ftp, ftp-

data, http, ntp, pop2, pop3, rip, smtp, snmp, telnet, tftp, telnet, time, who and www. Each of these keywords translates into its equivalent destination port number.

- When “range” is specified, IPv6 ACL rule matches only if the layer 4 port number falls within the specified port range. The *startport* and *endport* parameters identify the first and last ports that are part of the port range. They have values from 0 to 65535. The ending port must have a value equal or greater than the starting port. The starting port, ending port, and all ports in between will be part of the layer 4 port range.
- When “eq” is specified, IPv6 ACL rule matches only if the layer 4 port number is equal to the specified port number or portkey.
- When “lt” is specified, IPv6 ACL rule matches if the layer 4 destination port number is less than the specified port number or portkey. It is equivalent to specifying the range as 0 to <specified port number – 1>.
- When “gt” is specified, IPv6 ACL rule matches if the layer 4 destination port number is greater than the specified port number or portkey. It is equivalent to specifying the range as <specified port number + 1> to 65535.
- When “neq” is specified, IPv6 ACL rule matches only if the layer 4 destination port number is not equal to the specified port number or portkey.
- IPv6 TCP port names: **bgp, domain, echo, ftp, ftp-data, http, smtp, telnet, www, pop2, pop3**
- IPv6 UDP port names: **domain, echo, ntp, rip, snmp, time, who**

- *destination-ipv6-prefix*/*prefix-length* | **any** | *host destination-ipv6-address*—Specifies a destination IP address and netmask for match condition of the IP ACL rule.
  - For IPv6 ACLs, “any” implies 0::/128 prefix and a mask of all ones.
  - Specifying host implies prefix length as “/128” and a mask of 0::/128.
- [**dscp** *dscp*]—Specifies a match of DSCP values.
- flag [+fin | -fin] [+syn | -syn] [+rst | -rst] [+psh | -psh] [+ack | -ack] [+urg | -urg] [established]—Specifies that the IP/TCP/UDP ACL rule matches on the TCP flags.

- When "+<tcpflagname>*" is* specified, a match occurs if specified <tcpflagname> flag is set in the TCP header.
- When "-<tcpflagname>*" is* specified, a match occurs if specified <tcpflagname> flag is *NOT* set in the TCP header.
- When "established*" is* specified, a match occurs if specified either RST or ACK bits are set in the TCP header.
- This option is visible only if the protocol is tcp.
- **Ack** – Acknowledgment bit
- **Fin** – Finished bit
- **Psh** – push bit
- **Rst** – reset bit
- **Syn** – Synchronize bit
- **Urg** – Urgent bit

• [icmp-type *icmp-type* [icmp-code *icmp-code*] | icmp-message *icmp-message*]—Specifies a match condition for ICMP packets.
  - When icmp-type is specified, IP ACL rule matches on the specified ICMP message type, a number from 0 to 255.
  - When icmp-code is specified, IP ACL rule matches on the specified ICMP message code, a number from 0 to 255.
  - Specifying icmp-message implies both icmp-type and icmp-code are specified.
  - ICMP message is decoded into corresponding ICMP type and ICMP code within that ICMP type. This option is visible only if the protocol is "icmpv6".
  - ICMPv6 message types: destination-unreachable echo-reply echo-request header hop-limit mld-query mld-reduction mld-report nd-na nd-ns next-header no-admin no-route packet-too-big port-unreachable router-solicitation router-advertisement router-renumbering time-exceeded unreachable
  - The icmpv6 message types are available only if the protocol is icmpv6.

• flow-label—Specifies a match on the identified flow label. Range 0–1048575.

- fragments—Specifies the rule matches packets that are non-initial fragments (fragment bit asserted). Not valid for rules that match L4 information such as TCP port number since that information is carried in the initial packet. IPv6 fragments contain an IPv6 Fragment extension header.
- routing—Specifies that IP ACL rule matches on routed packets. Routed packets contain an IPv6 “routing” extension header.
- log—Specifies that this rule is to be logged when the rule has been matched one or more times since the expiry of the last logging interval. The logging interval is five minutes.
- time-range *time-range-name*—Allows imposing time limitation on the ACL rule as defined by the parameter time-range-name. If a time range with the specified name does not exist and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with specified name exists and the ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with specified name becomes active. The ACL rule is removed when the time-range with specified name becomes inactive.
- assign-queue *queue-id*—Specifies the assign-queue, which is the queue identifier to which packets matching this rule are assigned.
- {mirror | redirect} *interface-id*—Specifies the mirror or redirect Ethernet interface to which packets matching this rule are copied or forwarded, respectively. The mirroring or redirect logic stage occurs after the tag processing stage on ingress. Egress mirroring or redirect is not supported.
- rate-limit *rate burst-size*—Specifies the allowed rate of traffic as per the configured rate in Kbps, and burst-size in kbytes.
  - Rate – the committed rate in kilobits per second
  - Burst-size – the committed burst size in Kilobytes.

Default Configuration

An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Command Mode

IPv6-Access-List Configuration mode

User Guidelines

A rule may either deny or permit traffic according to the specified classification fields. At a minimum, either the every keyword or the protocol, source address, and destination address values must be specified. The source and destination IPv6 address fields may be specified using the keyword any to indicate a match on any value in that field. The remaining command parameters are all optional, but the most frequently used parameters appear in the same relative order as shown in the command format. An IPv6 ACL implicitly includes the EtherType in the match criteria. The assign-queue parameter allows specification of a particular hardware queue for handling traffic that matches this rule. The assign-queue parameter is valid only for a permit rule. The command is enhanced to accept the optional time-range parameter. The time-range parameter allows imposing a time limitation on the IPv6 ACL rule as defined by the parameter time-range-name. If a time range with the specified name does not exist, and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied immediately. If a time range with the specified name exists, and the IPv6 ACL containing this ACL rule is applied to an interface or bound to a VLAN, then the ACL rule is applied when the time-range with a specified name becomes active. The ACL rule is removed when the time-range with a specified name becomes inactive.

Users are permitted to add rules, but if a packet does not match any user-specified rules, the packet is dropped by the implicit "deny all" rule.

In order to provide the greatest amount of flexibility in configuring ACLs, the permit/deny syntax allows combinations of matching criteria that may not make sense when applied in practice.

Any – is equivalent to ::/0 for IPv6 access lists.

Host - indicates /128 prefix length for IPv6.

Port ranges are not supported for egress (out) IPv6 traffic-filters. This means that only the **eq** operator is supported for egress (out) ACLs.

The protocol type must be **SCTP**, **TCP** or **UDP** to specify a port range. The protocol type must be IPv6, SCTP, TCP, ICMPv6, or UDP to specify a flow label.

The IPv6 “fragment” and “routing” keywords are not supported on egress (out) access groups. The log action is supported for both permit and deny rules.

If a permit|deny clause is entered with the same sequence number as an existing rule, the configuration is denied with an error message.

An implicit deny all condition is added by the system after the last MAC or IP/IPv6 access group if no route-map is configured on the interface.

Every permit/deny rule that does not have a rate-limit parameter is assigned a counter. If counter resources become exhausted, a warning is issued and the rule is applied to the hardware without the counter.

If a permit|deny clause is entered with the same sequence number as an existing rule, an error is displayed and the existing rule is not updated with the new information.

Since ACLs have an implicit deny all at the end of the last access-group, IPv6 ACLs need an explicit **permit icmp any any nd-na** and **permit icmp any any nd-ns** statements as match conditions. These additional conditions allow for ICMPv6 neighbor discovery to occur.

For the N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON series switches, for ingress (in) ACLs:

- The IPv6 ACL “fragment” keyword matches only on the first IPv6 extension header for the fragment header (next header code 44). If the fragment header appears in the second or a subsequent header, it is not matched.
- The IPv6 ACL “routing” keyword matches only on the first IPv6 extension header for the routing header (next header code 43). If the fragment header appears in the second or a subsequent header, it is not matched.
- For all series switches, port ranges are not supported on egress (out) ACLs. Only the eq operator is supported in an egress ACL.

Command History

Updated in 6.3.0.1 firmware.

Example and description updated in the 6.4 release.

Example

The following example creates rules in an IPv6 ACL named "STOP_HTTP" to discard any HTTP traffic from the 2001:DB8::0/32 network, but allow all other traffic from that network:

```
console(config)#ipv6 access-list STOP_HTTP
console(Config-ipv6-acl)#deny tcp 2001:DB8::0/32 any eq http
console(Config-ipv6-acl)#permit every
```

ipv6 access-list

The **ipv6 access-list** command creates an IPv6 Access Control List (ACL) consisting of classification fields defined for the IP header of an IPv6 frame.

Syntax

ipv6 access-list *name*

no ipv6 access-list *name*

- *name* — Alphanumeric string of 1 to 31 characters uniquely identifying the IPv6 access list.

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode

User Guidelines

The *name* parameter is a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list.

If an IPv6 ACL with this name already exists, this command enters Ipv6-Access-List Configuration mode to update the existing IPv6 ACL.

Use the **no** form of the command to delete an IPv6 ACL from the system.

Example

The following example creates an IPv6 ACL named “DELL_IP6” and enters the IPv6-Access-List Configuration mode:

```
console(config)#ipv6 access-list DELL_IP6
console(Config-ipv6-acl)#
```

ipv6 access-list rename

The **ipv6 access-list rename** command changes the name of an IPv6 Access Control List (ACL). This command fails if an IPv6 ACL with the new name already exists.

Syntax

ipv6 access-list rename *name newname*

- *name* — the name of an existing IPv6 ACL.
- *newname* — alphanumeric string from 1 to 31 characters uniquely identifying the IPv6 access list.

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 access-list rename DELL_IP6 DELL_IP6_NEW_NAME
```

ipv6 traffic-filter

The **ipv6 traffic-filter** command either attaches a specific IPv6 Access Control List (ACL) to an interface or associates it with a VLAN ID in a given direction.

Use the **no** form of the command to remove an IPv6 traffic-filter from the interface(s) in a given direction.

Syntax

ipv6 traffic-filter *name* [**in** | **out** | **control-plane**] [*seq-num*]

no ipv6 traffic-filter *name* [**in** | **out** | **control-plane**]

- **name** — Alphanumeric string of 1 to 31 characters uniquely identifying the IPv6 access list.
- in — The access list is applied to ingress packets.
- out—The access list is applied to egress packets.
- control-plane—The access list is applied to ingress control plane packets. This parameter is only available in Global Configuration mode.
- *seq-num* — Order of access list relative to other access lists already assigned to this interface and direction. (Range: 1–4294967295)

Default Configuration

No IPv6 traffic filters are configured by default.

Command Modes

Global Configuration mode, Interface Configuration (Ethernet, Port-channel, VLAN) mode

User Guidelines

Dell EMC Networking switches support configuration of multiple access groups on interfaces. An optional sequence number may be specified to indicate the order of this access list relative to other IPv6 access lists already assigned to this interface and direction. A lower number indicates higher precedence order. If a sequence number is already in use for this interface and direction, the specified IPv6 access list replaces the currently attached IPv6 access list using that sequence number. If the sequence number is not specified for this command, a sequence number that is one greater than the highest sequence number currently in use for this interface and direction is used.

This command specified in Interface Configuration mode only affects a single interface, whereas the Global Configuration mode setting is applied to all interfaces. The optional control-plane keyword allows application of an ACL on the CPU port ingress queue. Control plane packets (e.g., BPDUs) are dropped because of the implicit deny all rule added at the end of every access control list. To mitigate this behavior, permit rules must be added by the operator to allow the appropriate control plane packets to ingress the CPU (i.e., ARP, DHCP, LACP, STP BPDU, etc.). The control-plane keyword does not filter traffic received over the out-of-band port.

Example

The following example attaches an IPv6 access control list to an interface.

```
console(config-if-Gi1/0/1)#ipv6 traffic-filter DELL_IP6 in
```

Command History

Syntax updated in the 6.4 release.

show ipv6 access-lists

Use the **show ipv6 access-lists** command in User Exec and Privileged Exec mode to display an IPv6 access list and all of the rules that are defined for the IPv6 ACL. Use the [*name*] parameter to identify a specific IPv6 ACL to display.

Syntax

show ipv6 access-lists [***name***]

- *name*—The name used to identify the IPv6 ACL.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ipv6 access-lists

Current number of ACLs: 4  Maximum number of ACLs: 100
```

```
      ACL Name                     Rules        Interface(s)       Direction
Count
------------------------------- ----- ------------------------- --------- --
-------
IPv6-ACL                        1     Gi1/0/8                   Inbound
43981900
asdasd                          2     Gi1/0/7                   Inbound
3981901
```

```
console#show ipv6 access-lists IPv6-ACL

IPV6 ACL Name: IPv6-ACL

Inbound Interface(s):
Gi1/0/8


Rule Number: 1
Action........................................ permit
Match All..................................... FALSE
Protocol...................................... 6(tcp)
Source IPV6 Address........................... fe80::2121/128
Destination IPV6 Address...................... fe80::1212/128
Destination Layer 4 Operator.................. Equal To
Destination L4 Port Keyword................... 800
Flow Label.................................... 65535
TCP Flags..................................... FIN (Set)
                                               SYN (Ignore)
                                               RST (Ignore)
                                               PSH (Ignore)
                                               ACK (Ignore)
                                               URG (Ignore)
ACL Hit Count................................. 43981900
```

IPv6 MLD Snooping Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

In IPv6, Multicast Listener Discover (MLD) snooping performs functions similar to IGMP snooping in IPv4. With MLD snooping, IPv6 multicast data is selectively forwarded to a list of ports that want to receive the data, instead of being flooded to all ports in a VLAN. This list is constructed by snooping IPv6 multicast control packets.

MLD is a protocol used by IPv6 multicast routers to discover the presence of multicast listeners (nodes wishing to receive IPv6 multicast packets) on its directly-attached links and to discover which multicast packets are of interest to neighboring nodes. MLD is derived from IGMP. MLD version 1 (MLDv1) is equivalent to IGMPv2. MLD version 2 (MLDv2) is equivalent to IGMPv3. MLD is a subprotocol of Internet Control Message Protocol version 6 (ICMPv6), and MLD messages are a subset of ICMPv6 messages, identified in IPv6 packets by a preceding Next Header value of 58.

Dell EMC Networking switches can snoop on both MLDv1 and MLDv2 protocol packets and bridge IPv6 multicast data based on destination IPv6 multicast MAC addresses. The switch can be configured to perform MLD snooping and IGMP snooping simultaneously. The Dell EMC Networking implementation is compliant to RFC 4541.

ipv6 mld snooping vlan groupmembership-interval

The **ipv6 mld snooping vlan groupmembership-interval** command sets the MLD Group Membership Interval time on a VLAN or interface. The Group Membership Interval time is the amount of time in seconds that a switch waits for a report from a particular group on a particular interface before deleting the interface from the entry. This value must be greater than the MLDv2 Maximum Response time value. The range is 2 to 3600 seconds.

Syntax

ipv6 mld snooping vlan *vlan-id* **groupmembership-interval** *time*

no ipv6 mld snooping *vlan-id* **groupmembership-interval** *time*

- *vlan-id* — A VLAN identifier (Range 1-4093).
- **time** — MLD group membership interval time in seconds. (Range: 2-3600)

Default Configuration

The default group membership interval time is 260 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)#ipv6 mld snooping vlan 2 groupmembership-interval 1500
```

ipv6 mld snooping vlan immediate-leave

This command enables or disables MLD Snooping immediate-leave mode on a selected VLAN.

Syntax

ipv6 mld snooping vlan *vlan-id* **immediate-leave**

- *vlan-id*— A VLAN identifier (Range 1-4093).

Default Configuration

Immediate leave is disabled on all VLANs by default.

Command Mode

Global Configuration mode.

User Guidelines

Enabling immediate-leave allows the switch to immediately remove the Layer 2 LAN interface from its forwarding table entry upon receiving an MLD done message for that multicast group without first sending out MAC-based general queries to the interface.

Enable immediate-leave admin mode only on VLANs where only one host is connected to each Layer 2 LAN port. This prevents the inadvertent dropping of the other hosts that were connected to the same Layer 2 LAN port, but were still interested in receiving multicast traffic directed to that group. Also, immediate-leave processing is supported only with MLD version 1 hosts.

Example

This example enables mld snooping immediate-leave for VLAN 2.

```
console(config)#ipv6 mld snooping vlan 2 immediate-leave
```

ipv6 mld snooping listener-message-suppression

This command enables MLD listener message suppression on a specific VLAN. Use the **no** form of this command to disable listener message suppression.

Syntax

ipv6 mld snooping vlan *vlan-id* **listener-message-suppression**

no ipv6 mld snooping vlan *vlan-id* **listener-message-suppression**

- *vlan-id* — A VLAN identifier (Range 1-4093).

Default Configuration

Listener message suppression is enabled by default.

Command Mode

Global Configuration mode.

User Guidelines

MLD listener message suppression is equivalent to IGMP report suppression. When MLD listener message suppression is enabled, the switch only sends the first report received for a group in response to a query. Listener message suppression is only applicable to MLDv1.

Example

```
console(config)#ipv6 mld snooping vlan 10 listener-message-suppression
```

ipv6 mld snooping vlan last-listener-query-interval

The **ipv6 mld snooping vlan last-listener-query-interval** command sets the number of seconds after which a host is considered to have left the group.

Syntax

ipv6 mld snooping vlan *vlan-id* **last-listener-query-interval** *time*

no ipv6 mld snooping vlan *vlan-id* **last-listener-query-interval**

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *time* — The number of seconds after which a host is considered to have left the group. (Range: 1–25 seconds)

Default Configuration

The default maximum response time is 10 seconds.

Command Mode

Global Configuration mode

User Guidelines

This value must be less than the MLD Query Interval time value. The range is 1 to 25 seconds.

Example

```
console(config)#ipv6 mld snooping vlan 2 last-listener-query-interval 7
```

ipv6 mld snooping vlan mcrtrexpiretime

The **ipv6 mld snooping mcrtrexpiretime** command sets the multicast router present expiration time.

Syntax

ipv6 mld snooping vlan *vlan-id* **mcrtrexpiretime** *time*

no ipv6 mld snooping vlan *vlan-id* **mcrtrexpiretime**

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *time* — Multicast router present expiration time in seconds. (Range: 1–3600)

Default Configuration

The default multicast router present expiration time is 300 seconds.

Command Mode

Global Configuration mode.

User Guidelines

The time is set for a particular interface or VLAN. This is the amount of time in seconds that a switch waits for a query to be received on an interface before the interface is removed from the list of interfaces with multicast routers attached. The range is 1 to 3600 seconds.

Example

```
console(config)#ipv6 mld snooping vlan 2 mcrtrexpiretime 1500
```

ipv6 mld snooping vlan mrouter

This command statically configures a port as connected to a multicast router for a specified VLAN. The **no** form of this command removes the static binding.

Syntax

ipv6 mld snooping vlan *vlan-id* **mrouter interface** *interface*

no ipv6 mld snooping vlan *vlan-id* **mrouter interface** *interface*

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *interface-id*— The next-hop interface to the multicast router.

Default Configuration

There are no multicast router ports configured by default.

Command Mode

Global Configuration mode.

User Guidelines

MLD snooping will forward IPv6 multicast data packets in the VLAN if a static mrouter port is configured. This behavior can be used to ensure that MLD snooping will selectively forward IPv6 multicast data traffic even if no dynamically discovered IPv6 multicast router has been discovered.

Example

```
console(config)#ipv6 mld snooping vlan 10 mrouter interface Gi1/0/2
```

ipv6 mld snooping (Global)

Use the **ipv6 mld snooping (Global)** command to globally enable MLD Snooping on the system (Global Configuration Mode). Use the **no** form of the command to disable MLD snooping.

Syntax

ipv6 mld snooping [**vlan** *vlan-id*]

no ipv6 mld snooping [**vlan** *vlan-id*]

- *vlan-id* — A VLAN identifier (Range 1-4093).

Default Configuration

MLD Snooping is enabled globally and on all VLANs by default.

Command Mode

Global Configuration mode.

User Guidelines

Use this command without parameters to globally enable MLD Snooping. Use the **no** form of the command to disable MLD Snooping. Use the **vlan** parameter to enable MLD Snooping on a specific VLAN.

It is recommended that IGMP snooping should be enabled whenever MLD snooping is enabled to ensure that unwanted pruning of multicast protocol packets used by other protocols does not occur.

Enabling MLD snooping on an IPv6 L3 multicast router is recommended. If a multicast source is connected to a VLAN on which both L3 multicast and IGMP/MLD snooping are enabled, the multicast source is forwarded to the mrouter ports as well as the internal mrouter port. MLD snooping does not flood IPv6 multicast data plane packets in the VLAN if IPv6 L3 routing is enabled. If MLD snooping is disabled, the switch will flood multicast data plane packets in the VLAN.

Example

```
console(config)#ipv6 mld snooping
console(config)#no ipv6 mld snooping vlan 1
```

show ipv6 mld snooping

The **show ipv6 mld snooping** command displays MLD Snooping information and SSM statistics. Configured information is displayed whether or not MLD Snooping is enabled.

Syntax

show ipv6 mld snooping [**interface** *interface-id* **|** **vlan** *vlan-id*}]

- *interface-id*—An Ethernet interface identifier or a port channel identifier
- *vlan-id*—A VLAN identifier.

Default Configuration

This command has no default configuration

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

With no optional arguments, the command displays the following information:

- Admin Mode — Indicates whether or not MLD Snooping is active on the switch.
- Multicast Control Frame Count— Displays the total number of IGMP or PIM packets which have been received (same as IPv4).
- Flooding Unregistered to All Ports—Indicates if Flooding Unregistered to All Ports is enabled. If enabled, multicast data traffic for which no listeners have registered is flooded to all ports in a VLAN instead of only flooded to multicast router ports.
- SSM FDB Capacity—The capacity of the SSM FDB.
- SSM FDB Current Entries—The current count of SSM FDB entries.
- SSM FDB High Water Mark—The highest count of FDB entries since the last **clear counters**.

When you specify an interface or VLAN, the following information displays:

- MLD Snooping Admin Mode — Indicates whether MLD Snooping is active on the interface or VLAN.
- Fast Leave Mode — Indicates whether MLD Snooping Fast-leave is active on the VLAN.
- Group Membership Interval — Shows the amount of time in seconds that a switch will wait for a report from a particular group on a particular interface, which is participating in the VLAN, before deleting the interface from the entry. This value may be configured.
- Last Listener Query Interval—Displays the amount of time the switch waits after it sends a query on an interface, participating in the VLAN, because it did not receive a report for a particular group on that interface. This value may be configured.
- Multicast Router Present Expiration Time — Displays the amount of time to wait before removing an interface that is participating in the VLAN from the list of interfaces with multicast routers attached. The interface is removed if a query is not received. This value may be configured.
- Listener Message Suppression Mode—Sends only the first report received in response to a query to the router.

Example

```
console(config)#show ipv6 mld snooping

Admin Mode..................................... Enable
Multicast Control Frame Count.................. 6255
SSM FDB Capacity............................... 64
SSM FDB High Water Mark........................ 1
SSM FDB Current Entries........................ 1
Flooding Unregistered to All Ports............. Disabled

Vlan 1:
--------
MLD Snooping Admin Mode........................ Enabled
Immediate Leave Mode........................... Disabled
Group Membership Interval...................... 260
Last Listener Query Interval................... 10
Multicast Router Expiry Time................... 300
Listener Message Suppression Mode.............. Enabled
```

show ipv6 mld snooping groups

The **show ipv6 mld snooping groups** command displays the MLD Snooping and SSM entries in the MFDB table.

Syntax

show ipv6 mld snooping groups [{**vlan** *vlan-id* | **address** *ipv6-multicast-address*}]

- *vlan-id* — A VLAN identifier (Range 1-4093).
- *ipv6-multicast-address* — Specifies an IPv6 multicast address.

Default configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This user guideline applies to all switch models.To see the full multicast address table (including static addresses) use the show mac address-table multicast command.

Example

This example shows MLDv2 snooping entries

```
console#show ipv6 mld snooping groups

Vlan  Group                    Type     OIFs
----  -----------------------  -------  ------------------------------------
1     3333.0000.0003           Dynamic  Te1/0/1,Te1/0/17

MLD SSM Entries :
-----------------

VLAN Group            Reporter         Filter    IIF        Source Address
---- ---------------- ---------------- --------- ---------- ----------------
1    ff1e:2222:2222:  fe80::200:3ff:f  include   Te1/0/1    2001::2
     2222:2222:2222:  e00:b00
     2222:2222
```

show ipv6 mld snooping mrouter

Use the **show ipv6 mld snooping mrouter** command to display information on dynamically learned multicast router interfaces.

Syntax

show ipv6 mld snooping mrouter

Default configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

MLD snooping forwards IPv6 multicast data plane packets to mrouter ports, including statically configured mrouter ports. If a static mrouter port is configured in a VLAN, MLD snooping will forward multicast data plane packets received on the VLAN even if the interface is down. This behavior can be used to ensure that MLD snooping will selectively forward IPv6 multicast data traffic even if no dynamically discovered IPv6 multicast router has been discovered.

Example

```
console#show ipv6 mld snooping mrouter
VLAN ID       Port
--------      ----------
10            Gi1/0/2 (static)
```

IPv6 MLD Snooping Querier Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The MLD Snooping Querier is an extension of the MLD snooping feature. MLD Snooping Querier allows the switch to simulate an MLD router in a Layer 2-only network, thus removing the need to have an MLD router to collect the multicast group membership information. The querier function simulates a small subset of the MLD router functionality.

In a network with IP multicast routing, the IP multicast router acts as the MLD querier. However, if it is required that the IP-multicast traffic in a VLAN be switched, the switch can be configured as an MLD querier. When MLD Snooping Querier is enabled, the querier sends out periodic MLD general queries that trigger the multicast listeners/member to send their joins so as to receive the multicast data traffic. MLD snooping listens to these reports to establish the appropriate forwarding table entries.

ipv6 mld snooping querier

Use the **ipv6 mld snooping querier** command to enable MLD Snooping Querier on the system. Use the `no` form of this command to disable MLD Snooping Querier.

Syntax

ipv6 mld snooping querier

no ipv6 mld snooping querier

Default Configuration

MLD Snooping Querier is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

It is not recommended the MLD Snooping Querier be enabled on a switch enabled for IPv6 multicast routing.

Example

```
console(config)#ipv6 mld snooping querier
```

ipv6 mld snooping querier (VLAN mode)

Use the **ipv6 mld snooping querier** command in VLAN mode to enable MLD Snooping Querier on a VLAN. Use the no form of this command to disable MLD Snooping Querier on a VLAN.

Syntax

ipv6 mld snooping querier vlan*vlan-id*

no ipv6 mld snooping querier vlan *vlan-id*

- *vlan-id* — A VLAN identifier. (Range: 1–4093)

Default Configuration

MLD Snooping Querier is disabled by default on all VLANs.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 mld snooping querier vlan 10
```

ipv6 mld snooping querier address

Use the **ipv6 mld snooping querier address** command to set the global MLD Snooping Querier address. Use the no form of this command to reset the global MLD Snooping Querier address to the default.

Syntax

ipv6 mld snooping querier address *prefix*[*/prefix-length*]

no ipv6 mld snooping querier address

- *prefix* — An IPv6 address prefix.
- *prefix-length* — Designates how many of the high-order contiguous bits of the address make up the prefix.

Default Configuration

There is no global MLD Snooping Querier address configured by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 mld snooping querier address Fe80::5
```

ipv6 mld snooping querier election participate

Use the **ipv6 mld snooping querier election participate** command to enable the Snooping Querier to participate in the Querier Election process when it discovers the presence of another Querier in the VLAN. Use the **no** form of this command to disable election participation on a VLAN.

Syntax

ipv6 mld snooping querier election participate *vlan-id*

no ipv6 mld snooping querier election participate *vlan-id*

- *vlan-id* — A VLAN identifier (Range: 1 - 4093)

Default Configuration

Election participation is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

When enabled, if there is another querier in the network and the local querier is in election mode, then the querier with the lower IP address is elected and the other querier stops querying. If the local querier is not in election mode and another querier is detected, the local querier stops querying.

Example

```
console(config-vlan)#ipv6 mld snooping querier election participate 10
```

ipv6 mld snooping querier query-interval

Use the **ipv6 mld snooping querier query-interval** command to set the MLD Querier Query Interval time. Use the **no** form of this command to reset the Query Interval to the default.

Syntax

ipv6 mld snooping querier query-interval *interval*

ipv6 mld snooping querier query-interval

- *interval* — Amount of time that the switch waits before sending another general query. (Range: 1–1800 seconds)

Default Configuration

The default query interval is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

The query interval is the amount of time in seconds that the switch waits before sending another general query.

Example

```
console(config)#ipv6 mld snooping querier 120
```

ipv6 mld snooping querier timer expiry

Use the **ipv6 mld snooping querier timer expiry** command to set the MLD Querier timer expiration period. Use the **no** form of this command to reset the timer expiration period to the default.

Syntax

ipv6 mld snooping querier timer expiry *timer*

ipv6 mld snooping querier timer expiry

- *timer* — The time that the switch remains in Non-Querier mode after it has discovered that there is a multicast querier in the network. (Range: 60–300 seconds)

Default Configuration

The default timer expiration period is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

The timer expiry is the time period that the switch remains in non-querier mode once it has discovered that there is another multicast querier in the network.

Example

```
console(config)#ipv6 mld snooping querier timer expiry 222
```

show ipv6 mld snooping querier

Use the **show ipv6 mld snooping querier** command to display MLD Snooping Querier information. Configured information is displayed whether or not MLD Snooping Querier is enabled.

Syntax

show ipv6 mld snooping querier [**detail** | **vlan** *vlan-id*]

- *vlan-id* — A VLAN identifier (Range: 1 - 4093)

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

When the optional argument **vlan** *vlan-id* is not used, the command shows the following information:

Parameter	Description
MLD Snooping Querier Mode	Indicates whether or not MLD Snooping Querier is active on the switch.
Querier Address	Shows the IP Address which will be used in the IPv6 header while sending out MLD queries.
MLD Version	Indicates the version of MLD that will be used while sending out the queries. This is defaulted to MLD v1 and it can not be changed.
Querier Query Interval	Shows the amount of time that a Snooping Querier waits before sending out a periodic general query.
Querier Expiry Interval	Displays the amount of time to wait in the Non-Querier operational state before moving to a Querier state.

When the optional argument **vlan** *vlan-id* is used, the following additional information appears:

Parameter	Description
MLD Snooping Querier VLAN Mode	Indicates whether MLD Snooping Querier is active on the VLAN.
Querier Election Participate Mode	Indicates whether the MLD Snooping Querier participates in querier election if it discovers the presence of a querier in the VLAN.
Querier VLAN Address	Shows the IP Address which will be used in the IPv6 header while sending out MLD queries.

Operational State	Indicates whether MLD Snooping Querier is in “Querier” or “Non-Querier” state. When the switch is in Querier state it will send out periodic general queries. When in Non-Querier state it will wait for moving to Querier state and does not send out any queries.
Operational Version	Indicates the version of MLD that will be used while sending out the queries. This is defaulted to MLD v1 and it can not be changed.
Operational Max Response Time	Displays the maximum response time the local querier waits for a response from a multicast router.

When the optional argument detail is used, the command shows the global information and the information for all Querier enabled VLANs as well as the following information:

Last Querier Address	Indicates the IP address of the most recent Querier from which a Query was received.
MLD Version	Indicates the version of MLD.

IP Source Guard Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

IP Source Guard (IPSG) is a security feature that filters IP packets based on source ID. The source ID may either be source IP address or a {source IP address, source MAC address} pair. The network administrator configures whether enforcement includes the source MAC address. The network administrator can configure static authorized source IDs. The DHCP Snooping binding database and static IPSG entries identify authorized source IDs. IPSG may be enabled on Ethernet and port-channel ports. IPSG is disabled by default.

If the network administrator enables IPSG on a port where DHCP snooping is disabled or where DHCP snooping is enabled but the port is trusted, all IP traffic received on that port is dropped depending upon the admin-configured IPSG entries. IPSG cannot be enabled on a port-based routing interface.

IPSG uses two enforcement mechanisms: the L2FDB to enforce the source MAC address and ingress VLAN and an ingress classifier to enforce the source IP address or {source IP, source MAC} pair.

ip verify source

Use the **ip verify source** command in Interface Configuration mode to enable filtering of IP packets from hosts which have not been assigned an IP address via DHCP on the specified interface.

Use the **no** form of the command to enable unverified traffic to flow over the interfaces.

Syntax

ip verify source {port-security}

no ip verify source

- **port-security**—Enables filtering based on IP address, VLAN, and MAC address. When not specified, filtering is based upon IP address.

Default Configuration

By default, no sources are blocked.

Command Mode

Interface Configuration mode (Ethernet and port channel)

User Guidelines

DHCP snooping should be enabled on any ports for which **ip verify source** is configured. If **ip verify source** is configured on an interface for which DHCP snooping is disabled, or for which DHCP snooping is enabled and the port is trusted, incoming traffic on the interface is dropped.

Incoming traffic is filtered based on the source IP address and VLAN. When the port-security keyword is configured, filtering occurs based upon source IP address, VLAN and source MAC address.

IP source guard also interacts with the port security component. Use the **switchport port-security** command in interface mode to optionally add checking of learned MAC addresses. When port security is enabled, MAC learning coordinates with the IP Source Guard to verify that the MAC address is in the DHCP binding database. If it is not, port security is notified that the frame is in violation of the security policy.

Example

```
console(config)#ip dhcp snooping
console(config)#ip dhcp snooping vlan 1
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#ip verify source
```

ip verify binding

Use the **ip verify binding** command in Global Configuration mode to configure static bindings. Use the no form of the command to remove the IPSG entry.

Syntax

ip verify binding *macaddr* **vlan** *ipaddr* **interface**

Default Configuration

By default, there are no static bindings configured.

Command Mode

Global Configuration mode

User Guidelines

The configured IP address and MAC address are used to match the source IP address and source MAC address for packets received on the interface. Hosts sending packets using the configured source IP address and source MAC address are trusted on the interface.

Example

```
console(config)#ip verify binding 00:11:22:33:44:55 vlan 1  1.2.3.4 interface
gigabitethernet 1/0/2
```

show ip verify

Use the **show ip verify** command to display the IP Source Guard configuration on all interfaces or the specified interface.

Syntax

show ip verify [**interface** *interface-id*]

- *interface-id*—An Ethernet interface identifier or a port channel interface identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec, Privileged Exec (all show modes)

User Guidelines

The filter type is one of the following values:

- ipv4-mac: IPv4 plus MAC address filtering

- ip: IPv4 address filtering
- ipv6: IPv6 address filtering
- ipv6-mac: IPv6 plus MAC address filtering
- N/A: No filtering is configured on the interface

Example

```
console(config-if-Gi1/0/5)#show ip verify

Interface    Filter Type
-----------  -----------
Gi1/0/1      ip
Gi1/0/2      ipv4-mac
Gi1/0/3      N/A
Gi1/0/4      N/A
Gi1/0/5      ipv4-mac
Gi1/0/6      N/A
Gi1/0/7      N/A
Gi1/0/8      N/A
Gi1/0/9      N/A

console(config-if-Gi1/0/5)#show ip verify interface gi1/0/5

Interface    Filter Type
-----------  -----------
Gi1/0/5      ipv6-mac
```

show ip verify source

Use the **show ip verify source** command to display the bindings configured on a particular interface or all interfaces.

Syntax

show ip verify source [interface *interface-id*]

- *interface-id:* A valid Ethernet interface identifier or port-channel identifier

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip verify source interface gigabitethernet 1/0/1

Interface  Filter Type   IP Address        MAC Address     Vlan
----------- ----------- --------------- ----------------- -----
Gi1/0/1     ip            1.2.3.4       00:12:32:43:54:66    1
```

show ip source binding

Use the **show ip source binding** command to display all bindings (static and dynamic).

Syntax

show ip source binding

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip source binding
MAC Address    IP Address  Type  VLAN   Interface
------------   ---------- ----- ----- -------------
0011.2233.4455 1.2.3.4    static  1      Gi1/0/2
```

iSCSI Optimization Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

iSCSI Optimization provides a means of performing configuration specific to storage traffic and optionally giving traffic between iSCSI initiator and target systems special Quality of Service (QoS) treatment.

iSCSI Optimization is best applied to mixed-traffic networks where iSCSI packets constitutes a portion of overall traffic. In these cases, the assignment of iSCSI packets to non-default CoS queues can provide flows with lower latency and avoid queue resource contention.

If iSCSI frames comprise most of the traffic passing through the switch, the system provides optimal throughput when all traffic is assigned to the default queue. An example of this situation is a Storage Area Network (SAN) where the switch is dedicated to interconnecting iSCSI Targets with Initiators. Using the default queue for this homogeneous traffic provides the best performance in traffic burst handling and the most accurate 802.3x Flow Control Pause Frame generation. In these cases, the application of QoS treatment other than the default policy may result in less overall throughput or more packet loss.

By default, iSCSI optimization is enabled and iSCSI QoS treatment is disabled.

LLDP is used to detect the presence of EqualLogic storage arrays. When iSCSI optimization is enabled, and LLDP detects an EQL array on a port, that port configuration is changed to enable portfast and disable unicast storm control. Configuration changes appear in the running config and are not removed by disabling the feature or disconnecting the EQL array.

QoS treatment is accomplished by monitoring traffic to detect packets used by iSCSI stations to establish iSCSI sessions and connections. Data from these exchanges is used to create classification rules that assign the traffic between the stations to a configured traffic class. Packets in the flow are queued and scheduled for egress on the destination port based on these rules.

In addition, if configured, the packets can be updated with IEEE 802.1p or IP-DSCP values. This is done by enabling **remark**. Remarking packets with priority data provides special QoS treatment as the packets continue through the network.

iSCSI Optimization borrows ACL lists from the global system pool. ACL lists allocated by iSCSI Optimization reduce the total number of ACLs available for use by the network operator. Enabling iSCSI Optimization uses one ACL list to monitor for iSCSI sessions for the application of any CoS treatment.

iscsi cos

Use the **iscsi cos** command in Global Configuration mode to set the quality of service profile that will be applied to iSCSI flows. To return the VPT/DSCP setting to the default value, use the **no** form of this command. VPT/DSCP values can be configured independently from the application of QoS treatment.

Syntax

iscsi cos {**enable** | **disable** | **vpt** *vpt* | **dscp** *dscp*} [**remark**]

no iscsi cos

- **enable**—Enables application of preferential QoS treatment to iSCSI frames.
- **disable**—Disables application of preferential QoS treatment to iSCSI frames.
- *vpt/dscp*—The VLAN Priority Tag or DSCP value to assign received iSCSI session packets.
- **remark**—Mark the iSCSI frames with the configured DSCP when egressing the switch.

Default Configuration

By default, frames are not remarked. The default vpt setting for iSCSI is 4, which the default class of service 802.1p mapping assigns to queue 2.

Command Mode

Global Configuration mode.

User Guidelines

The remark option only applies to DSCP values. Remarking is not available for vpt values.

In general, the use of iSCSI CoS is not required. By default, iSCSI flows are assigned to the highest VPT/DSCP value that is mapped to the highest queue not used for stack management or the voice VLAN. Make sure you configure the relevant Class of Service parameters for the queue in order to complete the setting.

Configuring the VPT/DSCP value sets the QoS profile which selects the egress queue to which the frame is mapped. The default setting for egress queues scheduling is Weighted Round Robin (WRR).

You may alter the QoS setting by configuring the relevant ports to work in other scheduling and queue management modes via the Class of Service settings. These choices may include strict priority for the queue used for iSCSI traffic. The downside of strict priority is that, in certain circumstances (under heavy high priority traffic), other lower priority traffic may get starved. In WRR, the queue to which the flow is assigned to can be set to get the required percentage using the min-bandwidth settings.

If an EqualLogic array is detected when QoS is enabled, two additional TCP ports receive preferential QoS treatment (TCP ports 25555 and 9876). This QoS policy is applied globally. The `iscsi cos enable` command enables the generation of the iSCSI Application Priority TLV over DCBX using the value set by the `iscsi cos vpt` command on switches that support DCBX.

Example

The following example configures iSCSI packets to receive CoS treatment using DiffServ Code Point AF 41 and configures remarking of transmitted iSCSI packets.

```
console(config)#iscsi cos dscp 41 remark
```

iscsi enable

The **iscsi enable** command globally enables iSCSI optimization. To disable iSCSI optimization, use the **no** form of this command.

Syntax

iscsi enable

no iscsi enable

Default Configuration

iSCSI is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command modifies the running config to enable flow control on all interfaces.

Monitoring for EqualLogic Storage arrays via LLDP is enabled by this command. Upon detection of an EQL array, the specific interface involved will have spanning-tree portfast enabled and unicast storm control disabled. These changes appear in the running config. Disabling iSCSI Optimization does not disable flow control, portfast or storm control configuration applied as a result of enabling iSCSI Optimization.

Command History

Modified in version 6.5 firmware.

Example

In the following example, iSCSI is globally enabled.

```
console(config)#iscsi enable
```

show iscsi

Use the **show iscsi** command to display the iSCSI configuration.

Syntax

show iscsi

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

The following example displays the iSCSI configuration.

```
console#show iscsi
iSCSI enabled
iSCSI CoS disabled
iSCSI vpt is 4
Session aging time: 10 min
Maximum number of sessions is 1024
------------------------------------------------
iSCSI Targets and TCP Ports:
------------------------------------------------
TCP Port    Target IP Address    Name
---------------------------------------------------
iSCSI Static Rule Table
---------------------------------------------------
Index TCP Port    IP Address       IP Address Mask
1    9876             -                 -
2    25555            -                 -
```

Link Dependency Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Link dependency allows the link status of a group of interfaces to be made dependent on the link status of other interfaces. The effect is that the link status of a group that depends on another interface either mirrors or inverts the link status of the depended-on interface. Circular dependencies are not allowed. For example, if port-channel 1 in group 1 depends on port-channel 2. Then the system will not allow the operator to configure another link dependency group where port-channel 2 depends on port-channel 1.

action

Use the **action** command in Link Dependency mode to indicate if the link-dependency group should mirror or invert the status of the depended-on interfaces.

Syntax

action {down|up}

- **down**—Mirror the depended on interface(s) status.
- **up**—Invert the depended on interface(s) status.

Default Configuration

The default configuration for a group is down, i.e. the group members will mirror the depended-on link status by going down when all depended-on interfaces are down.

Command Mode

Link Dependency mode

User Guidelines

The **action up** command will cause the group members to be up when no depended-on interfaces are up.

Example

```
console(config-depend-1)#action up
```

link-dependency group

Use the **link-dependency group** command to enter the link-dependency mode and configure a link-dependency group.

Syntax

link-dependency group *GroupId*

no link-dependency group *GroupId*

- *GroupId* — Link dependency group identifier. (Range: 1–72)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The preference of a group is to remain in the up state. A group will be in the up state if any depends-on interface is up and will be in the down state only if all depends-on interfaces are down.

Example

```
console(config)#link-dependency group 1
console(config-linkDep-group-1)#
```

add

Use this command to add member ten Gigabit or Gigabit Ethernet port(s) or port channels to the dependency list.

Syntax

add *intf-list*

- *intf-list* — List of Ethernet interface identifiers or port channel identifiers or ranges. Separate nonconsecutive ports with a comma and no spaces. Use a hyphen to designate the range of ports.

Default Configuration

This command has no default configuration.

Command Mode

Link Dependency mode

User Guidelines

Adding an interface to a dependency list brings the interface down until the depends-on command is entered. The link status will then follow the interface specified in the depends-on command.

To avoid bringing down interfaces, enter the depends-on command prior to entering the add command.

Example

```
console(config-depend-1)#add gigabitethernet 1/0/1
console(config-depend-1)#add tengigabitethernet 1/0/1
console(config-depend-1)#add port-channel 10-12
```

depends-on

Use this command to add the dependent Ethernet ports or port channels list. Use the **no depends-on** command to remove the dependent Ethernet ports or port-channels list.

Syntax

depends-on *intf-list*

no depends-on *intf-list*

- *intf-list* — List of Ethernet interface identifiers or port channel interface identifiers or ranges.Separate nonconsecutive items with a comma and no spaces. Use a hyphen to designate the range of ports or port-channel numbers.

Default Configuration

This command has no default configuration.

Command Mode

Link Dependency mode

User Guidelines

Circular dependencies are not allowed, i.e. interfaces added to the group may not also appear in the depends-on list of the same group or a different group. If an interface appears in the add list of any group, the interfaces in the corresponding depends-on list may not refer back to the interfaces in the add group.

Examples

```
console(config-linkDep-group-1)#depends-on gigabitethernet 1/0/10
console(config-linkDep-group-1)#depends-on port-channel 6
```

show link-dependency

Use the **show link-dependency** command to show the link dependencies configured for a particular group. If no group is specified, then all the configured link-dependency groups are displayed.

Syntax

show link-dependency [***group*** *GroupId*] [**detail**]

- *GroupID*—Link dependency group identifier. (Range: Valid Group Id, 1–16)
- **detail**—Show detailed information about the state of members and the dependent ports.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

Configure a link dependency group prior to using this command.

Example

The following command shows link dependencies for all groups.

```
console#show link-dependency
GroupId  Member Ports Ports Depended On Link Action Group State
------- -----------------------------------------------------
1 Gi4/0/2-3,Gi4/0/5 Gi4/0/10-12 Link Up Up/Down
```

The following command shows link dependencies for group 1 only.

```
console#show link-dependency group 1
GroupId  Member Ports Ports Depended On Link Action Group State
------- -----------------------------------------------------
1       Gi4/0/2-3,Gi4/0/5 Gi4/0/10-12   Link Up      Up/Down
```

The following command shows detailed information for group 1.

```
console#show link-dependency group 1 detail
GroupId: 1
Link Action: Link UpGroup
State: Up
Ports Depended On State:
Link Up:   Gi4/0/10
Link Down: Gi4/0/11-12
Member Ports State:
Link Up:   Gi4/0/2-3
Link Down: Gi4/0/5
```

LLDP Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The IEEE 802.1AB standard defines the Link Layer Discovery Protocol (LLDP). This protocol allows stations residing on an IEEE802 LAN to advertise major capabilities, physical descriptions, and management information to physically adjacent devices, allowing a network management system (NMS) to access and display this information.

The standard is designed to be extensible, providing for the optional exchange of organizational specific information and data related to other IEEE standards. The base implementation supports only the required basic management set of type length values (TLVs).

LLDP is a one-way protocol; there are no request/response sequences. Information is advertised by stations implementing the transmit function. The information is received and processed by stations implementing the receive function. Devices are not required to implement both transmit and receive functions and each function can be enabled or disabled separately by the network manager. Dell EMC Networking supports both the transmit and receive functions in order to support device discovery.

The LLDP component transmit and receive functions can be enabled/disabled separately per physical port. By default, both transmit and receive functions are enabled on all ports. The application starts each transmit and receive state machine appropriately based on the configured status and operational state of the port.

The transmit function is configurable with respect to packet construction and timing parameters. The required Chassis ID, Port ID, and Time to Live (TTL) TLVs are always included in the Link Layer Discovery Protocol Data Unit (LLDPDU). However, inclusion of the optional TLVs in the management set is configurable by the administrator. By default, they are not included. The transmit function extracts the local system information and builds the LLDPDU based on the specified configuration for the port. In addition, the administrator has control over timing parameters affecting the TTL of LLDPDUs and the interval in which they are transmitted.

The receive function accepts incoming LLDPDU frames and stores information about the remote stations. Both local and remote data may be displayed by the user interface and retrieved using SNMP as defined in the LLDP MIB definitions. The component maintains one remote entry per physical network connection.

The LLDP component manages a number of statistical parameters representing the operation of each transmit and receive function on a per-port basis. These statistics may be displayed by the user interface and retrieved using SNMP as defined in the MIB definitions.

clear lldp remote-data

Use the **clear lldp remote-data** command to delete all LLDP peer information.

Syntax

clear lldp remote-data

Default Configuration

By default, data is removed only on system reset.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to clear the LLDP remote data.

```
console#clear lldp remote-data
```

clear lldp statistics

Use the **clear lldp statistics** command to reset all LLDP statistics.

Syntax

clear lldp statistics

Default Configuration

By default, the statistics are only cleared on a system reset.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to reset all LLDP statistics.

```
console#clear lldp statistics
```

debug lldp

Use the **debug lldp** command to display LLDP debug information. Use the **no** form of the command to halt the display of LLDP debug information.

Syntax

debug lldp packet [**transmit** | **receive**]

no debug lldp packet [**transmit** | **receive**]

- Transmit–Display LLDP packets transmitted by the switch.
- Receive–Display LLDP packets received by the switch.

Default Configuration

If neither transmit nor receive is specified, packets for both directions are displayed.

Command Mode

Privileged Exec mode

User Guidelines

Decode of LLDP packet information is limited. If possible, it is preferable to attach the Wireshark tool to the switch CPU to obtain a full decode, if an out-of-band port is available. Refer to the Remote Capture example in the *User's Configuration Guide*.

Command History

Command introduced in version 6.5 firmware.

lldp med

This command is used to enable/disable LLDP-MED on an interface. By enabling MED, the transmit and receive functions of LLDP are effectively enabled.

Syntax

lldp med

no lldp med

Command Mode

Interface Configuration (Ethernet) mode

Default Value

Transmission and reception of LLDP-MED TLVs is enabled on all supported interfaces.

User Guidelines

No specific guidelines.

Example

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#lldp med
```

lldp med confignotification

This command is used to enable sending topology change notifications.

Syntax

lldp med confignotification

no lldp med confignotification

Command Mode

Interface Configuration (Ethernet) mode

Default Value

By default, notifications are disabled on all Ethernet interfaces.

User Guidelines

There are no guidelines for this command.

Example

```
console(config)#lldp med confignotification
```

lldp med faststartrepeatcount

This command is used to set the value of the fast start repeat count.

Syntax

lldp med faststartrepeatcount *count*

no lldp med faststartrepeatcount

- *count* — Number of LLDPPDUs that are transmitted when the protocol is enabled. (Range 1–10)

Command Mode

Global Configuration

Default Value

3

User Guidelines

No specific guidelines.

Example

```
console(config)# lldp med faststartrepeatcount 2
```

lldp med-tlv-select

This command is used to specify which optional TLVs in the LLDP MED set are transmitted in the LLDPDUs. There are certain conditions that have to be met for a port to be MED compliant. These conditions are explained in the normative section of the ANSI/TIA-1057 specification. For example, the MED TLV 'capabilities' is mandatory. By disabling transmission of the MED capabilities TLV, MED is effectively disabled on the interface.

Syntax

lldp med-tlv-select [**capabilities**] [**network-policy**] [**ex-pse**] [**ex-pd**]

no lldp med-tlv-select [**capabilities**] [**network-policy**] [**ex-pse**] [**ex-pd**]

Command Mode

Interface Configuration (Ethernet)

User Guidelines

The optional ex-pse (extended PSE) and ex-pd (extended PD) parameters are only available on PoE capable switches.

Default Value

By default, the capabilities and network policy TLVs are included in LLDP packets sent on interfaces enabled for MED. On PoE capable switches, the extended PD TLV and extended PSE TLV are transmitted.

Command History

Command updated in version 6.6 firmware.

Example

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#lldp med-tlv-select capabilities
console(config-if-Gi1/0/1)#lldp med-tlv-select network-policy
```

lldp notification

Use the **lldp notification** command in Interface Configuration mode to enable remote data change notifications. To disable notifications, use the **no** form of this command.

Syntax

lldp notification

no lldp notification

Default Configuration

By default, notifications are disabled on all supported interfaces.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to enable remote data change notifications.

```
console(config-if-Gi1/0/3)#lldp notification
```

lldp notification-interval

Use the **lldp notification-interval** command in Global Configuration mode to limit how frequently remote data change notifications are sent. To return the notification interval to the factory default, use the **no** form of this command.

Syntax

lldp notification-interval *interval*

no lldp notification-interval

- interval — The smallest interval in seconds at which to send remote data change notifications. (Range: 5–3600 seconds)

Default Configuration

The default value is 5 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to set the interval value to 10 seconds.

```
console(config)#lldp notification-interval 10
```

lldp receive

Use the **lldp receive** command in Interface Configuration mode to enable the LLDP receive capability. To disable reception of LLDPDUs, use the **no** form of this command.

Syntax

lldp receive

no lldp receive

Default Configuration

The default lldp receive mode is enabled.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to enable the LLDP receive capability.

```
console(config-if-Gi1/0/3)#lldp receive
```

lldp timers

Use the **lldp timers** command in Global Configuration mode to set the timing parameters for local data transmission on ports enabled for LLDP. To return any or all parameters to factory default, use the **no** form of this command.

Syntax

lldp timers [**interval** *transmit-interval*] [**hold** *hold-multiplier*] [**reinit** *reinit-delay*]

no lldp timers [**interval**] [**hold**] [**reinit**]

- *transmit-interval* — The interval in seconds at which to transmit local data LLDPDUs. (Range: 5–32768 seconds)
- *hold-multiplier* — Multiplier on the transmit interval used to set the TTL in local data LLDPDUs. (Range: 2–10)
- *reinit-delay* — The delay in seconds before reinitialization. (Range: 1–10 seconds)

Default Configuration

The default transmit interval is 30 seconds.

The default hold-multiplier is 4.

The default delay before reinitialization is 2 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Examples

The following example displays how to configure LLDP to transmit local information every 1000 seconds.

```
console(config)#lldp timers interval 1000
```

The following example displays how to set the timing parameter at 1000 seconds with a hold multiplier of 8 and a 5 second delay before reinitialization.

```
console(config)#lldp timers interval 1000 hold 8 reinit 5
```

lldp transmit

Use the **lldp transmit** command in Interface Configuration mode to enable the LLDP advertise (transmit) capability. To disable local data transmission, use the **no** form of this command.

Syntax

lldp transmit

no lldp transmit

Default Configuration

LLDP is enabled on all supported interfaces.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how enable the transmission of local data.

```
console(config-if-Gi1/0/3)#lldp transmit
```

lldp tlv-select

Use the **lldp tlv-select** command to specify which optional type-length-value settings (TLVs) in the 802.3 AB basic management set will be transmitted in the LLDPDUs. To disable transmission of an optional TLV, use the **no** form of this command. To return the configuration to the default, use the **no** form of the command with no arguments.

Syntax

lldp tlv-select [management-address] [port-description] [port-vlan] [system-capabilities] [system-description] [system-name]

no lldp tlv-select [management-address] [port-description] [port-vlan] [system-capabilities] [system-description] [system-name]

- **management-address**— Transmits the switch management address (TLV type 8).
- **port-description** — Transmits the port description (TLV type 4).
- **port-vlan** — Transmits the port PVID (TLV type 127, subtype 1)
- **system-name** — Transmits the system name (TLV type 5).
- **system-description** — Transmits the system description (TLV type 6).
- **system-capabilities** — Transmits the system capabilities (TLV type 7).

Default Configuration

By default, the chassis ID (1), port ID (2), time-to-live (3), port-description (4), port-vlan (127/1), and system-name (5) TLVs are transmitted.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

LLDP must be enabled globally, or if disabled globally, enabled on the interface for this command to have an effect.

The switch does not attempt to identify if the transmitted VLAN information matches the received VLAN information.

The string configured by the **hostname** command is transmitted by the system-name TLV.

If no TLV argument is given, the configuration remains unchanged.

Use the **show lldp remote-device all** command to see the advertised LLDP neighbor information.

The management address TLV is type 8. The switch will send the address of the service port, if available, otherwise, the IP address of the switch, if defined, otherwise, the MAC address of the switch. The interface numbering subtype sent is always IfIndex. If IPv6 management addresses are configured, they are also sent.

See the **lldp med** command for additional LLDP transmission capabilities.

Command History

Syntax updated in version 6.5. Deprecated l**ldp transmit-tlv** command in favor of **lldp tlv-select** command in 6.5.2 firmware release. Deprecated lldp transmit-mgmt command in favor of lldp tlv-select management-address in 6.5.2 firmware release.

Example

The following example shows how to include the system description TLV in local data transmit.

```
console(config-if-Gi1/0/3)#lldp transmit-tlv system-description
```

show lldp

Use the **show lldp** command to display the current LLDP configuration summary.

Syntax

show lldp

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the current LLDP configuration summary.

```
console#show lldp
LLDP Global Configuration
Transmit Interval........................... 30 seconds
Transmit Hold Multiplier.................... 4
Reinit Delay................................ 2 seconds
Notification Interval....................... 5 seconds
```

Command History

Example updated in the 6.4 release.

show lldp interface

Use the **show lldp interface** command to display the current LLDP interface state.

Syntax

show lldp interface {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port| **all**}

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

This example show how the information is displayed when you use the command with the **all** parameter.

```
console#show lldp interface all

LLDP Interface Configuration

Interface  Link    Transmit  Receive   Notify    TLVs
---------  ------  --------  --------  --------  -------------
Gi1/0/1    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/2    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/3    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/4    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/5    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/6    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/7    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/8    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/9    Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/10   Up      Enabled   Enabled   Disabled  0,1,4
Gi1/0/11   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/12   Up      Enabled   Enabled   Disabled  0,1,4
Gi1/0/13   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/14   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/15   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/16   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/17   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/18   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/19   Up      Enabled   Enabled   Disabled  0,1,4
Gi1/0/20   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/21   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/22   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/23   Down    Enabled   Enabled   Disabled  0,1,4
Gi1/0/24   Down    Enabled   Enabled   Disabled  0,1,4
Te1/0/1    Down    Enabled   Enabled   Disabled  0,1,4
Te1/0/2    Down    Enabled   Enabled   Disabled  0,1,4

TLV Codes: 0- Port Description,    1- System Name, 2- System Description
           3- System Capabilities, 4- Port VLAN, 5- Management Address


console# show lldp interface Gi1/0/1
```

```
Interface Link Transmit Receive  Notify   TLVs    Mgmt
--------- ---- -------- -------- -------- ------- ----
Gi1/0/1    Up   Enabled  Enabled  Enabled  0,1,2,4  Y
TLV Codes: 0 - Port Description, 1 - System Name, 2 - System Description, 3 -
System Capabilities, 4-Port VLAN
```

show lldp local-device

Use the **show lldp local-device** command to display the advertised LLDP local data. This command can display summary information or detail for each interface.

Syntax

show lldp local-device {**detail** *interface* | *interface* | **all**}

- **detail** — includes a detailed version of the local data.
- *interface* — Specifies a valid Ethernet interface on the device. Specify either **gigabitethernet** unit/slot/port or **tengigabitethernet** unit/slot/port *or* fortygigabitethernet unit/slot/port.
- **all** — Shows lldp local device information on all interfaces.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

These examples show advertised LLDP local data in two levels of detail.

```
console#show lldp local-device all
LLDP Local Device Summary
Interface   Port ID              Port Description
--------- -------------------- --------------------
Gi1/0/1    Gi1/0/1
```

```
console# show lldp local-device detail Gi1/0/1
LLDP Local Device Detail
Interface: Gi1/0/1
Chassis ID Subtype: MAC Address
Chassis ID: 00:62:48:00:00:00
Port ID Subtype: Interface Name
Port ID: Gi1/0/1
Port VLAN: 22
System Name:
System Description: Routing
Port Description:
System Capabilities Supported: bridge, router
System Capabilities Enabled: bridge
Management Address:
Type: IPv4
Address: 192.168.17.25
```

show lldp med

This command displays a summary of the current LLDP MED configuration.

Syntax

show lldp med

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Default Value

Not applicable

User Guidelines

No specific guidelines.

Example

```
console(config)#show lldp med
LLDP MED Global Configuration

Fast Start Repeat Count: 3
Device Class: Network Connectivity
```

show lldp med interface

This command displays a summary of the current LLDP MED configuration for a specific interface.

Syntax

show lldp med interface {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port| **all**}

- **all** — Shows information for all valid LLDP interfaces.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Default Value

Not applicable

Example

```
console#show lldp med interface all
LLDP MED Interface Configuration
Interface  Link    configMED operMED   ConfigNotify TLVsTx
---------  ------  --------- --------  ------------ -----------
Gi1/0/1    Detach  Enabled   Enabled   Enabled0,1
Gi1/0/2    Detach  Disabled  Disabled  Disabled     0,1
Gi1/0/3    Detach  Disabled  Disabled  Disabled     0,1
Gi1/0/4    Detach  Disabled  Disabled  Disabled     0,1
Gi1/0/5    Detach  Disabled  Disabled  Disabled     0,1

console #show lldp med interface gi1/0/1

LLDP MED Interface Configuration

Interface  Link    configMED operMED   ConfigNotify    TLVsTx
---------  ------  --------  --------  --------       -------
Gi1/0/1       Up      Enabled   Enabled   Disabled      0,1

TLV Codes: 0- Capabilities,   1- Network Policy
           2-Location, 3- Extended PSE, 4- Extended PD, 5-Inventory
```

show lldp med local-device detail

This command displays the advertised LLDP local data in detail.

Syntax

show lldp med local-device detail {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port}

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Default Value

Not applicable

Example

```
Console#show lldp med local-device detail gi1/0/8

LLDP MED Local Device Detail

Interface: Gi1/0/8

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True

Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True
Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx
```

```
Extended POE
Device Type: pseDevice

Extended POE PSE
Available: 0.3 watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 watts
Source: local
Priority: low
```

show lldp med remote-device

This command displays the current LLDP MED remote data. This command can display summary information or detail for each interface.

Syntax

show lldp med remote-device {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port | all}

show lldp med remote-device detail {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port}

- **all** — Indicates all valid LLDP interfaces.
- **detail** — Includes a detailed version of remote data for the indicated interface.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Default Value

Not applicable

Example

```
console#show lldp med remote-device all

LLDP Remote Device Summary
```

```
Local
Interface  RemoteID    Device Class
---------  ----------  --------------------
Gi1/0/13   1           Class I
Gi1/0/16   2           Class II
Gi1/0/23   6           Not Defined

Console#show lldp med remote-device detail Gi1/0/1
LLDP MED Remote Device Detail

Local Interface: 1/0/1

Capabilities
MED Capabilities Supported: capabilities, networkpolicy, location,
extendedpse
MED Capabilities Enabled: capabilities, networkpolicy
Device Class: Endpoint Class I

Network Policies
Media Policy Application Type : voice
Vlan ID: 10
Priority: 5
DSCP: 1
Unknown: False
Tagged: True

Media Policy Application Type : streamingvideo
Vlan ID: 20
Priority: 1
DSCP: 2
Unknown: False
Tagged: True

Inventory
Hardware Rev: xxx xxx xxx
Firmware Rev: xxx xxx xxx
Software Rev: xxx xxx xxx
Serial Num: xxx xxx xxx
Mfg Name: xxx xxx xxx
Model Name: xxx xxx xxx
Asset ID: xxx xxx xxx

Location
Subtype: elin
Info: xxx xxx xxx

Extended POE
```

```
Device Type: pseDevice

Extended POE PSE
Available: 0.3 Watts
Source: primary
Priority: critical

Extended POE PD

Required: 0.2 Watts
Source: local
Priority: low
```

show lldp remote-device

Use the **lldp remote-device** command to display the current LLDP remote data. This command can display summary information or detail for each interface.

Syntax

show lldp remote-device {**detail** *interface* **|** *interface* **|** **all**}

- detail — Includes detailed version of remote data.
- *interface* — Specifies a valid Ethernet interface on the device. Substitute **gigabitethernet** unit/slot/port or **tengigabitethernet** unit/slot/port *or* **fortygigabitethernet** unit/slot/port}

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

These examples show current LLDP remote data, including a detailed version.

```
console#show lldp remote-device all

LLDP Remote Device Summary

Local
Interface RemID  Chassis ID          Port ID            System Name
-------- ------- ------------------ ------------------- -----------------
Gi1/0/7   12      14:18:77:15:23:68  14:18:77:15:23:6A  console
Gi1/0/19  7       00:1E:C9:AA:AB:FD Gi1/0/5
```

```
console#show lldp remote-device detail Gi1/0/19

LLDP Remote Device Detail

Local Interface: Gi1/0/19

Remote Identifier: 2
Chassis ID Subtype: MAC Address
Chassis ID: E4:F0:04:38:00:D7
Port ID Subtype: Interface Name
Port ID: Gi2/0/19
Port VLAN: 10
System Name:
System Description:
Port Description: Gi2/0/19
System Capabilities Supported:
System Capabilities Enabled:
Time to Live: 99 seconds
```

show lldp statistics

Use the **show lldp statistics** command to display the current LLDP traffic statistics.

Syntax

show lldp statistics {*unit/slot/port* | **all**}

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following examples shows an example of the display of current LLDP traffic statistics. The output is abbreviated for the **all** form of the command.

```
console#show lldp statistics all

LLDP Device Statistics

Last Update................................. 0 days 22:58:29

Total Inserts............................... 1

Total Deletes............................... 0

Total Drops................................. 0

Total Ageouts............................... 1

          Tx    Rx                            TLV      TLV      TLV  TLV   TLV
Interface Total Total Discards Errors Ageout Discards Unknowns MED  802.3 UPOE
--------- ----- ----- -------- ------ ------ -------- -------- ---- ----- -----
Gi1/0/1   29395  82562 0        0      1      0        0        0    1     4
Gi1/0/2   0     0     0        0      0      0        0        0    0     0     0
Gi1/0/3   0     0     0        0      0      0        0        0    0     0     0
Gi1/0/4   0     0     0        0      0      0        0        0    0     0     0

console#show lldp statistics Gi1/0/7

LLDP Device Statistics


Last Update................................. 0 days 00:38:16

Total Inserts............................... 13

Total Deletes............................... 0
```

```
Total Drops................................ 0

Total Ageouts.............................. 0

          Tx    Rx                            TLV      TLV      TLV  TLV   TLV
Interface Total Total Discards Errors Ageout Discards Unknowns MED  802.1 802.3
--------- ----- ----- -------- ------ ------ -------- -------- ---- ----- -----
Gi1/0/7   2297  2298  0        0      0      0        0        0    0     10
```

The following table explains the fields in this example.

Fields	Description
Last Update	The value of system of time the last time a remote data entry was created, modified, or deleted.
Total Inserts	The number of times a complete set of information advertised by a remote device has been inserted into the table.
Total Deletes	The number of times a complete set of information advertised by a remote device has been deleted from the table.
Total Drops	Number of times a complete set of information advertised by a remote device could not be inserted due to insufficient resources.
Total Ageouts	Number of times any remote data entry has been deleted due to time-to-live (TTL) expiration.
Transmit Total	Total number of LLDP frames transmitted on the indicated port.
Receive Total	Total number of valid LLDP frames received on the indicated port.
Discards	Number of LLDP frames received on the indicated port and discarded for any reason.
Errors	Number of non-valid LLDP frames received on the indicated port.
Ageouts	Number of times a remote data entry on the indicated port has been deleted due to TTL expiration.
TLV Discards	Number LLDP TLVs (Type, Length, Value sets) received on the indicated port and discarded for any reason by the LLDP agent.
TLV Unknowns	Number of LLDP TLVs received on the indicated port for a type not recognized by the LLDP agent.

Fields	Description
TLV MED	Number of OUI specific MED (Media Endpoint Device) TLVs received.
TLV	Number of OUI specific TLVs received.
TLV 802.3	Number of OUI specific 802.3 specific TLVs received.
TLV UPOE	Number of PoE TLVs received

Loop Protection Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Loop protection detects physical and logical loops between Ethernet ports on a device. Loop protection must be enabled globally before it can be enabled at the interface level.

keepalive (Interface Config)

Use the **keepalive** command in Interface Configuration mode to enable loop protection on an interface. Use the **no** form of the command to return the configuration to the defaults.

Syntax

keepalive

no keepalive

Default Configuration

Loop protection is disabled globally by default and disabled on all interfaces by default.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

Loop protection operates by unicasting a Configuration Test Protocol (CTP) reply packet with the following field settings:

- Source MAC Address:switch L3 MAC address
- Destination MAC Address: Switch L3 MAC address
- Ether Type: 0x0900 (LOOP)
- Skip Count: 0
- Functions: Reply
- Receipt Number: 0

- Data: 0

Since all switch ports share the same MAC address, if any interface receives CTP packets transmitted by the switch in excess of the configured limit, that interface is error disabled with a Loop Protection cause.

Looped CTP packets received on a routed interface are ignored and will not error-disable the interface. This is because routed interfaces receiving a packet addressed to the router will not unicast flood the packet to the VLAN.

The switch never sends a response to received CTP packets. The switch may flood the first few CTP packets it receives until a MAC address entry is placed in the CAM.

The CTP protocol operates on physical Ethernet interfaces only. It does not operate over Link Aggregation Groups. It may be configured to operate on LAG members.

The CTP protocol does not operate over the out-of-band interface.

Command History

Implemented in version 6.3.0.1 firmware.

Example

The following example enables loop protection on an interface:

```
console(config)#keepalive
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#keepalive
```

This example disables loop protection on an interface:

```
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#no keepalive
```

keepalive (Global Config)

Use the **keepalive** command in Global Configuration mode to enable keepalive or to configure the loop protection timer and packet count. Use the **no** form of the command to return the configuration to the defaults.

Syntax

keepalive [*period* [*count*]]

no keepalive

- *period* – Configures the interval for the transmission of keepalive packets. Default: 10 seconds
- *count* – Configures the number of consecutive CTP packets addressed to and received by the local switch before the interface is error disabled. Default: 3 packets.

Default Configuration

Loop protection is disabled globally by default.

The default period is 10 seconds.

The default count is 3 packets.

Command Mode

Global Configuration mode

User Guidelines

Loop protect must be enabled individually on an Ethernet interface as well as globally.

If only the period parameter is specified, the count parameter remains unchanged.

Loop protection may only be enabled on Ethernet interfaces, not on port channels or any virtual interfaces.

Command History

Implemented in version 6.3.0.1 firmware.

Example

The following example configures the CTP transmit interval to transmit CTP packets every 5 seconds.

```
console(config)#keepalive 5
```

This example configures the CTP transmit interval to 5 seconds. If an interface receives two CTP packets, it error disables the interface.

```
console(config)#keepalive 5 2
```

In the next example, if the CTP transmit interval is configured to 5 seconds, if an interface receives three CTP packets, it will error disable the interface.

```
console(config)#no keepalive
```

keepalive action

Use the **keepalive action** command to configure the action taken when a loop is detected on an interface. Use the **no** form of the command to return the action to the default.

Syntax

keepalive action {error-disable | log-only}

no keepalive action

- **error-disable** — When a loop is detected, the interface is disabled and a log message is issued.
- **log-only**— When a loop is detected, a log message is issued and the interface is not error disabled.

Default Configuration

The default is to error disable the interface when a loop is detected.

Command Mode

Interface Configuration mode

User Guidelines

Error disabled interfaces can be configured to auto-recover using the errdisable recovery cause loop-protect command. Keepalive should only be configured on interfaces that do not participate in spanning-tree. Keepalive may disable interfaces in the spanning-tree designated (blocked) role.

Command History

Implemented in version 6.3.0.1 firmware. Syntax corrected in 6.4 release.

Example

The following example configures loop protection to log detected loop conditions without error disabling the port.

```
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#keepalive action log-only
```

show keepalive

Use the **show keepalive** command to display the global loop protect configuration.

Syntax

show keepalive

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode and configuration submodes.

User Guidelines

The following information is displayed.

Field	Description
Keepalive Service	The Keepalive service configuration (Enabled, Disabled).
Transmit Interval	The transmission interval in seconds.
Retry Count	The number of times a keepalive packet must be seen before a looped state is declared.

Command History

Implemented in version 6.3.0.1 firmware. Example updated in 6.4 version.

Example

```
console#show keepalive

Keepalive Service............................. Enabled
Transmit Interval............................. 10
Retry Count................................... 3
```

show keepalive statistics

Use the **show keepalive statistics** command to display the loop protect status for one or all interfaces.

Syntax

show keepalive statistics {*interface-id* | **all**}

- *interface-id* — Displays the statistics for the specified Ethernet (Physical) interface.
- **all** — Displays statistics for all interfaces.

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode and all configuration sub modes

User Guidelines

The following information is displayed.

Field	Description
Port	The interface identifier.
Keep Alive	Are keepalives transmitted on this interface (Yes, No)?
Loop Detected	Has a loop been detected (Yes, No)?

Loop Count	The number of CTP packets detected.
Time Since Last Loop	The last time a loop was detected.
Rx Action	Action when a loop is detected (Error disable, Log).
Port Status	Current port status (Enable, Disable).

Command History

Implemented in version 6.3.0.1 firmware.

Example

```
console#show keepalive statistics gi1/0/3

         Keep      Loop        Loop     Time Since    Rx            Port
Port     Alive     Detected    Count    Last Loop     Action        Status
-------- --------- ----------- -------- ------------- ------------- --------
Gi1/0/3  Yes       No                                 Error disable Enable
```

MLAG Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

MLAG enables a LAG to be created across two independent switches, so that some member ports of a MLAG can reside on one switch and the other members of a MLAG can reside on another switch. The partner switch on the remote side can be a MLAG-unaware unit. To the MLAG unaware switch, the MLAG appears to be a single LAG connected to a single switch.

clear vpc statistics

Use the **clear vpc statistics** command to clear the counters for the keepalive messages transmitted and received by the MLAG switch.

Syntax

clear vpc statistics {**peer-keepalive** | **peer-link**}

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear vpc statistics
```

feature vpc

The **feature vpc** command globally enables MLAG. Use the **no** form of the command to globally disable MLAG.

Syntax

feature vpc

no feature vpc

Default Configuration

By default, the MLAG feature is not globally enabled.

Command Modes

Global Configuration mode

User Guidelines

The MLAG configuration is retained even when the feature is disabled. The peer link will not be enabled if the VPC feature is not enabled.

MLAG role election occurs if the MLAG feature is enabled and the keepalive state machine is enabled.

Example

```
console#configure terminal
console(config)#feature vpc
```

peer detection enable

Use the **peer detection enable** command to enable the Dual Control Plane Detection Protocol. This enables the detection of peer MLAG switches and suppresses state transitions out of the secondary state in the presence of peer link failures.

Use the **no** form of the command to disable the dual control plane detection protocol.

Syntax

peer detection enable

no peer detection enable

Default Configuration

Dual Control Plane Detection Protocol is disabled by default.

Command Modes

MLAG Domain Configuration mode

User Guidelines

Use of the Dual Control Plane Detection Protocol is optional. It provides a second layer of redundancy beyond that provided by the peer link protocol. System that operate without the DCPDP protocol enabled (and use static LAGs) run the risk of a split brain scenario in the case of peer link failure.

Example

```
console(config)#vpc domain 1
console(config-vpc 1)#peer-keepalive enable
console(config-vpc 1)#peer-keepalive destination 192.168.0.2 source
192.168.0.1
console(config-vpc 1)#peer detection enable
console(config-vpc 1)#exit
```

peer detection interval

Use this command to configure the peer detection transmission interval and the detection interval. Use the **no** form of the command to return the transmission and detection intervals to the default.

Syntax

peer detection interval *interval-msecs* **timeout** *timeout-msecs*

no peer detection interval

- *interval-msecs*—The peer keepalive timeout in seconds. The range is 200–4000 milliseconds.
- *timeout-msecs*—The peer timeout value in milliseconds. The range is 700–14000 milliseconds.

Default Configuration

The default transmission interval is 1000 milliseconds. The default reception timeout is 3500 milliseconds.

Command Modes

VPC Domain mode

User Guidelines

This command configures the DCPDP transmission and timeout values. If an MLAG switch does not receive DCPDP messages from the peer for the configured timeout value, it takes the decision to transition its role (if required).

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-vpc 1)#peer detection interval 750 timeout 3000
```

peer-keepalive destination

Use the **peer-keepalive destination** command to enable the Dual Control Plane Detection Protocol with the configured IP address of the peer MLAG, the local source address and the peer timeout value. The UDP port on which the MLAG switch listens to the Dual Control Plane Detection Protocol messages is also configurable with this command.

Use the **no** form of the command to return the configuration to the default.

Syntax

peer-keepalive destination *ipaddress* **source** *srcaddr* [**udp-port** *port*]

no peer-keepalive destination

- *ipaddress*—The ip address of the MLAG peer.
- *port*—The UDP port number to use to listen for peer Dual Control Plane Detection Protocol packets.
- *srcaddr*—The local source address to use.

Default Configuration

There are no Dual Control Plane Detection Protocol peers configured by default.

Command Modes

MLAG Domain Configuration mode

User Guidelines

Changes to the DCPDP configuration do not take effect until the protocol is disabled and then re-enabled. Both the local switch and the MLAG peer switch must be configured identically. The recommended procedure to update these parameters is to disable the DCPDP protocol on both switches, configure the new parameters on both switches, and then re-enable the DCPDP protocol on both switches.

The Dual Control Plane Detection Protocol is a UDP-based protocol. The administrator must configure this protocol on an IP interface with a VLAN that is not shared with any of the MLAG interfaces. This can include the out-of-band port. When enabled, the dual-control plane detection protocol sends a control plane detection message to the peer once every second. The message is unidirectional and contains the sender's MAC address. When a switch receives a control plane detection message it sets the 'peer is UP' variable to TRUE to indicate that a peer is detected.

Do not configure DCPDP to use a port reserved by the switch. UDP, TCP and RAW ports reserved by the switch and unavailable for use or configuration are:

Ports 1, 17, 58, 255, 546, 547, 2222, 4567, 6343, 49160

Example

```
console(config)#vpc domain 1
console(config-vpc 1)#peer-keepalive enable
console(config-vpc 1)#peer-keepalive destination 192.168.0.2 source
192.168.0.1
console(config-vpc 1)#peer detection enable
console(config-vpc 1)#exit
```

peer-keepalive enable

Use the **peer-keepalive enable** command to enable the peer keepalive protocol on the peer link. When enabled, if an MLAG switch does not receive keepalive messages from the peer within the timeout value and DCPDP is disabled, the switch begins the process of transitioning to the primary role (if standby).

Use the **no** form of the command to disable the peer keepalive protocol.

Syntax

peer-keepalive enable

no peer-keepalive enable

Default Configuration

The peer keepalive protocol is disabled by default.

Command Modes

MLAG Domain Configuration mode

User Guidelines

MLAG will not become operational until the peer keepalive protocol detects a peer and syncs the peer information. Peer keepalive timeout state transitions are suppressed if the Dual Control Plan Detection (DCPDP) is enabled and detects that the peer is still alive.

Two failure situations cause state transitions:

- The peer device fails: A peer does not receive any more advertisements and the timeout timer expires.
  - Secondary device fails: All MLAG members' port information regarding the secondary device that the primary switch maintains are removed from the primary switch. Forwarding and control processing continues on the local MLAG ports on the primary switch. Once the secondary comes back up again, it starts the keepalive protocol and, if successful in contacting the primary device, moves to the secondary state. It then initiates an FDB sync and becomes operational again.
  - Primary device fails: The secondary device transitions to primary state and continues forwarding traffic on its local MLAG ports. It also starts processing control messages. The MLAG connected devices see a change in the source MAC address. Once the peer device comes up again, it starts the keepalive protocol and transitions to the secondary state.
- The peer-link fails: This occurs when either switch cannot contact the peer through the peer keepalive protocol and the DCPDP protocol. The secondary switch transitions to a primary role which results in two primary switches. Both primaries continue forwarding traffic. Each primary also

processes control traffic and sends LACP and BPDU packets with a unique source MAC address (the system MAC of the local switch). The MLAG connected devices become aware that they are connected to two devices and, if LACP is enabled, block the links to one of the peers as a new actor ID is received. STP re-convergence may also occur in this scenario.

Example

```
console(config)#vpc domain 1
console(config-vpc 1)#peer-keepalive enable
console(config-vpc 1)#peer-keepalive destination 192.168.0.2 source
192.168.0.1
console(config-vpc 1)#peer detection enable
console(config-vpc 1)#exit
```

peer-keepalive timeout

Use this command to configure the peer keepalive timeout value, in seconds. Use the **no** form of this command to return the timeout value to the default.

Syntax

peer-keepalive timeout *value*

no peer-keepalive timeout

- *value*—The peer keepalive timeout value in seconds. The range is 2 to 15 seconds.

Default Configuration

By default, the keepalive timeout value is 5 seconds.

Command Modes

VPC Domain

User Guidelines

This command configures the peer keepalive timeout value (in seconds). If an MLAG switch does not receive keepalive messages from the peer for this timeout value, it takes the decision to transition its role (if required).

The keepalive state machine is not restarted if keepalive priority is modified post election.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-vpc 1)# peer-keepalive timeout 10
```

role priority

Use the **role priority** command to configure the priority value used on a switch for primary/secondary role selection. The primary switch is responsible for maintaining and propagating spanning-tree and link-aggregation to the secondary switch.

Use the **no** form of the command to return the switch priority to the default value.

Syntax

role priority *value*

no role priority

- Value—The local switch priority value. (The range is 1-255.)

Default Configuration

The default priority value is 100.

Command Modes

MLAG Domain Configuration mode

User Guidelines

This value is used for the MLAG role election and is sent to the MLAG peer in the MLAG keepalive messages. The MLAG switch with the numerically lower priority value becomes the Primary and the switch with higher priority becomes the Secondary. If both the MLAG peer switches have the same role priority, the device with lower system MAC address becomes the Primary switch.

Changes to the priority value are not preemptive. The keepalive role selection state machine is not restarted even if the keepalive priority is modified post election. This means that priority value changes in a running MLAG domain do not affect the selection of the primary and secondary switches. In order for changes to take effect, disable the VPC with the **no feature vpc** command and re-enable it.

Example

```
console(config-vpc 1)#role priority 30
```

show vpc

Use the **show vpc** command to display MLAG information. The configuration and operational modes of the MLAG are displayed. The MLAG is operationally enabled if all preconditions are met. The port channel configured as an MLAG interface is also displayed along with the member ports on the current switch and peer switch (plus their link status).

Syntax

show vpc *id*

- *id*—A valid MLAG identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

There are no user guidelines for this command.

Example

```
(console)# show vpc 10
VPC Id 10
-----------------
Configuration mode......................Enabled
Operational mode........................Enabled
Port channel...............................Po1
```

```
Self member ports        Status
------------------------ ---------
Gi1/0/2                  Up
Gi1/0/6                  Down
```

show vpc brief

Use the **show vpc brief** command to display the MLAG global status. The command displays the current MLAG operational mode as well as the peerlink and keepalive status is also displayed. The number of configured and operational MLAGs along with the system MAC and role are also displayed.

Syntax

show vpc brief

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

A VPC domain ID must be configured for this command to display the VPC status.

Only the Primary switch maintains the member status of the Secondary switch. The Secondary switch does not maintain or show the status of the Primary switch peer members.

A VPC instance may show as enabled even if all of the port-channels that are members of the VPC are disabled or all of the links in the port channels are disabled. A VPC will show as disabled if peer-link (or DCPDP) connectivity is lost.

The Keepalive admin status field shows the status of the peer-link protocol.

The VPC operational status shows the overall MLAG status.

The Peer detection admin status field shows the status of the DCPDP protocol.

Example

```
console#show vpc brief

VPC domain id is not configured.

console#show vpc brief
VPC Domain ID..................................2
VPC admin status...............................Disabled
Keepalive admin status.........................Disabled
VPC operational status.........................Disabled
Self role......................................None
Peer role......................................None
Peer detection admin status....................Disabled
Operational VPC MAC............................F8B1.562B.A1D6
Operational VPC system priority............... 100

Peer-Link details
-----------------

Interface......................................Po1
Peer-link admin status.........................Enabled
Peer-link STP admin status.....................Disabled
Configured VLANs...............................1,10,11,12,13,14,15,16,17

VPC Details
-----------

Number of VPCs configured..................... 2
Number of VPCs operational.................... 2

VPC id# 1
-----------
Interface..................................... Po2
Configured Vlans.............................. 1,10,11,12,13,14,15,16,17
VPC Interface State........................... Active
Local MemberPorts Status
----------------- ------
Gi1/0/23 UP
Gi1/0/24 UP
Peer MemberPorts Status
---------------- ------
Gi1/0/23 UP
Gi1/0/24 UP

VPC id# 2
-----------
```

```
Interface.................................... Po3
Configured Vlans............................. 1,10,11,12,13,14,15,16,17
VPC Interface State.......................... Active
```

show vpc consistency-parameters

Use the show vpc consistency parameters on both MLAG peers to display MLAG related configuration information in a format suitable for comparison with the other MLAG peer.

Syntax

show vpc consistency-parameters { **global** | **interface** *port-channel-number* }

- *port-channel-number*—A valid port-channel identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in 6.2.0.1 firmware.

Updated in 6.3.0.1 firmware.

Example

```
console# show vpc consistency-parameters global

Parameter                     Value
---------------------         -------------------------------------------
STP Mode                      Enabled
STP Version                   IEEE  802.1s
BPDU Filter Mode              Enabled
BPDU Guard Mode               Enabled
MST Instances                 1,2,4
FDB Aging Time                300 seconds
```

```
VPC System MAC Address       <AA:BB:CC:DD:EE:FF>
VPC System Priority          32767
VPC System MAC Address       00:1E:C9:DE.A2:08
VPC System Priority          32767
VPC Domain ID                1
MST VLAN Configuration

Instance       Associated VLANs
-------------  -----------------------------------
1              7,8,10,20
2              4,5,40-50
4              30,32,34-38

RSTP-PV Configuration

Direct Rapid Convergence:  Enabled/Disabled
DRC Update Rate:  <0-32000> per second
Indirect Rapid Convergence:  Enabled/Disabled

VLAN    STP        STP      Hello     Forward   Maximum  Priority
        Mode       Root     Time      Time      Age
-----  --------   -------  -----     -------   --------- ---------
4      Enabled    Primary  2         15        15       0

switch# show vpc consistency-parameters interface port-channel 2
Parameter
Name                          Value
----------------              ---------------------------
Port Channel Mode             Enabled
STP Mode                      Enabled
BPDU Filter  Mode             Enabled
BPDU Flood Mode               Enabled
Auto-edge                     FALSE
TCN Guard                     True
Port Cost                     2
Edge Port                     True
Root Guard                    True
Loop Guard                    True
Hash Mode                     3
Minimum Links                 1
Channel Type                  Static
Configured VLANs              4,5,7,8
MTU                           1518



Active Port     Speed       Duplex
```

```
------------    ---------   --------
Gi1/0/1         100         Full
Gi1/0/2         100         Full

MST VLAN Configuration

Instance        Associated VLANS
-------------  -----------------------------------
1              7,8
2              4,5

RSTP-PV Configuration:
STP Port Priority:      <0-240>

VLAN          Port Priority       Cost
-------       -----------------   ---------------------------
<ID>          <0-240>             Auto | <1- 200000000>
```

show vpc consistency-features

Use the show vpc consistency parameters on both MLAG peers to display MLAG related configuration information in a format suitable for comparison with the other MLAG peer.

Syntax

show vpc consistency-features { **global** | **interface** *port-channel-number* }

- *port-channel-number*—A valid port-channel identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

There are no user guidelines for this command.

show vpc peer-keepalive

Use the **show vpc peer-keepalive** command to display the peer MLAG switch's IP address used by the Dual Control Plane Detection Protocol. The port used for the Dual Control Plane Detection Protocol is shown, as well as if peer detection is enabled or not. If enabled, the detection status is displayed.

Syntax

show vpc peer-keepalive

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

A VPC domain ID must be configured for this command to display the keepalive status.

Example

```
(Switching) #  show vpc peer-keepalive
Peer IP address............................10.130.14.55
Source IP address..........................10.130.14.54
UDP port...................................50000
Peer detection admin status................Enabled
Peer detection operational status..........Up
Peer is detected...........................True
Configured Tx interval.....................500 milliseconds
Configured Rx timeout......................2000 milliseconds
Operational Tx interval....................500 milliseconds
Operational Rx timeout.....................2000 milliseconds
```

show vpc role

Use the **show vpc role** command to display information about the keepalive status and parameters. The role of the MLAG switch as well as the system MAC and priority are displayed.

Syntax

show vpc role

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

A VPC domain ID must be configured for this command to display the VPC role.

Example

```
console# show vpc role
Self
----
VPC domain ID...................................1
Keepalive config mode.......................... Enabled
Keepalive operational mode..................... Enabled
Role Priority.................................. 100
Configured VPC MAC..............................<AA:BB:CC:DD:EE:FF>
Operational VPC MAC.............................<AA:BB:CC:DD:EE:FF>
Configured VPC system priority..................32767
Operational VPC system priority.................32767
Local System MAC..................................... 00:10:18:82:18:63
Timeout........................................ 5
VPC State...................................... Primary
VPC Role....................................... Primary

Peer
----
VPC Domain ID.................................. 1
Role Priority.................................. 100
Configured VPC MAC..............................<AA:BB:CC:DD:EE:FF>
Operational VPC MAC.............................<AA:BB:CC:DD:EE:FF>
Configured VPC system priority..................32767
Operational VPC system priority.................32767
Role............................................Secondary
Local System MAC................................00:10:18:82:1b:ab
```

show vpc statistics

Use the **show vpc statistics** command to display the counters for the keepalive messages transmitted and received by the MLAG switch.

Syntax

show vpc statistics {**peer-keepalive** | **peer-link**}

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode and above

User Guidelines

There are no user guidelines for this command.

Example

```
(console)# show vpc statistics peer-keepalive
Total transmitted.......................................123
Tx successful...........................................118
Tx errors...............................................5
Total received..........................................115
Rx successful...........................................108
Rx Errors...............................................7
Timeout counter.........................................6

(console)# show vpc statistics peer-link
Peer link control messages transmitted..................123
Peer link control messages Tx errors................... 5
Peer link control messages Tx timeout.................. 4
Peer link control messages ACK transmitted............. 34
Peer link control messages ACK Tx errors............... 5
Peer link control messages received.................... 115
Peer link data messages transmitted.................... 123
Peer link data messages Tx errors...................... 5
Peer link data messages Tx timeout..................... 4
Peer link data messages ACK transmitted................ 34
Peer link data messages ACK Tx errors.................. 5
Peer link data messages received....................... 115
Peer link BPDU’s transmitted to peer................... 123
```

```
Peer link BPDU’s Tx error............................. 9
Peer link BPDU’s received from peer................... 143
Peer link BPDU’s Rx error............................. 1
Peer link LACPDU’s transmitted to peer................ 123
Peer link LACPDU’s Tx error........................... 9
Peer link LACPDU’s received from peer................. 143
Peer link LACPDU’s Rx error........................... 1
```

```
(console)#show vpc statistics peer-link
Peer link control messages transmitted......... 24
Peer link control messages Tx errors........... 0
Peer link control messages Tx timeout.......... 0
Peer link control messages ACK transmitted..... 23
Peer link control messages ACK Tx errors....... 0
Peer link control messages received............ 23
Peer link data messages transmitted............ 73
Peer link data messages Tx errors.............. 0
Peer link data messages Tx timeout............. 0
Peer link data messages received............... 73
Peer link BPDU's transmitted to peer........... 0
Peer link BPDU's Tx errors..................... 0
Peer link BPDU's received from peer............ 0
Peer link BPDU's Rx errors..................... 0
Peer link LACPDU's transmitted to peer......... 73
Peer link LACPDU's Tx errors................... 0
Peer link LACPDU's received from peer.......... 73
Peer link LACPDU's Rx errors................... 0
```

system-mac

Use this command to manually configures the MAC address for the VPC domain. Use the **no** form of the command to revert the domain MAC address to the default value.

Syntax

system-mac *mac-address*

no system-mac

- *mac-address*—The system MAC address for the VPC domain.

Default Configuration

By default, the domain uses a pre-configured MAC address.

Command Modes

VPC domain mode

User Guidelines

The VPC domain MAC address must be the same on both MLAG peer devices. The MAC address is a unicast MAC address in aa:bb:cc:dd:ee:ff format and is not equal to the physical MAC address of either the primary VPC or secondary VPC device. The configured VPC domain MAC address is exchanged during role election and, if configured differently on the peer devices, VPC does not become operational.

The configured domain MAC address is present in the LACP PDUs and STP BPDUs that are sent on VPC member ports if VPC primary device election takes place after the VPC MAC address is configured. When the VPC MAC address is configured after the VPC primary device is elected, already agreed upon operational VPC MAC address is used in the LACP PDUs and STP BPDUs instead of the configured VPC MAC address.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-vpc 1)system-mac 00A2.64B3.A245
```

system-priority

Use this command to manually configure the priority for the VPC domain. Use the **no** form of the command to revert the priority to the default value.

Syntax

system-priority *priority*

no system-priority

- *priority*—The priority for the VPC domain. Range is 1-65535.

Default Configuration

By default, the system priority is 32767.

Command Modes

VPC domain mode

User Guidelines

The system priority must be configured identically on all VPC peers. If the configured VPC system priority is different on any VPC peer, the VPC will not come up.

The system-priority is present in the LACP PDUs that are sent out on VPC member ports. When the VPC system priority is configured after a VPC primary device is elected, the already agreed operational VPC system priority is used in the LACP PDUs instead of the newly configured VPC system priority.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-vpc 1) system-priority 2774
```

vpc

Use the **vpc** command to configure a port-channel (LAG) as part of an MLAG instance. Upon issuing this command, the port-channel is down until the port-channel member information is exchanged and agreed between the MLAG peer switches.

Use the **no** form of the command to remove the LAG from the MLAG domain.

Syntax

vpc *vpc-id*

no vpc *vpc-id*

- *vpc-id*—The MLAG identifier.

Default Configuration

LAGs are not members of an MLAG domain by default. It is expected that all links belonging to an MLAG instance are connected to switch (or switches) which consider the links to be members of a single LAG.

This configuration must be present on both the primary and secondary switches.

The port channel number and VPC number can be different from each other but the mapping must be the same on the primary and secondary MLAG peers (i.e., the port channel number must map to the same VPC number on both MLAG peers).

Command Modes

Port-channel mode

User Guidelines

The peer keepalive protocol is required for MLAG operation. Configure a LAG between the two MLAG peers as an MLAG peer link before executing this command.

Example

```
console(config)#interface po3
console(config-if-Po3)#switchport mode trunk
console(config-if-Po3)#switchport trunk allowed vlan 1-99,101-4093
console(config-if-Po3)#vpc 2
console(config-if-Po3)#exitconsole(config)#interface po3
console(config-if-Po3)#switchport mode trunk
console(config-if-Po3)#switchport trunk allowed vlan 1-99,101-4093
console(config-if-Po3)#vpc 2
console(config-if-Po3)#exit
```

vpc domain

Use the **vpc domain** command to enter into MLAG configuration mode. This command creates an MLAG domain and enters into MLAG configuration mode. Use the no form of the command to delete the VPC domain, disable peer-keepalive and peer detection in the domain, and reset all the configured parameters (role priority, VPC MAC address and VPC system priority) for the VPC domain.

Syntax

vpc domain *domain-id*

- *domain-id*—The MLAG domain instance. The range is 1-255.

Default Configuration

By default, no MLAG domains are configured.

Command Modes

Global Configuration mode

User Guidelines

Only one MLAG domain per MLAG is supported. This command creates a VPC domain with the specified domain-id and enters into the VPC domain configuration mode. Only one VPC domain can be created on a given device. The domain-id of the VPC domain should be equal to the one configured on the other VPC peer with this device wants to form a VPC pair. The configured VPC domain-ids are exchanged during role election and if they are configured differently on the peer devices, then VPC does not become operational.

The administrator needs to ensure that the no two VPC domains share the same VPC domain-id. The domain-id is used to derive the auto-generated VPC MAC address used in the actor ID field in the LACP PDUs and STP BPDUs sent out on VPC interfaces. If two VPC domains have the identical domain-ids, the resulting actor IDs may lead to LACP or STP convergence issues.

Example

```
console(config)#vpc domain 1
console(config-vpc 1)#peer-keepalive enable
console(config-vpc 1)#peer-keepalive destination 192.168.0.2 source 
192.168.0.1
console(config-vpc 1)#peer detection enable
console(config-vpc 1)#exit
```

vpc peer-link

Use the **vpc peer-link** command to configure a port channel as the MLAG peer link for a domain and enables the peer link protocol.

Use the **no** form of the command to remove the peer link configuration from an MLAG domain and disable the peer link protocol.

Syntax

vpc peer-link

no vpc peer-link

Default Configuration

There are no peer links configured by default.

Command Modes

Port-channel configuration mode

User Guidelines

This configuration must the present on both the primary and secondary switches. The peer keepalive protocol is required for MLAG operation. Configure and enable a LAG between the two MLAG peers as an MLAG peer link before executing this command.

Example

```
console(config)#interface port-channel 1
console(config-if-Po1)#description "MLAG-Peer-Link"
console(config-if-Po1)#spanning-tree disable
console(config-if-Po1)#switchport mode trunk
console(config-if-Po1)#switchport trunk allowed vlan 1-99,101-4093
console(config-if-Po1)#vpc peer-link
console(config-if-Po1)#exit
```

Multicast VLAN Registration Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches Series Switches

Multicast VLAN registration (MVR) is a method for consolidating multicast traffic from multiple VLANs onto a single VLAN. A typical usage scenario would be the distribution of a multicast group to a switch using a single VLAN where the switch has users in different VLANs subscribing to the multicast group. MVR enables the distribution of the multicast group from the single consolidated VLAN onto the multiple user VLANs.

MVR, like the IGMP Snooping protocol, allows a Layer 2 switch to snoop on the IGMP control protocol. Both protocols operate independently from each other. Both protocols may be enabled on the switch interfaces at the same time. In such a case, MVR is listening to the join and report messages only for groups configured statically. All other groups are managed by IGMP snooping.

There are two types of MVR ports: source and receiver.

- Source port is the port to which the multicast traffic is flowing using the multicast VLAN.
- Receiver port is the port where a listening host is connected to the switch. It can utilize any (or no) VLAN, except the multicast VLAN. This implies that the MVR switch will perform VLAN tag substitution from the multicast VLAN Source port to the VLAN tag used by the receiver port.

The multicast VLAN is the VLAN that is configured in the specific network for MVR purposes. It must be manually specified by the operator for all multicast source ports in the network. It is this VLAN that is used to transfer multicast traffic over the network to avoid duplication of multicast streams for clients in different VLANs.

NOTE: MVR can only be enabled on physical interfaces, not on LAGs or VLANs.

mvr

Use the **mvr** command in Global Configuration and Interface Configuration modes to enable MVR. Use the **no** form of this command to disable MVR.

Syntax

mvr

no mvr

Default Configuration

The default value is **Disabled**.

Command Mode

Global Configuration, Interface Configuration

User Guidelines

MVR can only be configured on Ethernet interfaces.

mvr group

Use the **mvr group** command in Global Configuration mode to add an MVR membership group. Use the no form of the command to remove an MVR membership group.

Syntax

mvr group *A.B.C.D* [*count*]

no mvr group *A.B.C.D* [*count*]

- *A.B.C.D*—Specify a multicast group.
- *count*—Specifies the number of multicast groups to configure. Groups are configured contiguously by incrementing the first group specified.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None
Error Completion Message	• Not an IP multicast group address • Illegal IP multicast group address

Example

```
console(config)#mvr
console(config)#mvr group 239.0.1.0 31
console(config)#mvr vlan 10
```

mvr mode

Use the **mvr mode** command in Global Configuration mode to change the MVR mode type. Use the **no** form of the command to set the mode type to the default value.

Syntax

mvr mode {**compatible** | **dynamic**}

no mvr mode

- **compatible**—Do not allow membership joins on source ports.
- **dynamic**—Send IGMP joins to the multicast source when IGMP joins are received on receiver ports.

Default Configuration

The default mode is compatible.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

mvr querytime

Use the **mvr querytime** command in Global Configuration mode to set the MVR query response time. The query time is the maximum time to wait for an IGMP membership report on a receiver port before removing the port from the multicast group after receiving a leave message. The query time only applies to receiver ports and is specified in tenths of a second.

Use the **no** form of the command to set the MVR query response time to the default value.

Syntax

mvr querytime *1–100*

no mvr querytime

Default Configuration

The default value is 5 tenths of a second.

Command Mode

Global Configuration

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	Defaulting MVR query response time.
Error Completion Message	None

Example

```
console(config)#interface Gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 2
console(config-if-Gi1/0/1)#mvr
console(config-if-Gi1/0/1)#mvr type receiver
console(config-if-Gi1/0/1)#exit
```

```
console(config)#mvr mode dynamic
console(config)#mvr querytime 10
```

mvr vlan

Use the **mvr vlan** command in Global Configuration mode to set the MVR multicast VLAN. Use the **no** form of the command to set the MVR multicast VLAN to the default value.

Syntax

mvr vlan *vlan-id*

no mvr vlan

- *vlan-id*—Specifies the port on which multicast data is expected to be received. Source ports should belong to this VLAN.

Default Configuration

The default value is 1.

Command Mode

Global Configuration

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	MVR multicast VLAN ID is set to the default value which is equal to 1.
Error Completion Message	Receiver port in mVLAN, operation failed.

mvr immediate

Use the **mvr immediate** command in Interface Configuration mode to enable MVR Immediate Leave mode. Use the **no** form of this command to set the MVR multicast VLAN to the default value.

Syntax

mvr immediate

no mvr immediate

Default Configuration

The default value is **Disabled**.

Command Mode

Interface Configuration

User Guidelines

Immediate leave should only be configured on ports with a single receiver. When immediate leave is enabled, a receiver port will leave a group on receipt of a leave message. Without immediate leave, upon receipt of a leave message, the port sends an IGMP query and waits for an IGMP membership report.

Example

```
console(config)#interface Gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 10
console(config-if-Gi1/0/1)#mvr
console(config-if-Gi1/0/1)#mvr type receiver
console(config-if-Gi1/0/1)#mvr immediate
console(config-if-Gi1/0/1)#exit
console(config)#mvr mode dynamic
```

mvr type

Use the **mvr type** command in Interface Configuration mode to set the MVR port type. Use the **no** form of this command to set the MVR port type to **None**.

Syntax

mvr type {**receiver** | **source**}

no mvr type

- **receiver**—Configure the port as a receiver port. Receiver ports are ports over which multicast data will be sent but not received.

- **source**—Configure the port as a source port. Source ports are ports over which multicast data is received or sent.

Default Configuration

The default value is **None**.

Command Mode

Interface Configuration

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None
Error Completion Message	• Port is a Trunk port, operation failed. • Receiver port in mVLAN, operation failed.

Example

```
console(config)#mvr
console(config)#mvr group 239.1.1.1
console(config)#vlan 99
console(config-vlan99)#exit
console(config)#interface Gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 10
console(config-if-Gi1/0/1)#mvr
console(config-if-Gi1/0/1)#mvr type receiver
console(config-if-Gi1/0/1)#interface Gi1/0/24
console(config-if-Gi1/0/24)#switchport mode trunk
console(config-if-Gi1/0/24)#switchport trunk native vlan 99
console(config-if-Gi1/0/24)#switchport trunk allowed vlan add 99
console(config-if-Gi1/0/24)#mvr
console(config-if-Gi1/0/24)#mvr type source
console(config-if-Gi1/0/24)#exit
```

mvr vlan group

Use the **mvr vlan group** command in Interface Configuration mode to participate in the specific MVR group. Use the **no** form of this command to remove the port participation from the specific MVR group.

Syntax

mvr vlan *vlan-id* **group** *A.B.C.D*

no mvr vlan *vlan-id* **group** *A.B.C.D*

- *vlan-id*—The VLAN over which multicast data from the specified group is to be received.
- *A.B.C.D.*—The multicast group for which multicast data is to be received over the specified VLAN.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration

User Guidelines

This command statically configures a port to receive the specified multicast group on the specified VLAN. This command only applies to receiver ports in compatible mode. It also applies to source ports in dynamic mode. In dynamic mode, receiver ports can also join multicast groups using IGMP messages.

Example

```
console(config)#vlan 2000
console(config-vlan2000)#exit
console(config)#mvr vlan 2000
console(config)#interface gi1/0/24
console(config-if-Gi1/0/24)#switchport mode trunk
console(config-if-Gi1/0/24)#switchport trunk native vlan 2000
console(config-if-Gi1/0/24)#switchport trunk allowed vlan add 2000
console(config-if-Gi1/0/24)#mvr
console(config-if-Gi1/0/24)#mvr type source
console(config-if-Gi1/0/24)#mvr vlan 2000 group 239.1.1.1
```

show mvr

Use the **show mvr** command to display global MVR settings.

Syntax

show mvr

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None
Error Completion Message	MVR disabled

The following table explains the output parameters.

Parameter	Description
MVR Running	MVR running state. It can be enabled or disabled.
MVR Multicast VLAN	Current MVR multicast VLAN. It can be in the range from 1 to 4093.
MVR Max Multicast Groups	The maximum number of multicast groups that is supported by MVR.
MVR Current Multicast groups	The current number of MVR groups allocated.
MVR Query Response Time	The current MVR query response time.
MVR Mode	The current MVR mode. It can be compatible or dynamic.

Example

```
console #show mvr
MVR Running............................. TRUE
```

```
MVR multicast VLAN...................... 1200
MVR Max Multicast Groups................ 64
MVR Current multicast groups............ 1
MVR Global query response time.......... 10 (tenths of sec)
MVR Mode................................ compatible
```

show mvr members

Use the **show mvr members** command to display the MVR membership groups allocated.

Syntax

show mvr members [*A.B.C.D*]

- *A.B.C.D*—A valid multicast address in IPv4 dotted notation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None
Error Completion Message	MVR disabled

The following table explains the output parameters.

Parameter	Description
MVR Group IP	MVR group multicast IP address.
Status	The status of the specific MVR group. It can be active or inactive.

Parameter	Description
Members	The list of ports which participates in the specific MVR group.

Examples

```
console#show mvr members
MVR Group IP          Status              Members
------------------    ---------------     ---------------------
224.1.1.1             INACTIVE            Gi1/0/1, Gi1/0/2, Gi1/0/3

console#show mvr members 224.1.1.1
MVR Group IP          Status              Members
------------------    ---------------     ---------------------
224.1.1.1             INACTIVE            Gi1/0/1, Gi1/0/2, Gi1/0/3
```

show mvr interface

Use the **show mvr interface** command to display the MVR enabled interfaces configuration.

Syntax

show mvr interface [*interface-id* [**members** [**vlan** *vlan-id*]]]

- *interface-id*—Identifies a specific interface.
- *vlan-id*—VLAN identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None

Message Type	Message Description
Error Completion Message	MVR disabled

The following table explains the output parameters.

Parameter	Description
Port	Interface number
Type	The MVR port type. It can be **None**, **Receiver**, or **Source** type.
Status	The interface status. It consists of two characteristics: **1** **active** or **inactive** indicating if port is forwarding. **2** **inVLAN** or **notInVLAN** indicating if the port is part of any VLAN
Immediate Leave	The state of immediate mode. It can be **enabled** or **disabled**.

Examples

```
console#show mvr interface
Port        Type              Status                 Immediate Leave
---------   ---------------   ---------------------  --------------------
Gi1/0/9       RECEIVER          ACTIVE/inVLAN          DISABLED

console#show mvr interface gi1/0/9
Type: RECEIVER Status: ACTIVE   Immediate Leave: DISABLED

console#show mvr interface gi1/0/23 members
235.0.0.1 STATIC  ACTIVE

console#show mvr interface gi1/0/23 members vlan 12
235.0.0.1 STATIC  ACTIVE
235.1.1.1 STATIC  ACTIVE
```

show mvr traffic

Use the **show mvr traffic** command to display global MVR statistics.

Syntax

show mvr traffic

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	None
Error Completion Message	MVR disabled

Examples

The following table explains the output parameters.

Parameter	Description
IGMP Query Received	Number of received IGMP Queries.
IGMP Report V1 Received	Number of received IGMP Reports V1.
IGMP Report V2 Received	Number of received IGMP Reports V2.
IGMP Leave Received	Number of received IGMP Leaves.
IGMP Query Transmitted	Number of transmitted IGMP Queries.
IGMP Report V1 Transmitted	Number of transmitted IGMP Reports V1.
IGMP Report V2 Transmitted	Number of transmitted IGMP Reports V2.
IGMP Leave Transmitted	Number of transmitted IGMP Leaves.
IGMP Packet Receive Failures	Number of failures on receiving the IGMP packets.
IGMP Packet Transmit Failures	Number of failures on transmitting the IGMP packets.

```
console#show mvr traffic

IGMP Query Received........................... 2
IGMP Report V1 Received....................... 0
IGMP Report V2 Received....................... 3
IGMP Leave Received........................... 0
IGMP Query Transmitted........................ 2
IGMP Report V1 Transmitted.................... 0
IGMP Report V2 Transmitted.................... 3
IGMP Leave Transmitted........................ 1
IGMP Packet Receive Failures.................. 0
IGMP Packet Transmit Failures................. 0
```

Port Channel Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

A port channel is a set of one or more links that can be aggregated together to form a bonded channel (Link Aggregation Group or LAG or port channel). Individual conversations in a particular direction always travel over a single link in the port channel, however, in aggregate, the bandwidth usage of all of the links is fairly evenly distributed. Port channels have the advantage of allowing incremental bandwidth to be added as needed (by adding additional links) and supporting a form of fault tolerance (traffic on failed links is redistributed among other links in the LAG). LAGs are formed from similarly configured physical links, i.e. the speed, duplex, auto-negotiation, PFC configuration, DCBX configuration, etc. must be compatible on all member links. Per IEEE 802.1AX, only links with the same operational characteristics, such as speed and duplex setting, may be aggregated. Dell EMC Networking switches aggregate links only if they have the same operational speed and duplex setting, as opposed to the configured speed and duplex setting. This allows operators to aggregate links that use auto negotiation to set values for speed and duplex or to aggregate ports with SFP+ technology operating at a lower speeds, e.g., 1G. Dissimilar ports will not become active in the LAG if their operational settings do not match those of the first member of the LAG.

In practice, some ports in a LAG may auto-negotiate a different operational speed than other ports depending on the far end settings and any link impairments. Per the above, these ports will not become active members of the LAG. On a reboot or on flapping the LAG links, a lower speed port may be the first port selected to be aggregated into the LAG. In this case, the higher speed ports are not aggregated. Use the **lacp port-priority** command to select one or more primary link to lead the formation of the aggregation group.

While it is a requirement of a LAG that the link members operate at the same duplex and speed settings, administrators should be aware that copper ports have larger latencies than fiber ports. If fiber and copper ports are aggregated together, packets sent over the fiber ports may arrive significantly sooner at the destination than packets sent over the copper ports. This can cause significant issues in the receiving host (e.g. a TCP receiver) as it would be required to buffer a potentially large number of out-of-order frames. Devices unable to buffer the requisite number of frames will show excessive frame discard. Configuring copper and fiber ports together in an aggregation group is not recommended.

If a dynamic LAG member sees an LACPDU that contains information different from the currently configured default partner values, that particular member drops out of the LAG. This configured member does not aggregate with the LAG until all the other active members see the new information. When each of the other active members sees the new information, they continue to drop out of the LAG. When all the members have dropped out of the LAG, they form an aggregate with the new information.

Static LAGS

A static LAG is fundamentally no different from a dynamically configured LAG. All the requirements for the member ports hold true (member ports must have same duplex settings, same speed, and so on). The only difference is this LAG has an additional parameter **static** which makes this LAG not require a partner system running Link Aggregation Control Protocol (LACP) to be able to aggregate it's member ports.

Care must be taken while enabling this type of configuration. If the Partner System is not 802.3AD compliant or the Link Aggregation Control protocol is not enabled, there may be network instability. Network instability occurs when one side assumes that the members in an aggregation are one single link, while the other side is oblivious to this aggregation and continues to treat the 'members' as individual links.

A static LAG does not transmit or process received LACPDUs, that is, the member ports do not transmit LACPDUs and all the LACPDUs it receives are dropped. A dropped counter is maintained to count the number of such PDUs.

Configured members are added to the LAG (active participation) immediately if the LAG is configured to be static. There is no wait time before we add the port to the LAG.

A LAG can be either static or dynamic, but not both. It cannot have some member ports participate in the protocol while other member ports do not participate. Additionally, it is not possible to change a LAG from static to dynamic via the CLI. You must remove the member ports from the static LAG and then add them to the dynamic LAG.

VLANs and LAGs

When Ethernet interfaces are added to a LAG, they are removed from all existing VLAN membership and take on the VLAN membership of the LAG. When members are removed from a LAG, the members regain the Ethernet interface VLAN membership as per the configuration.

LAG Thresholds

In many implementations, a LAG is declared as up if any one of its member ports is active. This enhancement provides configurability for the minimum number of member links to be active to declare a LAG up. Network administrators can also utilize this feature to automatically declare a LAG down when only some of the links have failed.

LAG Hashing

The purpose of link aggregation is to increase bandwidth between two switches. It is achieved by aggregating multiple ports in one logical group. A common problem of port channels is the possibility of changing packets order in a particular TCP session. The resolution of this problem is correct selection of an Ethernet port within the port channel for transmitting the packet to keep the original packet order.

The hashing algorithm is configurable for each LAG. Typically, an administrator is able to choose from hash algorithms utilizing the following attributes of a packet to determine the outgoing port:

- Source MAC, VLAN, EtherType, and incoming port associated with the packet.
- Source IP and Source TCP/UDP fields of the packet.
- Destination MAC, VLAN, EtherType, and incoming port associated with the packet.
- Source MAC, Destination MAC, VLAN, EtherType, and incoming port associated with the packet.
- Destination IP and Destination TCP/UDP Port fields of the packet.
- Source/Destination MAC, VLAN, EtherType, and incoming port associated with the packet.

- Source/Destination IP and source/destination TCP/UDP Port fields of the packet.

Enhanced LAG Hashing

Dell EMC Networking devices based on Broadcom XGS-IV silicon support configuration of hashing algorithms for each LAG interface. The hashing algorithm is used to distribute traffic load among the physical ports of the LAG while preserving the per-flow packet order.

NOTE: Enhanced hashing mode is not supported on the N1100-ON/N1500 Series switches.

One limitation with earlier LAG hashing techniques is that the packet attributes were fixed for all type of packets. Also, there was no MODULO-N operation involved, which can result in poor load balancing performance.

The LAG hashing support supports an enhanced hashing mode, which has the following advantages:

- MODULO-N operation based on the number of ports in the LAG.
- Packet attributes selection based on the packet type. For L2 packets, Source and Destination MAC address are used for hash computation. For IP packets, Source IP, Destination IP address, TCP/UDP ports are used.
- Non-Unicast traffic and Unicast traffic is hashed using a common hash algorithm.
- Excellent load balancing performance.
- Enhanced LAG hashing is the default hashing mode for LAGs on switches that support it.

Manual Aggregation of LAGs

Dell EMC Networking switching supports the manual addition and deletion of links to aggregates.

In the manual configuration of aggregates, the ports send their Actor Information (LACPDUs) to the partner system in order to find a suitable Partner to form an aggregation. When the Partner System neglects to respond using LACPDUs, the Dell EMC Networking switching aggregates manually. The Dell EMC Networking switching uses the currently configured default Partner Values for Partner Information.

Flexible Assignment of Ports to LAGs

Assignment of interfaces to dynamic LAGs is based upon a maximum of 144 interfaces assigned to dynamic LAGs, a maximum of 128 dynamic LAGs and a maximum of 8 interfaces per dynamic LAG. For example, 128 LAGs may be assigned 2 interfaces each or 18 LAGs may be assigned 8 interfaces each.

NOTE: The N1100-ON/N1500 Series switches support 64 port channels.

channel-group

Use the **channel-group** command in Interface (Ethernet) Configuration mode to associate a port with a port channel. To remove the channel-group configuration from the interface, use the **no** form of this command.

Syntax

channel-group *port-channel-number* **mode** {**on** | **active**}

no channel-group

- *port-channel-number* — Number of a valid port-channel with which to associate the current interface.
- **on** — Forces the port to join a channel without LACP (static LAG).
- **active** — Forces the port to join a channel with LACP (dynamic LAG).

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example shows how port gi1/0/5 is configured in port-channel 1 without LACP (static LAG).

```
console(config)# interface gigabitethernet 1/0/5
```

```
console(config-if-Gi1/0/5)# channel-group 1 mode on
```

The following example shows how port gi1/0/6 is configured to port-channel 2 with LACP (dynamic LAG).

```
console(config)# interface gigabitethernet 1/0/6
console(config-if-Gi1/0/6)# channel-group 2 mode active
```

interface port-channel

Use the **interface port-channel** command in Global Configuration mode to enter port-channel configuration mode.

Syntax

interface port-channel *port-channel-number*

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Port channel numbers range from 1 to 128 for all switches except the N1500 which supports 64 port channels.

Example

The following example enters the context of port-channel 1.

```
console(config)# interface port-channel 1
console(config-if-po1)#
```

interface range port-channel

Use the **interface range port-channel** command in Global Configuration mode to execute a command on multiple port channels at the same time.

Syntax

interface range port-channel {*port-channel-range* | **all**}

- *port-channel-range* — List of port-channels to configure. Separate non-consecutive port-channels with a comma and no spaces. A hyphen designates a range of port-channels. (Range: valid port-channel)
- **all** — All the channel-ports.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Commands in the interface range context are executed independently on each interface in the range. If the command returns an error on one of the interfaces, it stops the execution of the command on subsequent interfaces.

Example

The following example shows how port-channels 1, 2 and 8 are grouped to receive the same command.

```
console(config)# interface range port-channel 1-2,8
console(config-if)#
```

hashing-mode

Use the **hashing-mode** command to set the hashing algorithm on trunk ports. Use the **no hashing-mode** command to set the hashing algorithm on trunk ports to the default.

Syntax

hashing-mode *mode*

- *mode* — Mode value in the range of 1 to 7.

Range: 1–7:

- 1 — Source MAC, VLAN, EtherType, source module, and port ID
- 2 — Destination MAC, VLAN, EtherType, source module, and port ID
- 3 — Source IP and source TCP/UDP port

- 4 — Destination IP and destination TCP/UDP port
- 5 — Source/destination MAC, VLAN, EtherType, and source MODID/port
- 6 — Source/destination IP and source/destination TCP/UDP port
- 7 — Enhanced hashing mode. This mode is not available on Dell EMC Networking N1100-ON/N1500 Series switches.

Default Configuration

The default hashing mode is 7—Enhanced hashing mode. On Dell EMC Networking N1100-ON/N1500 Series switches, the default hashing mode is 5.

Command Mode

Interface Configuration (port-channel) mode

User Guidelines

Enhanced hashing mode is recommended, however, depending on the specific traffic patterns present in the network, a different hashing mode may give better bandwidth distribution across the LAG member links. Use the **show interfaces utilization** command to view link utilization.

Example

```
console(config)#interface port-channel 1
console(config-if-po1)#hashing-mode 4
console(config-if-po1)#no hashing mode
```

lacp port-priority

Use the **lacp port-priority** command to configure the priority value for physical ports. To reset to default priority value, use the **no** form of this command.

Syntax

lacp port-priority *value*

no lacp port-priority

- *value* — Port priority value. (Range: 1–65535)

Default Configuration

The default port priority value is 1.

Command Mode

Interface Configuration (Ethernet) mode

Interface Range mode

User Guidelines

Per IEEE 802.1AX-2008 Section 5.6, ports are selected for aggregation by each switch based upon the port priority assigned by the switch with the higher system priority, starting with the highest priority port of the switch with the higher switch priority, and working downward through the ordered list of port priority values for the ports.

The port priority of each port is a four octet binary number, formed by using the configured port priority as the two most significant octets and the port number as the two least significant octets. For any given set of ports, the port with the numerically lower value of port priority has the higher priority.

The selection algorithm is reapplied upon changes in the membership of the port channel (for example, if a link fails, or if a new link joins the group) and any subsequent changes to the set of active links are made according to the above algorithm.

Example

The following example configures the priority value for port 1/0/8 to 247.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#lacp port-priority 247
```

lacp system-priority

Use the **lacp system-priority** command in Global Configuration mode to configure the Link Aggregation system priority. To reset to default, use the **no** form of this command.

Syntax

lacp system-priority *value*

no lacp system-priority

- *value* — System priority value. (Range: 1–65535)

Default Configuration

The default system priority value is 1.

Command Mode

Global Configuration mode

User Guidelines

Per IEEE 802.1AX-2008 Section 5.6, ports are selected for aggregation by each switch based upon the port priority assigned by the switch with the higher system priority, starting with the highest priority port of the switch with the higher switch priority, and working downward through the ordered list of port priority values for the ports.

The system priority of each switch is an eight octet binary number, formed by using the configured system priority as the two most significant octets and the switch id (MAC address) as the least significant six octets. For a given switch and link aggregation partner, the switch with the numerically lower value of system priority has the higher priority.

The selection algorithm is reapplied upon changes in the membership of the port channel (for example, if a link fails, or if a new link joins the group) and any subsequent changes to the set of active links are made according to the above algorithm.

Example

The following example configures the system priority to 120.

```
console(config)#lacp system-priority 120
```

lacp timeout

Use the **lacp timeout** command to assign an administrative LACP timeout. To reset the administrative LACP timeout to the default, use the **no** form of this command.

Syntax

lacp timeout {**long** | **short**}

no lacp timeout

- **long** — Specifies a long timeout value.
- **short** — Specifies a short timeout value.

Default Configuration

The default port timeout value is **long**.

Command Mode

Interface Configuration (Ethernet) mode

Interface Range mode

User Guidelines

The LACP time-out setting indicates a local preference for the rate of LACPDU transmission and the period of time before invalidating received LACPDU information. This setting is negotiated with the link partner. Long time-outs are 90 seconds with a transmission rate of once every 30 seconds. Short time-outs are 3 seconds with a transmission rate of once every second. For further information, refer to the LACP_Timeout setting in IEEE Std. 802.1AX-2008.

Example

The following example assigns an administrative LACP timeout for port Gi1/0/8 to a long timeout value.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#lacp timeout long
```

port-channel local-preference

Use the **port-channel local-preference** command in Interface Configuration mode to enable the local-preference mode on a port-channel (LAG) interface or range of port-channel interfaces.

Use the **no** form of the command to remove the local preference.

Syntax

port-channel local-preference

no port-channel local-preference

Default Configuration

By default, port channels are not configured with local preference.

Command Mode

Interface Configuration (port-channel) mode

User Guidelines

For a LAG that contains links distributed across stacking units, the default behavior is to distribute locally received ingress traffic across all LAG links in the stack per the selected hashing algorithm. When enabled, this command disables forwarding of ingress unicast traffic across stacking links for a LAG that is comprised of links on multiple stack units. It does this by restricting LAG hashing to only select egress links on the stack unit where the traffic ingresses.

CAUTION: If the capacity of the local egress LAG links is exceeded, traffic will be discarded. Therefore, use of this option should be carefully considered, and the operator must ensure that sufficient egress bandwidth is available in the LAG links on every stack member to avoid excessive discards.

By default, the local-preference mode for a port-channel is disabled. This command can be used only on port-channel interfaces.

Example

```
console(config)#interface port-channel 1
console(config-if-Po1)#port-channel local-preference
console(config-if-Po1)#no port-channel local-preference
```

Command History

Example added in the 6.4 release.

port-channel min-links

Use the **port-channel min-links** command in Interface Configuration (port-channel) mode to set the minimum number of links that must be up in order for the port channel interface to be declared up. Use the **no** form of the command to return the configuration to the default value (1).

Syntax

port-channel min-links ***<1-8>***

no port-channel min-links

- **min-links**—The minimum number of links that must be active before the link is declared up. Range 1-8. The default is 1.

Default Configuration

The default minimum links is 1.

Command Mode

Interface Configuration (port-channel) mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)#interface port-channel 1
console(config-if-Po1)#port-channel min-links 3
console(config-if-Po1)#no port-channel min-links
```

show interfaces port-channel

Use the **show interfaces port-channel** command to show port-channel information.

Syntax

show interfaces port-channel [*port-channel-number*]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The command displays the following information.

Parameter	Description
Channel	Number of the port channel to show. This parameter is optional. If the port channel number is not given, all the channel groups are displayed. (Range: Valid port-channel number, 1 to 48). • Ports—The ports that are members of the port-channel. • Ch-Type—The aggregation scheme. Dynamic indicates that the LACP protocol is run. • Hash Algorithm Type—The hashing used to assign a conversation to a particular aggregation link. • Local Prf—An additional field added to support the display of the local preference.

Example #1

```
console#show interfaces port-channel 1

Channel   Ports                          Ch-Type   Hash Type Min-links Local Prf
------- ----------------------------- -------- ---------- --------- --------
Po1     Inactive: Gi1/0/1, Gi1/0/2,   Dynamic   3         1         Enabled
          Gi1/0/3, Gi1/0/4

Hash Algorithm Type
1 - Source MAC, VLAN, EtherType, source module and port ID
2 - Destination MAC, VLAN, EtherType, source module and port ID
3 - Source IP and source TCP/UDP port
4 - Destination IP and destination TCP/UDP port
5 - Source/Destination MAC, VLAN, EtherType, source MODID/port
6 - Source/Destination IP and source/destination TCP/UDP port
7 - Enhanced hashing mode
```

show lacp

Use this command to display LACP information for Ethernet ports.

Syntax

show lacp {**gigabitethernet** unit/slot/port| **tengigabitethernet** unit/slot/port / **fortygigabitethernet** unit/slot/port}[**parameters** | **statistics**]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows how to display LACP Ethernet interface information.

```
console#show lacp gi1/0/1

port Gi1/0/1 LACP parameters:
Actor:
      system priority:            1
      port Admin key:             0
      port oper key:              1
      port oper priority:         1
      port oper timeout:          LONG
      port Admin timeout:         LONG
      LACP Activity:              ACTIVE
      Aggregation:                AGGREGATABLE
      synchronization:            FALSE
      collecting:                 FALSE
      distributing:               FALSE
      expired:                    FALSE
Partner:
      port Admin key:             0
      port oper key:              0
```

```
      port Admin priority:          0
      port oper priority:           0
      port Oper timeout:            LONG
      LACP Activity:                PASSIVE
      Aggregation:                  NOTAGGREGATABLE
      synchronization:              FALSE
      collecting:                   FALSE
      distributing:                 FALSE
      expired:                      FALSE
port Gi1/0/1 LACP Statistics:
      LACP PDUs send:               0
      LACP PDUs received:           0
```

show statistics port-channel

Use the **show statistics port-channel** command to display statistics about a specific port-channel.

Syntax

show statistics port-channel *port-channel-number*

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows statistics about port-channel 1.

```
console#show statistics port-channel 1

Total Packets Received (Octets)................ 0
Packets Received 64 Octets..................... 0
Packets Received 65-127 Octets................. 0
Packets Received 128-255 Octets................ 0
Packets Received 256-511 Octets................ 0
```

```
Packets Received 512-1023 Octets............... 0
Packets Received 1024-1518 Octets.............. 0
Packets Received > 1518 Octets................. 0
Packets RX and TX 64 Octets.................... 0
Packets RX and TX 65-127 Octets................ 0
Packets RX and TX 128-255 Octets............... 0
Packets RX and TX 256-511 Octets............... 0
Packets RX and TX 512-1023 Octets.............. 0
Packets RX and TX 1024-1518 Octets............. 0
Packets RX and TX 1519-2047 Octets............. 0
Packets RX and TX 2048-4095 Octets............. 0
Packets RX and TX 4096-9216 Octets............. 0

Total Packets Received Without Errors.......... 0
Unicast Packets Received....................... 0
Multicast Packets Received..................... 0
Broadcast Packets Received..................... 0
Receive Packets Discarded...................... 0

Total Packets Received with MAC Errors......... 0
Jabbers Received............................... 0
Fragments/Undersize Received................... 0
Alignment Errors............................... 0
FCS Errors..................................... 0
Overruns....................................... 0

Total Received Packets Not Forwarded........... 0
802.3x Pause Frames Received................... 0
Unacceptable Frame Type........................ 0

Total Packets Transmitted (Octets)............. 0
Packets Transmitted 64 Octets.................. 0
Packets Transmitted 65-127 Octets.............. 0
Packets Transmitted 128-255 Octets............. 0
Packets Transmitted 256-511 Octets............. 0
Packets Transmitted 512-1023 Octets............ 0
Packets Transmitted 1024-1518 Octets........... 0
Packets Transmitted > 1518 Octets.............. 0
Max Frame Size................................. 1518

Total Packets Transmitted Successfully......... 0
Unicast Packets Transmitted.................... 0
Multicast Packets Transmitted.................. 0
Broadcast Packets Transmitted.................. 0
Transmit Packets Discarded..................... 0

Total Transmit Errors.......................... 0
```

```
FCS Errors..................................... 0
Underrun Errors................................ 0

Total Transmit Packets Discarded............... 0
Single Collision Frames........................ 0
Multiple Collision Frames...................... 0
Excessive Collision Frames..................... 0

802.3x Pause Frames Transmitted................ 0
GVRP PDUs received............................. 0
GVRP PDUs Transmitted.......................... 0
GVRP Failed Registrations...................... 0
GMRP PDUs Received............................. 0
GMRP PDUs Transmitted.......................... 0
GMRP Failed Registrations...................... 0
BPDUs: Sent: 0, Received: 0


Time since counters last cleared............... 0 day 6 hr 19 min 42 sec
```

Port Monitor Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking switches allow the user to monitor traffic with an external network analyzer. The external network analyzer can use any of the Ethernet ports as a probe port. The probe port transmits a mirror copy of the traffic being probed. SPAN and RSPAN encapsulation is supported. Network traffic transmission is always disrupted whenever a configuration change is made for port monitoring. Therefore, whenever port monitoring is enabled, the probe port does not always forward traffic as a normal port. When diagnosing problems, an operator should always check the status of port monitoring.

The port monitoring feature allows the user to configure a session. A session consists of one destination or probe port and one or multiple source ports. When a session is enabled, any traffic entering or leaving the source ports of that session is copied (mirrored) onto the corresponding destination port. A network traffic analyzer can be attached to destination ports to analyze the traffic patterns of source ports.

A session is operationally active only if both a destination port and at least one source port are configured. If neither is true, the session is inactive. A port configured as a destination port acts as a mirroring port when the session is operationally active. If it is not, the port acts as a normal port and participates in all normal operation with respect to transmitting traffic.

The port mirroring logic stage occurs after the after the VLAN tag processing stage on ingress and before the VLAN tag processing stage on egress. When mirroring packets associated with DVLAN/QinQ SP or CE ports, the outer VLAN tag may or may not appear in the frame. Due to the internal processing of QinQ tagging, the TPID of ingress frames mirrored from the SP port will always be 0x8100. In addition, packets forwarded internally across a stacking link may have different tags applied than packets forwarded on a local egress port. This is due to the processing required for forwarding across a stack.

Any Ethernet port may be configured as a source port.

Caveats:

- Platforms may behave unpredictably if an attempt is made to mirror a port of greater speed than the probe port.

- Once configured, there is no network connectivity on the probe (destination) port. The probe port does not forward any traffic and does not receive any traffic. The probe tool attached to the probe port is unable to ping the networking device or ping through the networking device, and no device is able to ping the probe tool.
- ACL attributes redirect, mirror, log, rate-limit, assign-queue, time-range, IGMP type, ICMP type, ICMP code, routing, fragments, and TCP established are not supported when applied to a mirroring session.

destination

Use this command to enter destination configuration mode on the source switch.

Syntax

destination

Default Configuration

This command has no default configuration.

Command Mode

ERSPAN Source Configuration mode

User Guidelines

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware.

destination interface

Use this command to configure the destination interface on a destination switch. Use the **no** form of the command to remove the destination configuration.

Syntax

destination interface *interface-id*

no destination interface

- interface-id — The interface on the destination switch over which the GRE encapsulated packets are transmitted to the packet sniffer.

Default Configuration

By default, there is no destination interface.

Command Mode

ERSPAN Source Destination Configuration mode

User Guidelines

A destination interface must be configured on the destination switch. The ERSPAN packets are transmitted on the destination interface encapsulated in GRE. It may be necessary to configure the packet sniffer to properly analyze the encapsulated packet data.

ERSPAN utilizes separate source and destination sessions. This command is utilized in the destination session.

Example

This example configures the source switch to mirror received packets with ERSPAN flow ID 200 to interface gi1/0/1. The packets are sent to IP address 10.10.10.11.

```
console(config)#monitor session 2 type erspan-destination
console(config-erspan-src)#destination interface gi1/0/1
console(config-erspan-src)#source
console(config-erspan-src-dst)#erspan-id 200
console(config-erspan-src-dst)#ip address 10.10.10.11
```

Command History

Command introduced in version 6.7.0 firmware.

erspan-id

Use this command to configure an ERSPAN flow identifier.

Syntax

erspan-id ***erspan-flow-identifier***

no erspan-id

- ***erspan-flow-identifier*** — The ERSPAN flow identifier. The range is 1 to 1023.

Default Configuration

This command has no default configuration.

Command Mode

ERSPAN Destination Source Configuration mode. ERSPAN Source Destination Configuration mode.

User Guidelines

ERSPAN encapsulates monitored traffic into GRE packets. Configure a matching ERSPAN flow ID using the **erspan-id** command in both ERSPAN destination source and ERSPAN source destination configuration modes. An ERSPAN flow is identified by the IP address and ERSPAN ID.

ERSPAN utilizes separate source and destination sessions. This command is configured on both the source and destination session switch.

Example

This example configures the source switch to mirror received packets with ERSPAN flow ID 200 to interface gi1/0/1. The packets are sent to IP address 10.10.10.11.

```
console(config)#monitor session 2 type erspan-destination
console(config-erspan-src)#destination interface gi1/0/1
console(config-erspan-src)#source
console(config-erspan-src-dst)#erspan-id 200
console(config-erspan-src-dst)#ip address 10.10.10.11
```

Command History

Command introduced in version 6.7.0 firmware.

ip address

Use this command to configure an ERSPAN destination on the source and destination switches.

Syntax

ip address *ipv4-address*

no ip address

- *ipv4-address* — The valid, reachable IPv4 address of the monitoring station.

Default Configuration

This command has no default configuration.

Command Mode

ERSPAN Destination Source Configuration mode, ERSPAN Source Destination Configuration mode

User Guidelines

The IP address is the address of the monitoring station on which the GRE traffic is recorded/decoded. An ERSPAN flow is identified by the IP address and ERSPAN ID.

The IP address and the ERSPAN identifier in the source and destination switch configuration must be the same. On the destination switch, the IP address must identify a station that is on a reachable subnet.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source switch and the destination switch.

Command History

Command introduced in version 6.7.0 firmware.

ip dscp

Use this command to configure the DSCP value for the GRE packet on the source switch. Use the **no** form of the command to return the DSCP value to the default.

Syntax

ip dscp *dscp-val*

no ip dscp

- *dscp-val* — The DiffServ Code Point value. The range is 0 to 63.

Default Configuration

By default, a DSCP value of 0 is used.

Command Mode

ERSPAN Source Destination Configuration mode

User Guidelines

This command may be used to override the source TTL of the GRE packets.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware.

ip prec

Use this command to configure the IP precedence value for the GRE packet on the source switch. Use the **no** form of the command to return the IP precedence value to the default.

Syntax

ip prec *prec-val*

no ip prec

- *prec-val* — The IP precedence. The range is 0 to 7.

Default Configuration

By default, a precedence of 0 is used.

Command Mode

ERSPAN Source Destination Configuration mode

User Guidelines

This command may be used to override the IP precedence (first 3 bits of the IP TOS field) of the GRE packets.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware

ip ttl

Use this command to configure the time-to-live for the GRE packet on the source switch. Use the **no** form of the command to return the TTL value to the default.

Syntax

ip ttl *ttl-val*

no ip ttl

- *ttl-val* — The IP time to live. The range is 1 to 255.

Default Configuration

By default, a TTL of 64 is used.

Command Mode

ERSPAN Source Destination Configuration mode

User Guidelines

This command may be used to override the source TTL of the GRE packets.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware.

monitor capture (Global Configuration)

Use the **monitor capture** command to capture packets transmitted or received from the CPU. This facility captures switch control plane traffic and is useful in monitoring network control traffic and analyzing network security.

No monitor capture file size returns the capture file size to the defaults.

No monitor capture remote port returns the TCP port to the default.

Syntax

monitor capture {**file size** *max-size* | **remote port** *id* | **line wrap**}

no monitor capture {**file size** |**remote port** |**line wrap**}

- *max-size*—The size of the capture file in bytes.
- *id*—The local (switch) TCP port for use with Wireshark.

Default Configuration

Capture is not enabled by default.

The in memory buffer is 128 packets.

The file system buffer is 524288 bytes and is named cpuPktCapture.pcap.

The remote monitor capture port is 2002.

Command Modes

Global Configuration mode

User Guidelines

Packets that are transmitted or received by the switch CPU may be captured to the switch file system, to local memory, or sent to a WireShark client. Packets captured to the switch file system are stored in pcap format and may be copied from the system and opened with WireShark or TShark or other utilities. Packets sent to the console are written in ASCII hex format.

When WireShark is configured and connected to the switch, packet capture is controlled by WireShark. See the Users Configuration Guide for an example of how to configure WireShark for packet capture.

Changes to configuration take effect on the next execution of the **monitor capture start** command.

Only one of file, remote, or line may be specified. Setting the file, remote, or line stops the capture.

No monitor capture file size returns the capture file size to the defaults

No monitor capture remote port returns the TCP port to the default

The administrator can capture packets into one of the following locations: memory, switch NVRAM, or directly to a Wireshark analyzer.

Example

Configure capture for Wireshark remote access on port 2020:

```
console(config)#monitor capture remote port 2020
console(config)#monitor capture mode remote
console(config)#exit
console#monitor capture start
```

Copy the local capture file to a TFTP server

```
console#copy flash://cpuPktCapture.pcap tftp://10.267.9.99/mypkts.pcap
```

monitor capture (Privileged Exec)

Use the **monitor capture** command to capture packets transmitted or received from the CPU. This facility captures switch control plane traffic and is useful in monitoring network control traffic and analyzing network security.

Remote packet capture is not supported when the packets are received via Service Port.

Syntax

monitor capture {**start** [**transmit** | **receive** | **all**] | **stop**}

- **Transmit—**Capture packets transmitted by the switch CPU.
- **Receive—**Capture packets forwarded to the switch CPU.
- **All—**Capture both transmitted and received packets.

Default Configuration

Capture is not enabled by default.

By default, both transmitted and received packets are captured.

Command Modes

Privileged Exec mode

User Guidelines

In general, starting packet capture erases the previous capture buffer contents.

Example

```
console# monitor capture start all
```

monitor capture mode

Use the **monitor capture mode** command to select the destination for captured packets transmitted or received from the CPU. This facility captures switch control plane traffic and is useful in monitoring network control traffic and analyzing network security.

Use the **no** form of the command to return the capture mode to the default.

Syntax

monitor capture mode {**line** | **remote** | **file**}

no monitor capture mode

- **line**—Captured packets are sent to the console.
- **remote**—Captured packets are sent to a remote WireShark network analyzer.

- **file**—Captured packets are sent to the file system.

Default Configuration

By default, remote capture is configured.

Command Modes

Global Configuration mode

User Guidelines

Only one file, remote, or line may be specified. Setting the mode takes effect immediately.

Use the **monitor capture start** command to start the capture.

Memory Capture:

Captured packets can be displayed on the console using the **show monitor capture packets** command. Captured packets can be displayed when actively capturing or when stopped. When a capture session is active, it is possible to display only the captured packets which were not previously displayed as the show command empties the capture buffer. When a capture session is stopped, it is possible to display all saved packets as often as required. The command **show monitor capture packets** always displays the captured packets in chronological order.

The memory buffer only stores the first 128 bytes of each packet captured.

The switch displays the following information from the captured packet when it is displayed on CLI:

- Packet is transmitted or received.
- ID of interface through which the packet was passed.
- The time when packet passed through CPU.
- The first 128 bytes of packet.
- The length of full packet (if greater than 128 bytes).

The in-memory capture buffer can be configured to stop when full. This mode is configured with the command **no monitor capture line wrap.** Capturing packets is started by the **monitor capture start** command**.** Capturing packets is stopped automatically when 128 packets are captured and saved into the RAM. Capturing packets can be stopped manually before 128 packets have been captured using the **monitor capture stop** command to halt packet capture.

If capturing is in progress, the **show monitor capture packets** command displays only captured packets that have not yet been displayed during capturing session. If capturing is stopped, the first (after stopping) **show monitor capture packets** command displays packets which have not yet been displayed during capturing session. The next **show monitor capture packets** command displays all saved packets.

If the capturing session is stopped automatically during the period packet display is in progress, the packets display continues until all saved packets are shown and then the buffer is cleared. The next invocation of the **show capture packets** command will not display any packets. Please note that this behavior is observed only if the capturing session is stopped automatically when the packet displaying is in progress.

The in-memory capture can also be configured to wrap. This makes it possible to display more than 128 packets per capture session if the command **show capture packets** is periodically executed while capture is in progress. Saved packets that have been already displayed during the capturing session are overwritten in RAM by new captured packets if capturing is still in progress. In this manner, the limit of displaying 128 packets per session can be overcome (but only in **monitor capture line wrap** mode). Packets that have not been displayed are not overwritten.

Capturing packets is stopped automatically when 128 packets are captured and have not yet been displayed during capturing session. It is guaranteed that no one packet will be lost (not be displayed or not be saved) when capturing is in progress. In this case, the last 128 packets are saved into the RAM and can be displayed many number of times by executing the command **show monitor capture packets.**

If capturing is in progress and more than 128 packets are captured and the user configures **no monitor capture line wrap** mode, capturing is stopped automatically. No packets are lost when capturing is in progress.

All captured packets can be displayed. No captured and not yet displayed packets are lost. Captured packets can be displayed when capturing is in progress or after the moment when capturing is stopped. Only packets saved in RAM (up to 128) can be displayed when capturing is stopped.

If capturing is in progress, the **show monitor capture packets** command displays only the captured packets that have not yet been displayed during the capturing session. If capturing is stopped, the first (after stopping) **show monitor capture packets** command displays the packets that have not yet been displayed during the capturing session. The next **show monitor capture packets** command displays up to 128 captured packets.

If the capturing session is stopped automatically when the packet display is in progress, then packet display continues until all packets are shown. The next call of the **show capture packets** command displays nothing. Please note that such behavior is observed only if the capturing session is stopped automatically when the packet display is in progress.

NVRAM Capture:

After packet capture is activated, packets are stored in NVRAM until the capture file reaches its maximum size, or until the capture is stopped manually. When the capture is started the capture file from the previous capture is deleted.

The captured file can be uploaded via TFTP, SFTP, SCP via CLI, and SNMP using the **copy** command. The name of the capture file is cpuPktCapture.pcap.

Remote Capture:

Remote Packet Capture works with the Wireshark network analyzer tool. A packet capture server runs on the switch and sends the captured packets via a TCP connection to the Wireshark tool. Once a connection is established, packet capture is started and stopped via Wireshark commands.

Remote capture can be enabled or disabled using the CLI. The network operator should obtain a computer with the Wireshark tool to display the captured traffic. When using remote capture mode, the switch doesn’t store any captured data locally.

The local TCP port number can be configured for connecting Wireshark to the switch. The default port number is 2002. If a firewall is installed between the Wireshark PC and the switch, these ports must be allowed to pass through the firewall. The Firewall must be configured to allow the Wireshark PC to initiate a TCP connection to the switch.

The remote capture application listens on the configured TCP port for a connection request. Wireshark must send a request to that port to establish a connection. Once the socket connection to Wireshark has been established, captured CPU packets are written to the data socket. Wireshark receives the packets and processes them locally. This continues until the session is terminated by either end.

The following Wireshark request packets are supported:

- Request to list all the remote interfaces
- Request to open a remote device
- Request to start a capture on a remote device
- Request to close the connection with the remote peer
- Message that keeps the authentication parameters
- Request to get network statistics
- Request to stop the current capture, keeping the device open

The following Wireshark replies are supported:

- Reply that sends the list of all the remote interfaces
- Reply that the remote device has been opened correctly
- Reply that capturing has started correctly
- Reply that says 'ok, authorization successful'
- Reply that keeps network statistics
- Reply that confirms capturing stopped successfully

Remote capture is not supported for packets received via out-of-band ports.

Example

This example sends capture output to the console.

```
console(config)#monitor capture line
console(config)#exit
console#monitor capture start all
```

monitor session

Use the **monitor session** command in Global Configuration mode to configure the source and destination for mirroring. Packets are copied from the source to the destination. Use the **no** form of the command to disable the monitoring session.

Syntax

monitor session *session-number* **source** {**interface** {*interface–id* | **cpu** | **port-channel** *port-channel-id* } |**vlan** *vlan-id* | **remote vlan** *rspan-vlan-id*} [**rx** | **tx**]

no monitor session *session-number* **source** {**interface** {*interface–id* | **cpu** | **port-channel** *port-channel-id* } | **vlan** *vlan-id* | **remote vlan** *rspan-vlan-id*}

[**no**] **monitor session** *session-number* **destination** {**interface** *interface–id* [**remove-rspan-tag**] | **remote vlan** *rspan-vlan-id*}

[**no**] **monitor session** session-number **filter** {**ip access-group** [*acl-name* | *acl-number*] | **mac access-group** *acl-name*}

no monitor session *session-number* **mode**

- *session-number*— Session identification number. (Range: 1-4)
- *interface–id* — Physical Ethernet interface.
- *cpu*—The CPU interface.
- *port-channel–id* — A port channel identifier.
- **vlan** *vlan-id*— The source VLAN identifier. All the ports in this VLAN are mirrored in the ingress direction only. The source VLAN must not be the RSPAN VLAN.
- *acl-name*— An IP or MAC ACL name.
- **remote vlan** *rspan-vlan-id*— An RSPAN VLAN configured on the source switch.
- **rx** — Mirrors received packets only. If no option specified, monitors both rx and tx.
- **tx** — Mirrors transmitted packets only. If no option is specified, monitors both rx and tx.
- **both**—Mirrors both ingress and egress. This is the default.

- **mode**—Enable session mirroring. Use the **no** form of the command to disable monitoring.
- **remove-rspan-tag**—Remove the RSPAN tag from packets transmitted on the probe port.

Default Configuration

The default is to mirror both transmit and receive directions. If neither tx or rx is configured, both directions are monitored.

Command Mode

Global Configuration mode

User Guidelines

Use the source interlace parameter to specify the interface to monitor. Use rx to monitor only ingress packets, or use tx to monitor only egress packets. If you do not specify an rx or tx option, the session monitors both ingress and egress packets. Use the destination interface to specify the interface to receive the monitored traffic. Use the mode parameter to enabled the administrative mode of the session. If enabled, the destination (probe) port monitors all the traffic received and transmitted on the physical monitored port. The probe port should not be connected to a network. Connect it to a monitoring tool or a standalone (static IP address) workstation running a monitoring program.

Up to four sessions mirroring traffic in a single direction and with unique destinations are supported on the Dell EMC Networking N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON Series switches. The Dell EMC Networking N1100-ON and N1500 Series switches support a single unidirectional or bidirectional session. Each session supports multiple sources. However, the destination interface for a session may not overlap with other sessions. The internal CPU port cannot be configured as an RSPAN source.

The session limitations are as follows (N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON only):

- Up to 4 sessions in ingress (RX) traffic mirroring may be active.
- Up to 4 sessions with egress (TX) traffic mirroring may be active.
- Up to 2 sessions with both (RX and TX) traffic mirroring may be active.

- Any other combination of up to 4 total ingress or egress mirroring may be active.

Destination (probe) interfaces do not perform MAC learning and drop ingress traffic (forwarding is disabled and incoming packets are dropped). Routing, spanning-tree, and port channel configuration are operationally disabled on probe ports. Destination interfaces must be dedicated to the monitoring function (i.e., connected to a PC running WireShark or some other packet decoder).

VLAN based mirroring is applicable only for ingress (RX) traffic. If neither rx, tx, nor both are specified in a source session, both ingress and egress traffic are monitored

Mirrored traffic is subject to the same QoS constraints as normal traffic. Oversubscribed traffic (both mirrored and un-mirrored) will be dropped in accordance with the configured or default policy. The operator may assign CoS or Diffserv policies to the mirrored traffic in the same manner as for normal traffic. RSPAN traffic is transmitted with a PCP of 0.

On ingress, the port mirroring logic stage is after the VLAN tag processing stage in the hardware. This means that, on ingress, packets may not appear as they do on the wire if processing such as VLAN or CoS value rewriting is programmed or DVLAN tunneling is enabled on the source interface. Examples of ingress VLAN tag processing are DVLAN tunneling (QinQ) or VLAN rewriting. Likewise, on egress, the port mirroring logic stage is before the egress VLAN tag processing stage. This means that, on egress, packets may not appear as they do on the wire if processing such as VLAN or CoS value rewriting is programmed.

Reserve a few VLANs across the network for the exclusive use of RSPAN. The RSPAN VLANs should only be configured on the reflector interfaces (generally the uplink/transit/downlink interface). RSPAN VLANs are used exclusively to carry the mirrored traffic across the network and cannot have source or destination interfaces as members of the RSPAN VLAN. RSPAN destination interfaces will continue to transmit mirrored traffic even if blocked by spanning-tree. Each RSPAN session must use a unique reflector port, destination port and RSPAN VLAN. Reflector ports (source/transit/destination) should be configured as trunk or general mode ports, and be members of the RSPAN VLAN. Do not assign other ports to the RSPAN VLANs (for example, trunk ports that are not reflector ports). Additionally, reflector ports may not be port channels.

Monitored traffic is encapsulated in the RSPAN VLAN on the reflector port on the source switch. On a source switch, when both an RSPAN VLAN and reflector port are configured on a trunk or general mode port with other VLANs, the interface can also carry traffic on the other VLANs. For example, an uplink interface (trunk port) can carry both the RSPAN traffic and other traffic. Do not configure the RSPAN VLAN as a native VLAN on interfaces other than the uplink/transit/downlink interfaces. Be sure to remove the RSPAN VLAN from ports on which mirrored traffic should not be encapsulated and transported. The RSPAN tag is not transmitted on the destination (probe) port. The CPU interface is not supported as a destination interface or a source interface for RSPAN.

For VLAN mirroring, the source VLAN cannot be the same as the RSPAN VLAN. The source VLAN and the RSPAN VLAN cannot be configured on the same port. The source VLAN is monitored in the ingress direction only. Careful consideration to placement of source mirroring sessions will allow bidirectional traffic to be monitored. Another alternative is to use port mirroring and a VLAN ACL filter if duplicate packets are received on the probe device.

The reflector port must be configured as the only member of the RSPAN VLAN on the source switch.

Multiple source interfaces may mirror traffic onto the RSPAN VLAN on both source switches and transmit switches (but not the destination switch). Be aware that the RSPAN VLAN floods mirrored traffic in the RSPAN VLAN. If an intermediate switch mirrors traffic onto the RSPAN VLAN, the traffic is flooded to both the destination and the other sources. Configuration of an ACL on the reflector port may mitigate this behavior. The source interface must be configured as the only member of the RSPAN VLAN on the destination (probe) switch. Mirroring a source to the RSPAN VLAN on the destination switch is not supported.

If an ACL filter is specified, the ACL must be created prior to its use in an RSPAN configuration. The ACL filter is configured on the source switch. ACL filters are internally configured as an egress ACL on the destination interface/reflector port. All the criteria in the ACL are marked with the *mirror* attribute (and the RSPAN VLAN) to match the mirrored traffic (including the implicit deny all). If configuring an egress ACL on the destination port, care must be taken with the ACL numbering to ensure the mirrored traffic is properly processed.

Bidirectional mirroring of multiple ports in a network may result in duplicate packets transmitted on the probe port (one copy for the receive side and another copy for the transmit side). Configuring the mirroring as rx only may help to reduce this issue.

RSPAN VLANs must be configured with the **remote-span** command prior to configuration in an RSPAN session. RSPAN intermediate switches may also be configured with multiple sources feeding into an existing RSPAN VLAN. The source configuration requires an interface parameter, so traffic mirrored on the intermediate switch is not flooded across the entire RSPAN VLAN. Place probe ports upstream of the intermediate switch in this case.

Configuring a second session on a source switch that mirrors RSPAN traffic from the reflector port is not supported. Configuring a second session on a source switch that mirrors an RSPAN source port to a local probe port is supported.

VLAN mirroring is not recommended for RSPAN if sources on multiple switches are members of the VLAN. This is because, as stations communicate with each other over the mirrored VLAN, duplicate packets will be sent to the probe, once for the source port and once for each switch over which the packet is received in the source VLAN.

For an enabled mirroring session, with a port-channel configured as the source interface, packets are mirrored only for the ports that are members of the port-channel at the time the mirroring session was enabled. Changes to the port-channel membership do not change the interfaces mirrored. Traffic is not mirrored for interfaces added to the port-channel, and is mirrored for ports removed from the port-channel. Specifically, to mirror interfaces added to an enabled port-channel, disable and re-enable the mirror session. Likewise, mirroring continues for ports removed from an enabled port-channel. Disable and re-enable the mirror session to stop mirroring on removed interfaces.

Example

This example shows how to configure a source switch using VLAN 723 as the destination RSPAN VLAN and Gi1/0/3 as the source interface. Te1/0/1 is configured as the reflector port. It is recommended that interface Te1/0/1 be configured as a trunk port. Interface Te1/0/1 must be configured as a member of VLAN 723 and may also carry traffic on other VLANs. No other interface should be configured as a member of VLAN 723.

```
console(config)#vlan 723
console(config-vlan723)#remote-span
console(config-vlan723)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport mode trunk
console(config-if-Te1/0/1)#exit
console(config)#monitor session 1 source interface gi1/0/3 both
console(config)#monitor session 1 destination remote vlan 723 reflector-port
Te1/0/1
console(config)#monitor session 1 mode
console(config)#show monitor session 1

Session                : 1
Admin mode             : Enabled
Type                   : Remote source session
Source ports           :
  Both                 : Gi1/0/48
Destination port       : Te1/0/1
Destination RSPAN VLAN : 723
```

This example shows how to configure a destination switch using VLAN 723 as the source RSPAN VLAN interface Te1/0/1 and Gi1/0/10 as the destination interface. Interface Gi1/0/10 is dedicated to monitoring and has a PC running WireShark attached. VLAN 723 should only be configured on interface Te1/0/1.

```
console(config)#vlan 723
console(config-vlan723)#remote-span
console(config-vlan723)#exit
console(config)#interface Te1/0/1
console(config-if-Te1/0/1)#switchport mode trunk
console(config-if-Te1/0/10)#exit
console(config)# monitor session 1 source remote vlan 723
console(config)# monitor session 1 destination interface gi1/0/10
console(config)# monitor session 1 mode
console(config)#show monitor session 1
Session                : 1
Admin mode             : Enabled
Type                   : Remote destination session
Source RSPAN VLAN      : 723
Destination port       : Gi1/0/10
```

Command History

Revised in firmware release 6.3.6.

monitor session type erspan-source

Use this command to configure an ERSPAN source session.

Syntax

monitor session *session-id* **type erspan-source**

no monitor session *session-id* **type erspan-source**

- *session-id* — The session identifier (Range 1 to 4).

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

ERSPAN encapsulates monitored traffic into GRE packets. Once in ERSPAN Source Session configuration mode, configure the source ports from which traffic is mirrored, the ERSPAN destination IPv4 address, the ERSPAN origin IPv4 address, and the ERSPAN ID.

ERSPAN utilizes separate source and destination sessions. The source and destination sessions must be configured on different switches. This command is configured on the source session switch.

ERSPAN encapsulates monitored traffic into GRE packets. Once in ERSPAN Source Session configuration mode, configure the source port or VLAN using the source interface command.

The session ID is of local significance only. The session ID on the source switch need not match the session ID on the destination switch.

Example

This example configures interface Gi1/0/1 to mirror received packets through interface Te1/0/1 using GRE encapsulation using a source IP address of 11.10.10.10, a destination IP address of 10.10.10.11 and an ERSPAN flow identifier of 200.

```
console(config)#monitor session 2 type erspan-source
console(config-erspan-src)#source interface gi1/0/1 rx
console(config-erspan-src)#destination
console(config-erspan-src-dst)#erspan-id 200
console(config-erspan-src-dst)#ip address 10.10.10.11
console(config-erspan-src-dst)#origin ip address 11.10.10.10
console(config-erspan-src-dst)#reflector port te1/0/1
```

Command History

Command introduced in version 6.7.0 firmware.

origin ip address

Use this command to configure the ERSPAN GRE packet source IP address on the source switch.

Syntax

origin ip address *ipv4-address*

no origin ip address

- *ipv4-address* — The IPv4 address used as the source of the GRE traffic.

Default Configuration

This command has no default configuration.

Command Mode

ERSPAN Source Destination Configuration mode

User Guidelines

This command may be used to override the source IP address of the GRE packets.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware.

reflector-port

Use this command to configure the port on the source switch over which the GRE encapsulated packets are transmitted. Use the **no** form of the command to remove the reflector port.

Syntax

reflector-port *interface-id*

no reflector-port

- *interface-id* — The interface identifier of the reflector interface.

Default Configuration

By default, no reflector port is configured.

Command Mode

ERSPAN Source Configuration mode

User Guidelines

The reflector interface should not be an access-mode interface. Configure the interface in trunk or general mode.

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware.

remote-span

Use this command to configure a VLAN as an RSPAN VLAN. Use the **no** form of the command to remove the remote SPAN characteristics from a VLAN and revert it to a normal MAC learning VLAN.

Syntax

remote-span

no remote-span

Default Configuration

There is no default configuration for this command.

Command Modes

VLAN Configuration mode.

User Guidelines

Remote-span VLANs must be configured as a tagged VLAN on trunk or general mode ports on RSPAN transit switches. Traffic in an RSPAN VLAN is always flooded as MAC address learning and link local protocols are disabled on RSPAN VLANs. VLANs on transit switches must be configured as remote-span VLANs in order to ensure delivery of all mirrored packets. Remote-span VLANs configured on transit switches may co-exist with other non remote-span VLANs on trunk ports. Do not configure the RSPAN VLAN as a member of spanning tree (RSTP-PV or MST).

Example

```
console#vlan 10
console(config-vlan10)#remote-span
```

source

Use this command to enter ERSPAN Destination Session Source Configuration mode on the destination switch.

Syntax

source

Default Configuration

This command has no default configuration.

Command Modes

ERSPAN Source Configuration mode

User Guidelines

Configure the matching ERSPAN ID and IPv4 address of the source switch flow to be transmitted on the destination interface to the packet sniffer.

ERSPAN utilizes separate source and destination sessions. This command is configured on the destination session switch.

Command History

Command introduced in version 6.7.0 firmware.

source interface

Use this command to select the interface on the source switch from which packets are mirrored to the reflector port. Use the **no** form of the command to remove the source interface.

Syntax

source interface { *interface-id* | **cpu** | **vlan** *vlan-id* } [**rx** | **tx**]

no source interface { *interface-id* | **cpu** | **vlan** *vlan-id* }

- *interface-id* — An Ethernet or port-channel identifier.
- **cpu** — The internal CPU interface.
- *vlan-id* — A VLAN identifier (range 1 to 4093).
- **rx** — Mirror packets received on the interface.
- **tx** — Mirror packets transmitted on the interface.

Default Configuration

By default, packets are mirrored in both the rx and tx direction.

Command Mode

ERSPAN Source Configuration mode

User Guidelines

ERSPAN utilizes separate source and destination sessions. This command is configured on the source session switch.

Command History

Command introduced in version 6.7.0 firmware

show monitor capture

Use this command to display captured packets transmitted or received from the CPU.

Syntax

show monitor capture [packets]

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec mode (all SHOW modes)

User Guidelines

This command has no user guidelines.

Example

```
console#show monitor capture

Operational Status............................ Enabled
Current Capturing Type........................ Line
Capturing Traffic Mode........................ Tx/Rx
Line Wrap Mode................................ Disabled
RPCAP Listening Port.......................... 2002
RPCAP dump file size (KB)..................... 45

console#show monitor capture packets

Gi1/0/1  Length = 94  [RECEIVE]
===================
02:29:23.0000
0000 33 33 00 00 00 01 00 11 88 2f 8e 82 81 00 00 01
0010 86 dd 60 00 00 00 00 24 00 01 fe 80 00 00 00 00
0020 00 00 00 00 88 ff fe 2f 8e 82 ff 02 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 01 3a 00 05 02 00 00
0040 01 00 82 00 43 62 27 10 00 00 00 00 00 00 00 00
```

```
0050 00 00 00 00 00 00 00 00 00 00 ff ff 00 00
===================

Gi1/0/1  Length = 94  [RECEIVE]
===================
02:29:24.0000
0000 33 33 00 00 00 01 00 11 88 2f 8e 82 81 00 00 01
0010 86 dd 60 00 00 00 00 24 00 01 fe 80 00 00 00 00
0020 00 00 00 00 88 ff fe 2f 8e 82 ff 02 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 01 3a 00 05 02 00 00
0040 01 00 82 00 43 62 27 10 00 00 00 00 00 00 00 00
0050 00 00 00 00 00 00 00 00 00 00 ff ff 00 00
===================

Gi1/0/1  Length = 94  [RECEIVE]
===================
02:29:25.0000
0000 33 33 00 00 00 01 00 11 88 2f 8e 82 81 00 00 01
0010 86 dd 60 00 00 00 00 24 00 01 fe 80 00 00 00 00
0020 00 00 00 00 88 ff fe 2f 8e 82 ff 02 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 01 3a 00 05 02 00 00
0040 01 00 82 00 43 62 27 10 00 00 00 00 00 00 00 00
0050 00 00 00 00 00 00 00 00 00 00 ff ff 00 00
===================

Gi1/0/1  Length = 94  [RECEIVE]
===================
02:29:26.0000
0000 33 33 00 00 00 01 00 11 88 2f 8e 82 81 00 00 01
0010 86 dd 60 00 00 00 00 24 00 01 fe 80 00 00 00 00
0020 00 00 00 00 88 ff fe 2f 8e 82 ff 02 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 01 3a 00 05 02 00 00
0040 01 00 82 00 43 62 27 10 00 00 00 00 00 00 00 00
0050 00 00 00 00 00 00 00 00 00 00 ff ff 00 00
```

show monitor session

Use the **show monitor session** command to display status of port monitoring, VLAN-based mirroring, Flow-based mirroring, and mirroring across RSPAN.

Syntax

show monitor session *session_number* [**detail**]

- *session _number*— Session identification number.

- detail—Displays additional information.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following example shows port monitor status.

```
console(config)#show monitor session 1

Session                : 1
Admin mode             : Disabled
Type                   : Local session
Source ports           :
  Both                 : Te1/0/10
Destination ports      : Te2/0/20
IP access-group        : a1
```

The following example shows the detailed status of the port based mirroring session that is constrained to a local switch.

```
console(config)#show monitor session 1 detail

Session                : 1
Admin mode             : Disabled
Type                   : Local session
Source ports           :
  Rx only              : None
  Tx only              : None
  Both                 : Te1/0/10
Source VLANs           :
  Rx only              : None
Source RSPAN VLAN      : None
Destination ports      : Te2/0/20
```

```
Destination RSPAN VLAN : None
IP access-group        : a1
MAC access-group       : None
```

The following example shows the detailed status of a VLAN session on source switch, where session is span across multiple switches.

```
console# show monitor session 1 detail
Session             : 1
Type                : Remote Destination Session
Source Ports        :
    RX Only         : None
    TX Only         : None
    Both            : None
Source VLANs        :
    RX Only         : 100
Source RSPAN VLAN : None
Destination Ports : None
Dest RSPAN VLAN     : 999
```

The following example shows the detailed status of a VLAN session on destination switch, where session is span across multiple switches.

```
console# show monitor session 1 detail
Session             : 1
Type                : Remote Destination Session
Source Ports        :
    RX Only         : None
    TX Only         : None
    Both            : None
Source VLANs        :
    RX Only         : None
Source RSPAN VLAN : 999
Destination Ports : Gi1/0/15
Dest RSPAN VLAN     : None
```

show vlan remote-span

Use this command to display the RSPAN VLAN IDs.

Syntax

show vlan remote-span

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows the RSPAN VLANs configured on the switch.

```
console# show vlan remote-span

RSPAN Vlan
-----------------------------------------------------
10
```

QoS Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Quality of Service (QoS) technologies are intended to provide guaranteed timely delivery of specific application data to a particular destination. In contrast, standard IP-based networks are designed to provide best effort data delivery service. Best effort service implies that the network delivers the data in a timely fashion, although there is no guarantee. During times of congestion, packets may be delayed, sent sporadically, or dropped. For typical Internet applications, such as electronic mail and file transfer, a slight degradation in service is acceptable and, in many cases, unnoticeable.

Conversely, any degradation of service has undesirable effects on applications with strict timing requirements, such as voice or multimedia.

QoS is a means of providing consistent, predictable data delivery by distinguishing between packets that have strict timing requirements from those that are more tolerant of delay. Packets with strict timing requirements are given special treatment in a QoS-capable network. To accomplish this, all elements of the network must be QoS-capable. If one node is unable to meet the necessary timing requirements, this creates a deficiency in the network path and the performance of the entire packet flow is compromised.

Access Control Lists

The Dell EMC Networking ACL feature allows classification of packets based upon Layer 2 through Layer 4 header information. An Ethernet IPv6 packet is distinguished from an IPv4 packet by its unique Ether-type value; thus, all IPv4 and IPv6 classifiers include the Ether-type field.

Multiple ACLs per interface are supported. The ACLs can be combination of Layer 2 and/or Layer 3/4 ACLs.

ACL assignment is appropriate for both Ethernet ports and port channels.

A user configures an ACL **permit** rule to force its matching traffic stream to a specific egress interface, bypassing any forwarding decision normally performed by the device. The interface can be an Ethernet interface or a LAG. The redirect interface rule action is independent of, but compatible with, the assign queue rule action.

ACLs can be configured to apply to a VLAN instead of an interface. Traffic tagged with a VLAN ID (either receive-tagged or tagged by ingress process such as PVID) is evaluated for a match regardless of the interface on which it is received.

Layer 2 ACLs

The Layer 2 ACL feature provides access list capability by allowing classification on the Layer 2 header of an Ethernet frame, including the 802.1Q VLAN tag(s). In addition, the rule action set is enhanced to designate which (egress) CoS queue should handle the traffic, and whether the traffic flow is to be redirected to a specific outgoing interface.

MAC access lists are identified by a user-specified name instead of a number.

Layer 3/4 IPv4 ACLs

The Layer 3/4 ACL feature supports extended IP access lists. These lists check the Layer 3 portion of a packet, looking specifically at information contained in the IP header and, in certain cases, the TCP or UDP header. An EtherType of 0x0800 is assumed in the case of IP access lists. Permit and deny actions are supported for each ACL rule.

Standard layer 3/4 ACLs can be classified based on the source IP address and netmask or other extended classification criteria.

Class of Service (CoS)

The Dell EMC Networking CoS Queuing feature allows the user to directly configure device queuing and, therefore, provide the desired QoS behavior without the complexities of DiffServ. The CoS feature allows the user to determine the following queue behavior:

- Queue Mapping
  - Trusted Port Queue Mapping
  - Untrusted Port Default Priority
- Queue Configuration

This enables Dell EMC Networking switches to support a wide variety of delay sensitive video and audio multicast applications.

CoS mapping tables, port default priority, and hardware queue parameters may be configured on LAG interfaces as well as Ethernet port interfaces.

Queue Mapping

The priority of a packet arriving at an interface is used to steer the packet to the appropriate outbound CoS queue through a mapping table. Network packets arriving at an ingress port are directed to one of n queues in an egress port(s) based on the translation of packet priority to CoS queue. The CoS mapping tables define the queue used to handle each enumerated type of user priority designated in either the 802.1p User Priority, or IP DSCP contents of a packet. If neither of these fields is trusted to contain a meaningful COS queue designation, the ingress port can be configured to use its default priority to specify the CoS queue.

CoS queue mappings use the concept of trusted and untrusted ports.

A trusted port is one that takes at face value a certain priority designation within arriving packets. Specifically, a port may be configured to trust one of the following packet fields:

- IEEE 802.1p User Priority
- IP Precedence
- IP DSCP

Packets arriving at the port ingress are inspected and their trusted field value is used to designate the COS queue that the packet is placed when forwarded to the appropriate egress port. A mapping table associates the trusted field value with the desired COS queue.

Alternatively, a port may be configured as untrusted, whereby it does not trust any incoming packet priority designation and uses the port default priority value instead. All packets arriving at the ingress of an untrusted port are directed to a specific COS queue on the appropriate egress port(s) in accordance with the configured default priority of the ingress port. This process is also used for cases where a trusted port mapping is unable to be honored, such as when a non-IP packet arrives at a port configured to trust the User Priority or IP DSCP value.

DiffServ

Standard IP-based networks are designed to provide “best effort” data delivery service. Best effort service implies that the network delivers the data in a timely fashion, although there is no guarantee that it will meet the latency or bandwidth requirements. During times of congestion, packets may be delayed, sent sporadically, or dropped. For typical Internet applications, such as email and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. Conversely, any degradation of service has undesirable effects on applications with strict timing requirements, such as voice or multimedia.

Diffserv allows the network operator to classify and apply a distinguished service to traffic based on a number of criteria. The distinguished service can meter traffic and apply per hop behavior based upon the bandwidth utilization and burstiness of traffic. In addition, preferential drop characteristics can be configured in support of an assured forwarding capability such that TCP clients are informed if they exceed the switch buffering limits.

assign-queue

Use the **assign-queue** command in Policy-Class-Map Configuration mode to modify the queue ID to which the associated traffic stream is assigned.

Syntax

assign-queue *queueid*

- *queueid* — Specifies a valid queue ID. (Range: integer from 0–6.)

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

The queue id is the internal queue number (traffic class), not the CoS value. Use the **show classofservice** command to display the assignment of CoS and DSCP values to internal queue numbers.

Example

The following example displays how to change the queue ID to 4 for the associated traffic stream.

```
console(config-policy-classmap)#assign-queue 4
```

class

Use the **class** command in Policy-Map Class Configuration mode to create an instance of a class definition within the specified policy for the purpose of defining treatment of the traffic class through subsequent policy attribute statements.

Syntax

class *classname*

no class

- *classname* — Specifies the name of an existing DiffServ class. (Range: 1–31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Policy Map Configuration mode

User Guidelines

This command causes the specified policy to create a reference to the class definition. The command mode is changed to Policy-Class-Map Configuration when this command is executed successfully.

Example

The following example shows how to specify the DiffServ class name of "DELL."

```
console(config)#class-map match-all DELL
console(config-classmap)#exit
console(config)#policy-map DELL1 in
console(config-policy-map)#class DELL
```

class-map

Use the **class-map** command in Global Configuration mode to define a new DiffServ class of type *match-all*. To delete an existing class, use the **no** form of this command.

Syntax

class-map [match-any|match-all] *class-map-name*

no class-map *class-map-name*

- *class-map-name* — a case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying an existing DiffServ class.
- match-any—The class map will match if any of the specified criteria matches.
- match-all—The class map will match only if all of the specified criteria match.

Default Configuration

The class-map command has no defaults.

Command Mode

Global Configuration mode

User Guidelines

Enter the **class-map** command without the *match-all/match-any* parameter and an existing *class-map-name* to modify the named class map.

Enter the **class-map** command with the *match-all/match-any* parameter and a nonexistent *class-map-name* to create a new class map. The *class-map-name* must not be the same as any other class map or access group name.

Use the **no class-map** form of the command without a *match-all/match-any* parameter to delete an existing class map.

The match-all parameter indicates that all of the match criteria configured in the class map must be met for the packet to be processed by the class map.

The match-any parameter indicates that any of the match criteria configured in the class-map may be met for the packet to be processed by the class-map.

Only one access-group may be referenced in a match-all class map. Multiple access-groups of the same type may be referenced in a match-any class map.

Command History

Updated syntax in version 6.5 firmware.

Example

The following example creates a class-map named "DELL" which requires terms in the access-group DELL-ACCESS to be matched.

```
console(config)#class-map match-all DELL
console(config-classmap)#match access-group DELL-ACCESS
console(config-cmap)#exit
```

The following example configures multiple policy maps. Each policy map references a class map that references access groups. Assign the policy for inbound traffic to interfaces using the **service policy-in** command.

```
console(config)#ip access-list default
console(config-ip-acl)#deny   ip any any
console(config-ip-acl)#exit
console(config)#ip access-list  voice-all
console(config-ip-acl)#permit udp 10.0.0.0 0.255.255.255 any range 16384 
32768
console(config-ip-acl)#permit udp any 10.0.0.0 0.255.255.255 range 16384 
32768
console(config-ip-acl)#permit udp 10.0.0.0 0.255.255.255 eq 17000 any
console(config-ip-acl)#deny   ip any any
console(config-ip-acl)#exit
console(config)#ip access-list  voice-pass
console(config-ip-acl)#deny   ip any any
console(config-ip-acl)#exit
console(config)# class-map match-any voice-all
```

```
console(config-classmap)#match access-group name voice-pass
console(config-classmap)#match access-group name voice-all
console(config- classmap)#exit
console(config)#class-map match-all port-default
console(config-classmap)#match access-group name default
console(config- classmap)#exit
console(config)#policy-map inbound in
console(config-policy-map)#class voice-all
console(config-policy-classmap)#mark ip dscp af41
console(config-policy-classmap)#exit
console(config-policy-map)#class port-default
console(config-policy-classmap)#mark ip dscp af21
console(config-policy-classmap)#exit
console(config-policy-map)#exit
```

class-map rename

Use the **class-map rename** command in Global Configuration mode to change the name of a DiffServ class.

Syntax

class-map rename *classname newclassname*

- *classname* — The name of an existing DiffServ class. (Range: 1–31 characters)
- *newclassname* — A case-sensitive alphanumeric string. (Range: 1–31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to change the name of a DiffServ class from "DELL" to "DELL1."

```
console(config)#class-map rename DELL DELL1
console(config)#
```

classofservice dot1p-mapping

Use the **classofservice dot1p-mapping** command in Global Configuration mode to map an IEEE 802.1p user priority to an internal traffic class. In Interface Configuration mode, the mapping is applied only to packets received on that interface. Use the **no** form of the command to remove mapping between an 802.1p priority and an internal traffic class.

Syntax

classofservice dot1p-mapping *ppriority trafficclass*

no classofservice dot1p-mapping

- *ppriority* — Specifies the user priority mapped to the specified traffic class for this switch. (Range: 0–7)
- *trafficclass* — Specifies the traffic class for this switch. (Range: 0–6)

Default Configuration

The default 802.1p mapping is as follows:

User Priority	Traffic Class
0	1
1	0
2	0
3	1
4	2
5	2
6	3
7	3

Command Mode

Global Configuration or Interface Configuration (Ethernet, Port-channel) mode

User Guidelines

None

Example

The following example globally configures a mapping for user priority 1 and traffic class 2. If trust mode is enabled for 802.1p (classofservice trust dot1p), packets received on any interface marked with IEEE 802.1p priority 1 will be assigned to internal CoS queue 2.

```
console(config)#classofservice dot1p-mapping 1 2
```

classofservice ip-dscp-mapping

Use the **classofservice ip-dscp-mapping** command in Global Configuration mode to map an IP DSCP value to an internal traffic class. Use the **no** form of the command to return the classofservice mapping to the default, and remove a traffic class mapping for an IP DSCP value.

Syntax

classofservice ip-dscp-mapping *ipdscp trafficclass*

no classofservice ip-dscp-mapping

- *ipdscp*—Specifies the IP DSCP value which is to be mapped to the specified traffic class. (Range: 0–63 or an IP DSCP keyword – af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef).
- *trafficclass*—Specifies the traffic class for this value mapping. (Range: 0–6).

Default Configuration

The default DSCP mapping is as follows:

IP DSCP	Traffic Class (queue-id)
0(be/cs0)	1
1	1
2	1
3	1
4	1
5	1
6	1
7	1
8(cs1)	0
9	0
10(af11)	0
11	0
12(af12)	0
13	0
14(af13)	0
15	0
16(cs2)	0
17	0
18(af21)	0
19	0
20(af22)	0
21	0
22(af23)	0
23	0
24(cs3)	1
25	1
26(af31)	1

IP DSCP	Traffic Class (queue-id)
27	1
28(af32)	1
29	1
30(af33)	1
31	1
32(cs4)	2
33	2
34(af41)	2
35	2
36(af42)	2
37	2
38(af43)	2
39	2
40(cs5)	2
41	2
42	2
43	2
44	2
45	2
46(ef)	2
47	2
48(cs6)	3
49	3
50	3
51	3
52	3
53	3
54	3

IP DSCP	Traffic Class (queue-id)
55	3
56(cs7)	3
57	3
58	3
59	3
60	3
61	3
62	3
63	3

Command Mode

Global Configuration mode

User Guidelines

The switch may be configured to trust either DSCP or CoS values, but not both. Setting the trust mode does not affect ACL packet matching, e.g. it is still possible to use an ACL that matches on a received CoS value and assigns the packet to a queue even when DSCP is trusted.

Example

The following example globally configures the mapping for IP DSCP 1 to traffic class 2. If trust mode is enabled for DSCP (**classofservice trust ip-dscp**), packets received on any interface marked with DSCP 1 will be assigned to internal CoS queue 2.

```
console(config)#classofservice ip-dscp-mapping 1 2
```

classofservice trust

Use the **classofservice trust** command in either Global Configuration mode or Interface Configuration mode to set the class of service trust mode of an interface. To set the interface mode to trust 802.1p markings, use the **no** form of this command.

Syntax

classofservice trust {dot1p | untrusted | ip-dscp}

no classofservice trust

- **dot1p** — Specifies that the mode be set to trust IEEE 802.1p packet markings.
- **untrusted** — Sets the Class of Service Trust Mode to Untrusted.
- **ip-dscp** — Specifies that the mode be set to trust IP DSCP packet markings.

Default Configuration

By default, the switch trusts IEEE 802.1p markings.

Command Mode

Global Configuration mode or Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command has no user guidelines.

Examples

The following example sets the class of service trust mode of all interfaces to trust 802.1p packet markings.

```
console(config)#classofservice trust dot1p
```

The following example displays how to set the class of service trust mode of all interfaces to trust IP DSCP packet markings.

```
console(config)#classofservice trust ip-dscp
```

conform-color

Use the **conform-color** command in Policy-Class-Map Configuration mode to enable color-aware marking for a policy.

NOTE: This command is not available on the N1500 Series switches.

Syntax

conform-color {class-map-name} [exceed-color { class-map-name }]

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

This command must be preceded by a police command. If the conform-color command is not entered, the police algorithm uses the color-blind version, meaning in the incoming color is ignored. The conform-color command can be used with any of the three police algorithms. In the simple algorithm, only the conform color class can be configured. The conform color class pre-colors packets as green prior to metering. Non-conforming packets are pre-colored red prior to metering. With the single-rate and two-rate police algorithm, the conform color class pre-colors packets as green and the exceed color class pre-colors packets as yellow. Non-conforming packets are pre-colored red. Per-colored packets are then metered and re-colored based upon the meter parameters.

Color conforming classes must be one of the following types:

- Primary COS
- Secondary COS
- DSCP
- IP Precedence

This includes both the input and color aware classes. The conform color class may not be the same as the input class, nor may the match criteria be of the same type. The input class map may have a match type of “any.”

The exceed color class may only be specified for the two-rate police algorithm.

Example

The following example uses a simple policer to color TCP packets that exceed an average rate of 1000 Kbps or a burst size of 16 Kbytes as red. Conforming packets (those in CoS queue 1) are pre-colored green prior to metering. After metering, non-conforming packets are colored red. Both green and red packets are transmitted, but may be subject to further color-based action on egress. The example configuration below also shows the configuration of WRED drop thresholds and probabilities for colored traffic.

```
console(config)#class-map match-all class-ipv4
console(config-classmap)#match any
console(config-classmap)#exit
console(config)#class-map match-all class-cos1
console(config-classmap)#match cos 1
console(config-classmap)#exit
console(config)#policy-map color in
console(config-policy-map)#class class-ipv4
console(config-policy-classmap)#police-simple 1000 16 conform-action 
transmit violate-action transmit
console(config-policy-classmap)#conform-color class-cos1
console(config-policy-classmap)#exit
console(config-policy-map)#exit
```

cos-queue min-bandwidth

Use the **cos-queue min-bandwidth** command in either Global Configuration mode or Interface Configuration mode to specify the minimum transmission bandwidth for each interface queue. To restore the default for each queue's minimum bandwidth value, use the **no** form of this command.

Syntax

cos-queue min-bandwidth *bw-0 bw-1 … bw-n*

no cos-queue min-bandwidth

- *bw-0* — Specifies the minimum transmission bandwidth guarantee for an interface. You must specify as many bandwidth parameters as there are COS queues (bw-0 through bw-n). (Range: 0–100 in increments of 5)

Default Configuration

By default, all CoS queues are configured with a 0% minimum bandwidth guarantee.

Command Mode

Global Configuration mode or Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command changes the scheduling policy for packet transmission of the selected CoS queues. It does not change the packet buffering policy nor does it reserve packet buffers to a CoS queue.

The maximum number of queues supported per interface is seven. It is recommended that the operator avoid the use of queue 5-7 to avoid conflicts with inter- and intra-network control traffic.

In order to better accommodate bursty traffic, it is recommended that the sum of the configured min-bandwidths be much less than 100%. Configuring the minimum bandwidths such that they sum to 100% effectively locks the scheduler such that bandwidth sharing by lower priority queues cannot be accommodated under congestion conditions.

Example

The following example displays how to specify the minimum transmission bandwidth guarantee for cos-queues 0 through 6 as follows:

Cos Queue 0—5% scheduler capacity

CoS Queue 1—5% scheduler capacity

CoS Queue 2—10% scheduler capacity

CoS Queue 3—10% scheduler capacity

CoS Queue 4-7—Shared scheduler capacity.

```
console(config)#cos-queue min-bandwidth 5 5 10 10 0 0 0
```

cos-queue random-detect

Use the **cos-queue random-detect** command in Global Configuration or Interface Configuration mode to enable WRED queue management policy on an interface CoS queue. Use the **no** form of the command to disable WRED policy for a CoS queue on an interface.

NOTE: On the N1500 Series switches, this command enables Simple RED since the hardware is not capable of Weighted RED.

Syntax

cos-queue {**random-detect** *queue-id1* [*queue-id2..queue-idn*]}

no cos-queue {**random-detect** *queue-id1* [*queue-id2..queue-idn*]}

- *queue-id*—An integer indicating the internal CoS queue-id which is to be enabled for WRED. Range 0-6. Up to 7 queues may be simultaneously specified.

Default Configuration

WRED queue management policy is disabled by default. Tail-drop queue management policy is enabled by default. The threshold for invoking tail-drop behavior when WRED is disabled is approximately 1/2 of the remaining free packet buffer in the switch.

Command Mode

Interface Configuration (Ethernet or port-channel) mode, Interface Range mode, or Global Configuration mode

User Guidelines

When used on a port-channel, this command will override the settings on the individual interfaces that are part of the port channel. Removing an interface from the port channel restores the individual interface settings.

This command can be used in Interface Range mode.

Use the cos-queue min-bandwidth command to configure the minimum scheduler bandwidth percentage guarantee for the CoS queues.

Use the show interfaces random-detect command to display the WRED configuration, including ECN configuration.

Use the policy-map and conform-color commands to mark traffic with a color other than default green color.

The drop probability scale supports values in the range 0-10% and the discrete values 25%, 50%, 75%, and 100%. Other values are truncated to the next lower value by the hardware.

N1500 Series Switches

N1500 Series switches support a simple RED capability. The N1500 Series switch does not support configuration of the maximum threshold nor can the threshold or drop probability be configured for non-TCP traffic. Only the minimum threshold (min-thresh) and drop probability (drop-prob-scale) may be configured for the TCP colors green/yellow/red. The maximum threshold may not be configured nor can the threshold or drop probability be configured for non-TCP traffic. ECN capability is not supported.

Simple RED may be enabled/disabled for any CoS queue on the Dell EMC Networking N1500 Series switches, however, the drop probability must be one of the values given below. The percentage before the dash indicates the actual drop probability. The number after the dash indicates the value entered in the drop-prob-scale parameter.

0.097% - 1

0.195% - 2

0.391% - 4

0.781% - 8

1.563% - 16

3.125% - 31

6.250% - 63

100% - 100

Examples

Example 1

This example enables WRED on internal CoS 0 queue for unmarked packets and set the green, yellow, and red colored traffic to utilize WRED starting at 3% of port congestion with a drop probability of 1%, 2% and 3%, respectively. In this configuration, non-TCP traffic uses tail-drop queue discipline with a drop threshold at 100% of the statically calculated port queue length vs. the dynamically calculated value used by the normal tail-drop mechanism (approx. 1/2 remaining free packet buffer memory).

```
console(config)# cos-queue random-detect 0
console(config)# random-detect queue-parms 0 min-thresh 3 3 3 100 max-thresh
10 10 10 100 drop-prob-scale 1 2 3 0
```

Example 2

This example configures simple RED on an N1500 series switch. CoS queue 1 is globally configured for simple RED with a congestion threshold of 50% and a drop probability of 0.781% for green colored traffic.

```
console(config)# random-detect queue-parms 1 min-thresh 50 0 0 drop-prob-scale  8 0 0
console(config)#cos-queue random-detect 1
```

cos-queue strict

Use the **cos-queue strict** command in either Global Configuration mode or Interface Configuration mode to activate the strict priority scheduler mode for the specified queue. To restore the default weighted scheduler mode for each specified queue, use the **no** form of this command.

Syntax

cos-queue strict {*queue-id-1*} [{*queue-id-2*} … {*queue-id-n*}]

no cos-queue strict {*queue-id-1*} [{*queue-id-2*} … {*queue-id-n*}]

- **queue-id-1** — Specifies the queue ID for which you are activating the strict priority scheduler. You can specify a queue ID for as many queues as you have (queue-id 1 through queue-id-n). (Range: 0–6)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode or Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

Strict priority (SP) queues are scheduled in priority order ahead of WRR queues. Strict priority queues are allocated unlimited bandwidth by default. Configuring the min-bandwidth on a CoS queue also configured for strict priority wastes the scheduler slots. Use the **cos-queue min-bandwidth** command on lower priority SP and WRR queues to ensure fairness to lower priority queues by reserving a specific amount of scheduler bandwidth. Use the **show interfaces cos-queue** command to display the class of service settings.

Strict priority scheduling is most useful when it is desirable that low-bit-rate time-sensitive traffic be queued ahead of other traffic. The administrator must be careful to limit the bandwidth assigned to the strict priority queue to avoid potential denial of service attacks. See the "Enterprise Voice VLAN Configuration With QoS" section in the Users Configuration Guide for a rate limiting example. If using the min-bandwidth command to reserve bandwidth on other queues, ensure that the total of the minimum bandwidths is less than 100% to allow the scheduler to handle bursts of traffic.

Example

The following example displays how to activate the strict priority scheduler mode for two queues.

```
console(config)#cos-queue strict 1 2
```

The following example displays how to activate the strict priority scheduler mode for three queues (1, 2, and 4) and reserves a minimal amount of bandwidth on the other four internal CoS queues (0, 3, 5 and 6).

```
console(config)#cos-queue strict 1 2 4
console(config)#cos-queue min-bandwidth 5 0 0 10 0 10 10
```

diffserv

Use the **diffserv** command in Global Configuration mode to set the DiffServ operational mode to active. While disabled, the DiffServ configuration is retained and can be changed, but it is not operational. When enabled, DiffServ services are operational on queues configured for WRED. To set the DiffServ operational mode to inactive, use the **no** form of this command.

NOTE: On the N1500 Series switches, enable Simple RED since the hardware is not capable of Weighted RED.

Syntax

diffserv

no diffserv

Default Configuration

This command default is **enabled**.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to set the DiffServ operational mode to active.

```
console(Config)#diffserv
```

drop

Use the **drop** command in Policy-Class-Map Configuration mode to specify that all packets for the associated traffic stream are to be dropped at ingress.

NOTE: This command is not available on the N1500 Series switches.

Syntax

drop

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to specify that matching packets are to be dropped at ingress.

```
console(config-policy-classmap)#drop
```

mark cos

Use the **mark cos** command in Policy-Class-Map Configuration mode to mark all packets for the associated traffic stream with the specified class of service value in the user priority field of the 802.1p header. If the packet does not already contain this header, one is inserted.

NOTE: This command is not available on the N1500 Series switches.

Syntax

mark cos *cos-value*

- *cos-value* — Specifies the CoS value as an integer. (Range: 0–7)

Default Configuration

There is no default cos-value for this command. Packets are not remarked by default.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

Received frames are assigned to an internal CoS queue on ingress depending on configuration such as whether the ingress port is trusted for CoS, DSCP or IP precedence value and it's mapping onto an internal CoS queue.

Frames may be remarked using either an **in** or an **out** policy map. Changing the CoS value in the VLAN tag of a frame does not alter the internal CoS assigned to the packet; it only rewrites the CoS value in the Ethernet frame header.

Example

The following example displays how to mark all packets with a CoS value.

```
console(config-policy-classmap)#mark cos 7
```

mark ip-dscp

Use the **mark ip-dscp** command in Policy-Class-Map Configuration mode to mark all packets for the associated traffic stream with the specified IP DSCP value.

NOTE: This command is not available on the N1500 Series switches.

Syntax

mark ip-dscp *dscpval*

- *dscpval* — Specifies a DSCP value (10, 12, 14, 18, 20, 22, 26, 28, 30, 34, 36, 38, 0, 8, 16, 24, 32, 40, 48, 56, 46) or a DSCP keyword (af11, af12, af13, af21, af22, af23, af31, af32, af33, af41, af42, af43, be, cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, ef).

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

Received frames are assigned to a CoS queue on ingress depending on configuration items such as whether the ingress port is trusted for CoS, DSCP or IP precedence value and it's mapping onto an internal CoS queue.

IP packets may be remarked using either an **in** or an **out** policy map. Changing the IP DSCP value in the ToS value of an IP packet does not alter the internal CoS assigned to the packet; it only rewrites the ToS value in the IP packet header.

Example

The following example displays how to mark all packets with an IP DSCP value of “cs4.”

```
console(config-policy-classmap)#mark ip-dscp cs4
```

mark ip-precedence

Use the **mark ip-precedence** command in Policy-Class-Map Configuration mode to mark all packets for the associated traffic stream with the specified IP precedence value.

NOTE: This command is not available on the N1500 Series switches.

Syntax

mark ip-precedence *prec-value*

- *prec-value* — Specifies the IP precedence value as an integer. (Range: 0–7)

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines.

Received frames are assigned to a CoS queue on ingress depending on configuration such as whether the ingress port is trusted for CoS, DSCP or IP precedence value and it's mapping onto an internal CoS queue.

IP packets may be remarked using either an **in** or an **out** policy map. Changing the IP precedence value in the ToS value field of an IP packet does not alter the internal CoS assigned to the packet; it only rewrites the ToS value in the IP packet header.

Example

The following example displays

```
console(config)#policy-map p1 in
console(config-policy-map)#class c1
console(config-policy-classmap)#mark ip-precedence 2
console(config-policy-classmap)#
```

match access-group

Use the **match access-group** command to add ACL match criteria to a class map. Use the **no** form of the command to remove the ACL match criteria.

Syntax

match access-group name *name*

no match access-group name *name*

- *name*—The name of an access-list. Only MAC, IPv4, and IPv6 access-lists are allowed.

Default Configuration

No access-lists are configured for a class-map.

Command Mode

Class-Map Configuration mode

User Guidelines

ACLs are used to classify traffic and class/policy maps are used to define the QoS treatment of the traffic class. The ACL is used for classification only, and the result of classification is match or not match. Access-groups identified in a class-map are applied in order of appearance in the class-map declaration (regardless of ACL number). ACLs in an access-group are applied in order of ACL number.

Access-groups may only be specified in ingress class maps.

The clauses in an access-list referenced in a class-map are used solely to match (or not match) traffic. Action (set/drop/mirror/rate-limit) clauses in ACLs referenced by a policy are ignored for the purposes of policy application.

The permit and deny clauses have a different meaning than that used in a standard ACL.

If a packet matches a permit ACL clause specified in a class-map, the packet matches, no further matching is performed, and the class-map clause is matched.

If a packet matches a deny ACL class specified in a class-map, the packet does not match, no further matching is performed, and the class-map clause is not matched.

No counters are instantiated for ACLs referenced in a class map.

Command History

Command introduced in version 6.5 firmware.

Example

The following example configures an access list arp-list with a policy that implements a simple policer for ARP packets coming from any of the hosts listed in the access list. The policer operates on the aggregate bandwidth of the matched packet streams.

```
console(config)#mac access-list extended arp-list
console(config-mac-access-list)#permit 00:01:02:03:04:05 0000.0000.0000 any 
0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:07 0000.0000.0000 any 
0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:08 0000.0000.0000 any 
0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:01 0000.0000.0000 any 
0x0806
console(config-mac-access-list)#exit
console(config)#class-map match-any class-arp
console(config-classmap)#match protocol none
console(config-classmap)#match access-group arp-list
console(config-classmap)#exit
console(config)#policy-map arp-limiter in
console(config-policy-map)#class class-arp
console(config-policy-classmap)#police-simple 1000 16 conform-action 
transmit violate-action drop
console(config-policy-classmap)#exit
console(config-policy-map)#exit
```

The above policy must be configured on one or more interfaces to be enabled.

match class-map

Use the **match class-map** command to add to the specified class definition the set of match conditions defined for another class. Use the **no** form of this command to remove from the specified class definition the set of match conditions defined for another class.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match class-map *refclassname*

no match class-map *refclassname*

- *refclassname* — The name of an existing DiffServ class whose match conditions are being referenced by the specified class definition.

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

- The parameters *refclassname* and *class-map-name* can not be the same.
- Only one other class may be referenced by a class.
- Class maps may be chained, for example, a class-map may reference another class map, which references a third class map, et. seq.
- Any attempts to delete the *refclassname* class while the class is still referenced by any *class-map-name* fails.
- The combined match criteria of *class-map-name* and *refclassname* must be an allowed combination based on the class type.
- Any subsequent changes to the *refclassname* class match criteria must maintain this validity, or the change attempt fails.

- The total number of class rules formed by the complete reference class chain (including both predecessor and successor classes) must not exceed a platform-specific maximum. In some cases, each removal of a refclass rule reduces the maximum number of available rules in the class definition by one.

Example

The following example adds match conditions defined for the Dell class to the class currently being configured.

```
console(config-classmap)#match class-map Dell
```

The following example deletes the match conditions defined for the Dell class from the class currently being configured.

```
console(config-classmap)#no match class-map Dell
```

match cos

Use the **match cos** command in Class-Map Configuration mode to add a match condition for the class of service value (the only tag in a single-tagged packet or the first or outer 802.1Q tag of a double-VLAN tagged packet).

NOTE: This command is not available on the N1500 Series switches.

Syntax

match cos

- cos-value — Specifies the CoS value as an integer (Range: 0–7)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays adding a match condition to the specified class.

```
console(config-classmap)#match cos 1
```

match destination-address mac

Use the **match destination-address mac** command in Class-Map Configuration mode to add a match condition based on the destination MAC address of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match destination-address mac *macaddr macmask*

- *macaddr* — Specifies any valid layer 2 MAC address formatted as six two-digit hexadecimal numbers separated by colons.
- *macmask* — Specifies a valid layer 2 MAC address bit mask formatted as six two-digit hexadecimal numbers separated by colons. This address bit mask does not need to be contiguous.

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures a match condition for the specified MAC address and bit mask.

```
console(config-classmap)#match destination-address mac AA:ED:DB:21:11:06
FF:FF:FF:EF:EE:EE
```

match any

Use the **match any** command in Class-Map Configuration mode to allow matching on any of the specified match conditions. Use the **no** form of the command to remove the ACL match criteria and revert to match-all behavior.

Syntax

match any

no match any

Default Configuration

The default matching for a class map is to match on all specified match conditions.

Command Mode

Class-Map Configuration mode

User Guidelines

The clauses in an access-list referenced in a class-map are used solely to match (or not match) traffic. Access-groups identified in a class-map are matched in order of appearance in the class-map declaration (regardless of ACL number). ACLs in an access-group are matched in order of ACL number.

Unlike the match all condition, when a class-map contains the match any condition, the first match for a permit or deny immediately exits the matching activity for the class-map. Conceptually, the permit/deny clauses in the access group are applied sequentially.

In the match all scenario, the permit/deny clauses in the access group are applied in parallel, and all conditions must match for the matching activity to exit. For this reason, it is not advised to mix permit and deny clauses within an access-group used in a match all class map.

Command History

Command introduced in version 6.5 firmware.

Example

The following example configures a MAC access list arp-list with a policy that implements a simple policer for ARP packets coming from any of the hosts listed in the access list. Apply the policy to an interface using the **service-policy in** command in Interface Configuration mode.

```
console(config)#mac access-list extended arp-list
console(config-mac-access-list)#permit 00:01:02:03:04:05 0000.0000.0000 any 0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:07 0000.0000.0000 any 0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:08 0000.0000.0000 any 0x0806
console(config-mac-access-list)#permit 00:03:04:05:06:01 0000.0000.0000 any 0x0806
console(config-mac-access-list)#exit
console(config)#class-map match-any class-arp
console(config-classmap)#match protocol none
console(config-classmap)#match access-group name arp-list
console(config-classmap)#exit
console(config)#policy-map arp-limiter in
console(config-policy-map)#class class-arp
console(config-policy-classmap)#police-simple 1000 16 conform-action
transmit violate-action drop
console(config-policy-classmap)#exit
console(config-policy-map)#exit
```

match dstip

Use the **match dstip** command in Class-Map Configuration mode to add a match condition based on the destination IP address of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match dstip *ipaddr ipmask*

- *ipaddr* — Specifies a valid IP address.
- *ipmask* — Specifies a valid IP address bit mask. Note that even though this parameter is similar to a standard subnet mask, it does not need to be contiguous.

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays adding a match condition using the specified IP address and bit mask.

```
console(config-classmap)#match dstip 10.240.1.1 255.255.255.1
```

match dstip6

The **match dstip6** command adds a match condition based on the destination IPv6 address of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match dstip6 *destination-ipv6-prefix/prefix-length*

- *destination-ipv6-prefix*—IPv6 prefix in IPv6 global address format.
- *prefix-length*—IPv6 prefix length value.

Default Configuration

There is no default configuration for this command.

Command Mode

Ipv6-Class-Map Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-classmap)#match dstip6 2001:DB8::0/32
```

match dstl4port

Use the **match dstl4port** command in Class-Map Configuration mode to add a match condition based on the destination layer 4 port of a packet using a single keyword or a numeric notation.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match dstl4port {*portkey* | *port-number*}

- *portkey* — Specifies one of the supported port name keywords. A match condition is specified by one layer 4 port number. The currently supported values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, and www.
- *port-number* — Specifies a layer 4 port number (Range: 0–65535).

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays adding a match condition based on the destination layer 4 port of a packet using the “echo” port name keyword.

```
console(config-classmap)#match dstl4port echo
```

match ethertype

Use the **match ethertype** command in Class-Map Configuration mode to add a match condition based on the value of the ethertype.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match ethertype {**keyword** | *0x0600-0xffff*}

- **keyword** — Specifies either a valid keyword or a valid hexadecimal number. The supported keywords are **appletalk**, **arp, ibmsna**, **ipv4, ipv6**, **ipx**, **mplsmcast**, **mplsucast**, **netbios**, **novell**, **pppoe**, **rarp**. (Range: 0x0600–0xFFFF)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to add a match condition based on ethertype.

```
console(config-classmap)#match ethertype arp
```

match ip6flowlbl

The **match ip6flowlbl** command adds to the specified class definition a match condition based on the IPv6 flow label of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match ip6flowlbl *label*

- *label* - The value to match in the Flow Label field of the IPv6 header (Range 0-1048575).

Default Configuration

There is no default configuration for this command.

Command Mode

Ipv6-Class-Map Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example adds a rule to match packets whose IPv6 Flow Label equals 32312.

```
console(config-classmap)#match ip6flowlbl 32312
```

match ip dscp

Use the **match ip dscp** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the value of the IP DiffServ Code Point (DSCP) field in a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match ip dscp *dscpval*

- *dscpval* — Specifies an integer value or a keyword value for the DSCP field. (Integer Range: 0–63) (Keyword Values: *af11*, *af12*, *af13*, *af21*, *af22*, *af23*, *af31*, *af32*, *af33*, *af41*, *af42*, *af43*, *be*, *cs0*, *cs1*, *cs2*, *cs3*, *cs4*, *cs5*, *cs6*, *cs7*, *ef*)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This DSCP field is defined as the high-order six bits of the Service type octet in the IP header. The low-order two bits are not checked.

The **ip dscp**, **ip precedence**, and **ip tos** match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header but with a slightly different user notation.

To specify a match on all DSCP values, use the **match ip tos** *tosbits tosmask* command with tosbits set to “0” (zero) and tosmask set to hex “03.”

Example

The following example displays how to add a match condition based on the DSCP field.

```
console(config-classmap)# match ip dscp 3
```

match ip precedence

Use the **match ip precedence** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the value of the IP precedence field.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match ip precedence *precedence*

- *precedence* — Specifies the precedence field in a packet. This field is the high-order three bits of the Service Type octet in the IP header. (Integer Range: 0–7)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

The **ip dscp**, **ip precedence**, and **ip tos** match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header but with a slightly different user notation.

To specify a match on all precedence values, use the **match ip tos** *tosbits tosmask* command with tosbits set to “0” (zero) and tosmask set to hex “1F.”

Example

The following example displays adding a match condition based on the value of the IP precedence field.

```
console(config-classmap)#match ip precedence 1
```

match ip tos

Use the **match ip tos** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the value of the IP TOS field in a packet. This field is defined as all eight bits of the Service Type octet in the IP header.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match ip tos *tosbits tosmask*

- *tosbits* — Specifies a two-digit hexadecimal number. (Range: 00–ff)
- *tosmask* — Specifies the bit positions in the tosbits parameter that are used for comparison against the IP TOS field in a packet. This value of this parameter is expressed as a two-digit hexadecimal number. (Range: 00–ff)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

The **ip dscp**, **ip precedence**, and **ip tos** match conditions are alternative ways to specify a match criterion for the same Service Type field in the IP header but with a slightly different user notation.

This specification is the *free form* version of the IP DSCP/Precedence/TOS match specification in that you have complete control of specifying which bits of the IP Service Type field are checked.

Example

The following example displays adding a match condition based on the value of the IP TOS field in a packet.

```
console(config-classmap)#match ip tos AA EF
```

match protocol

Use the **match protocol** command in Class-Map Configuration mode to match packets using the EtherType field in the Ethernet frame header. For certain protocols, an additional match condition for the IP protocol number is performed.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match protocol {icmp|igmp|ip|ipv6|tcp|udp|gre|icmpv6 |<identifier>|none }

Ethertype only matches:

- ip—Match IPv4 protocol packets (Ethertype 0x0800)
- ipv6—Match IPv6 protocol packets (Ethertype 0x86dd)
- <identifier>—A numerical value (0x0-255) identifying an IPv4 orIPv6 protocol.

Ethertype and Protocol matches:

- none—Remove the default or configured Ethertype/Protocol match criteria. Configure a MAC access-group match.
- icmp—Match ICMP protocol packets (Ethertype 0x0800 and IPv4 protocol 1).

- igmp—Match IGMP protocol packets (Ethertype 0x0800 and IPv4 protocol 2).
- tcp—Match TCP packets (Ethertype 0x0800 and IPv4 protocol 6 or Ethertype 0x86dd and IPv6 Next Header 6
- udp—Match UDP packets (Ethertype 0x0800 and IPv4 protocol 17 or Ethertype 0x86dd and IPv6 Next Header 17)
- gre—Match GRE protocol packets (Ethertype 0x0800 and IPv4 protocol 47 or Ethertype 0x86dd and IPv6 Next Header 47)
- icmpv6—Match IPv6 ICMP packets (Ethertype 0x86dd and IPv6 Next Header 58)

Default Configuration

The default is match protocol ip (Ethertype 0x0800).

Command Mode

Class-Map Configuration mode

User Guidelines

Use the **match protocol none** command to remove any match condition for Ethertype or Protocol number. Only one Ethertype match protocol statement can appear in a class-map. Entering a match protocol statement overrides any prior protocol match.

Prior to entering a **match access-group** command other than type IPv4 in class-map configuration mode, it is necessary to enter the corresponding **match protocol** command. For example, to match an IPv6 access-group, issue the **match protocol ipv6** command first. Use **match protocol none** to match a MAC access-group. Only a single **match protocol** command may be issued.

If an ACL is referenced in the class-map, it must be of the same type as the configured Ethertype.

If the **match ethertype** command is configured, **match protocol** may not be configured, and vice versa.

Command History

Command introduced in version 6.5 firmware

Example

The following example displays adding a match condition based on the "ip" protocol name keyword.

```
console(config-classmap)#match protocol ip
```

match source-address mac

Use the **match source-address mac** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the source MAC address of the packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match source-address mac *address macmask*

- *macaddr* — Specifies any valid layer 2 MAC address formatted as six two-digit hexadecimal numbers separated by colons.
- *macmask* — Specifies a layer 2 MAC address bit mask formatted as six two-digit hexadecimal numbers separated by colons. This bit mask does not need to be contiguous.

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example adds to the specified class definition a match condition based on the source MAC address of the packet.

```
console(config-classmap)# match source-address mac 10:10:10:10:10:10
11:11:11:11:11:11
```

match srcip

Use the **match srcip** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the source IP address of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match srcip *ipaddr ipmask*

- *ipaddr* — Specifies a valid IP address.
- *ipmask* — Specifies a valid IP address bit mask. Note that although this IP address bit mask is similar to a subnet mask, it does not need to be contiguous.

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

Only one srcip matching criteria can be specified. To remove the matching criteria, delete the class map.

Example

The following example displays adding a match condition for the specified IP address and address bit mask.

```
console(config-classmap)#match srcip 10.240.1.1 10.240.0.0
```

match srcip6

The **match srcip6** command adds to the specified class definition a match condition based on the source IPv6 address of a packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match srcip6 *source-ipv6-prefix/prefix-length*

- *source-ipv6-prefix*—IPv6 prefix in IPv6 global address format.
- *prefix-length*—IPv6 prefix length value.

Default Configuration

There is no default configuration for this command.

Command Mode

Ipv6-Class-Map Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-classmap)#match srcip6 2001:DB8::0/32
```

match srcl4port

Use the **match srcl4port** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the source layer 4 port of a packet using a single keyword or a numeric notation.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match srcl4port {*portkey* | *port-number*}

- *portkey* — Specifies one of the supported port name keywords. A match condition is specified by one layer 4 port number. The currently supported values are: domain, echo, ftp, ftpdata, http, smtp, snmp, telnet, tftp, and www.
- *port-number* — Specifies a layer 4 port number (Range: 0–65535).

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

Only one srcl4port matching criteria can be specified. To remove the matching criteria, delete the class map.

Example

The following example displays how to add a match condition using the "snmp" port name keyword.

```
console(config-classmap)#match srcl4port snmp
```

match vlan

Use the **match vlan** command in Class-Map Configuration mode to add to the specified class definition a match condition based on the value of the layer 2 VLAN Identifier field. This field is the only tag in a single tagged packet or the first or outer tag of a double VLAN packet.

NOTE: This command is not available on the N1500 Series switches.

Syntax

match vlan *vlan-id*

- *vlan-id* — Specifies a VLAN ID as an integer. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Class-Map Configuration mode

User Guidelines

Only a single VLAN can be specified for each class map. To remove the matching criteria, delete the class map.

Example

The following example displays adding a match condition for the VLAN ID "2."

```
console(config-classmap)#match vlan 2
```

mirror

Use the **mirror** command in Policy-Class-Map Configuration mode to mirror all the data that matches the class defined to the destination port specified.

NOTE: This command is not available on the N1500 Series switches.

Syntax

mirror *interface*

- *interface* — Specifies the Ethernet port to which data needs to be copied.

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

The port identified in this command is identical to the destination port of the **monitor** command.

Example

The following example displays how to copy all the data to port Gi1/0/5.

```
console(config-policy-classmap)#mirror gi1/0/5
```

police-simple

Use the **police-simple** command in Policy-Class-Map Configuration mode to applying a policing meter for the specified class.

NOTE: This command is not available on the N1500 Series switches.

Syntax

police-simple {{*rate-kbps* | *rate-percent*} *burstsize* **conform-action** {**drop** | **set-prec-transmit** *cos* | **set-dscp-transmit** *dscpval* | **transmit**} [**violate-action** {**drop** | **set-cos transmit** *cos* | **set-prec-transmit** *cos* | **set-dscp-transmit** *dscpval* | **transmit**}]}

- *rate-kbps* — Data rate in kilobits per second (Kbps). (Range: 1 to 4294967295)
- *rate-percent* — Data rate expressed as percentage of the supported maximum rate on the link (Range: 1 to 100).
- *burstsize* — Burst size in Kbytes (Range: 1 to 128)
- **conform action** — Configures the action taken for packets that do not exceed the data rate or the burst size:
  - **drop**: Drop the packet.
  - **sec-prec-transmit ip-prec**: Remark the IP precedence in the packet to ip-prec and transmit. (Range 0 to 7)
  - **set-dscp-transmit dscp-val**: Remark the DSCP in the packet to dscp-val and transmit. (Range 0 to 63)
  - **set-cos-transmit 802.1p-priority**: Remark the 802.1p priority in the packet to 802.1p-priority and transmit. (Range 0 to 7)
  - **transmit**: Transmit the packet unmodified.

  The same actions are available for packets that violate the policing rule.

  - **violate- action** — Configures the action taken for packets that exceed the data rate or burst size.
- *cos* — Class of Service value. (Range: 0 to 7)
- dscpval — DSCP value. (Range: 0 to 63 or a keyword from this list: **af11**, **af12**, **af13**, **af21**, **af22**, **af23**, **af31**, **af32**, **af33**, **af41**, **af42**, **af43**, **be**, **cs0**, **cs1**, **cs2**, **cs3**, **cs4**, **cs5**, **cs6**, **cs7**, **ef**)

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

The simple form of the police command uses a single data rate and burst size, resulting in two outcomes: conform and violate. Conforming packets are colored green and non-conforming packets are colored red for use by the WRED mechanism. Only one style of police command (simple, single-rate or two-rate) is allowed for a given class instance in a particular policy. The conform-color command can be used to pre-color packets prior to policing. Packets pre-colored red are not re-colored by the policer.

Data rate expressed as rate-percent self-adjusts to the speed the links comes up. For example, if the rate-percent is configured as 10%, the rate is 100 megabits per second (Mb/s) if the link comes up with 1G speed and its 1000 Mb/s if the link negotiates and comes up with 10G speed.

Example

The following example configures a single rate ingress meter with packets received at a rate below 1000 kilobits per second (Kb/s) and 4096 byte burst size are transmitted and packets above that rate are dropped. The transmitted packets are colored green should the operator desire to configure a WRED drop policy.

```
console(config-policy-classmap)#police-simple 1000 64 conform-action
transmit violate-action drop
```

Command History

Command syntax updated in version 6.7.0 firmware.

police-single-rate

Use the **police-single-rate** command to implement a single-rate Three Color Market (srTCM) per RFC 2697.

NOTE: This command is not available on the N1500 Series switches.

Syntax

police-single-rate {*rate-kbps* | *rate-percent*} *burstsize excess-burstsize* **conform-action** *action* **exceed-action** *action* **violate-action** *action*

- *rate-kbps* — Data rate in kilobits per second (Kbps). (Range: 1 to 4294967295)

- *rate-percent* — Data rate expressed as percentage of the supported maximum rate on the link (Range: 1 to 100).
- *burstsize*—Burst size in kilobits per seconds (Kbps). (Range 1-128)
- *excess-burstsize*—Excess burst size in kilobits per seconds (Kbps). (Range 1-128)
- *action*—The action to take according to the color. Select one:
  - **drop**: Drop the packet.
  - **set-prec-transmit** *ip-prec*: Remark the IP precedence in the packet to *ip-prec* and transmit. (Range 0-7)
  - **set-dscp-transmit** *dscp-val*: Remark the DSCP in the packet to *dscp-val* and transmit. (Range 0-63)
  - **set-cos-transmit** *802.1p-priority*: Remark the 802.1p priority in the packet to *802.1p-priority* and transmit. (Range 0-7)
  - **transmit**: Transmit the packet unmodified.

Default Configuration

There no default configuration for this command.

Command Modes

Policy-Class-Map Configuration mode

User Guidelines

An srTCM meters a traffic stream and colors packets according to three parameters: Committed Information Rate (CIR), Committed Burst Size (CBS), and Peak Burst Size (PBS). A packet is colored red if it exceeds the CBS and the PBS, yellow if it exceeds the CBS, but not the PBS, and green if it exceeds neither. An srTCM is useful in situations where only the length of the burst, but not the peak rate, determines the service assignment.

The CIR is measured in Kbps, the CBS in Kbytes, and the PBS in Kbytes. It is recommended that the CBS and PBS be configured to be larger than the largest expected IP packet. A **class** command in policy-map mode must be issued for an existing class-map before entering this command.

Data rate expressed as rate-percent self-adjusts to the speed the links comes up. For example, if the rate-percent is configured as 10%, the rate is 100 Mb/s if the link comes up with 1G speed and its 1000 Mb/s if the link negotiates and comes up with 10G speed.

Example

```
console(config-policy-classmap)#police-single-rate 100000000 32 64 conform-
action set-cos-transmit 7 exceed-action set-prec-transmit 7 violate-action
drop
```

Command History

Command syntax updated in version 6.7.0 firmware.

police-two-rate

Use the **police-two-rate** command to implement a two-rate Three Color Market (trTCM) per RFC 2698.

NOTE: This command is not available on the N1500 Series switches.

Syntax

police-two-rate {*rate-kbps* | *rate-percent*} *burstsize peak-data-rate excess-burstsize* **conform-action** *action* **exceed-action** *action* **violate-action** *action*

- *rate-kbps* — Data rate in kilobits per second (Kbps). (Range: 1 to 4294967295)
- *rate-percent* — Data rate expressed as percentage of the supported maximum rate on the link (Range: 1 to 100).
- *burstsize* — Burst size in Kbytes (Range: 1–128)
- ***peak-data-rate***— Peak data rate in kilobits per second (Kbps). (Range 1-4294967295)
- *excess-burstsize* — Excess burst size in kilobits per seconds (Kbps). (Range 1-128)
- *action*— The action to take according to the color. Select one of:
  - drop— Drop the packet.
  - **set-prec-transmit** *ip-prec*— Remark the IP precedence in the packet to *ip-prec* and transmit. (Range 0-7)

– **set-dscp-transmit** *dscp-val*— Remark the DSCP in the packet to *dscp-val* and transmit. (Range 0-63)
– **set-cos-transmit** 802.1*p-priority*— Remark the 802.1p priority in the packet to *802.1p-priority* and transmit. (Range 0-7)
– transmit— Transmit the packet unmodified.

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

A trTCM meters a traffic stream and colors packets according to four parameters:

Committed Information Rate (CIR)

Committed Burst Size (CBS)

Peak Information Rate (PIR)

Peak Burst Size (PBS)

A packet is colored red if it exceeds the PIR, yellow if it exceeds the CIR, but not the PIR, and green if it does not exceed either. A trTCM is useful when a peak rate needs to be enforced separately from a committed rate.

The CIR and PIR are measured in Kbps (not pps as indicated in the RFC), the CBS in Kbytes, and the PBS in Kbytes. It is recommended that the CBS and PBS be configured to be larger than the largest expected IP packet. A class command in policy-map mode must be issued for an existing class-map before entering this command.

Data rate expressed as rate-percent self-adjusts to the speed the links comes up. For example, if the rate-percent is configured as 10%, the rate is 100 Mb/s if the link comes up with 1G speed and its 1000 Mb/s if the link negotiates and comes up with 10G speed.

Example

```
console#show authentication clients Te1/0/23
```

```
Interface....................................... Te1/0/23
Mac Address..................................... 00:1B:21:96:10:2E
User Name....................................... testUser
VLAN Assigned Reason............................ RADIUS Assigned VLAN (100)
Host Mode....................................... multi-domain-multi-host
Method.......................................... 802.1X
Control Mode.................................... auto
Session time.................................... 95
Session timeout ................................ 0
Session Termination Action...................... Default
Filter ID.......................................
RADIUS Framed IPv4/IPv6 address.................
DACL............................................
Redirect ACL....................................
Redirect URL....................................
Acct SessionId.................................. testUser:1700000003
Linksec policy.................................. must-secure
```

Command History

Command syntax, and command output, updated in version 6.7.0 firmware.

policy-map

Use the **policy-map** command in Global Configuration mode to establish a new DiffServ policy or to enter policy map configuration mode. To remove the policy, use the **no** form of this command.

NOTE: This command is not available on the N1500 Series switches.

Syntax

policy-map *policyname* [**in**|**out**]

no policy-map *policyname*

- *policyname*— Specifies the DiffServ policy name as a unique case-sensitive alphanumeric string of characters. (Range: 1–31 alphanumeric characters.)
- **in**—The policy is applied on ingress. Must be specified to create new DiffServ policies. An existing policy can be selected without specifying “in” or “out”.

- **out**—The policy is applied on egress. Either “in” or “out” must be specified to create a new DiffServ policy. An existing policy may be selected without the “in” or “out” parameter.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The CLI mode is changed to Policy-Class-Map Configuration when this command is successfully executed.

The policy type dictates which of the individual policy attribute commands are valid within the policy definition.

Example

The following example shows how to establish a new ingress DiffServ policy named “DELL.”

```
console(config)#policy-map DELL in
console(config-policy-classmap)#
```

random-detect queue-parms

Use the random-detect queue-parms command to configure the WRED green, yellow, and red TCP and non-TCP packet minimum and maximum drop thresholds and corresponding drop probabilities on an interface or globally.

NOTE: On the N1500 Series switches, enable Simple RED since the hardware is not capable of Weighted Red.

Syntax

random-detect queue-parms *queue-id* [**queue-id**] ... **min-thresh** *minthresh-green minthresh-yellow minthresh-red minthresh-nontcp* **max-thresh** *max-thresh-green max-thresh-yellow max-thresh-red maxthresh-nontcp* **drop-prob-scale** *drop-scale-green drop-scale-yellow drop-scale-red drop-scale-nontcp* [**ecn**]

no random-detect queue-parms *queue-id* [**queue-id**] ...

- *queue-id*—The internal class of service queue (range 0-6). The queue-id is not the same as the CoS value received in incoming packets. Use the **show classofservice dot1p-mapping** command to display the CoS value to internal CoS queue mapping.
- *min-thresh*—The minimum threshold at which to begin dropping, based on the configured maximum drop probability for each color and for non-TCP packets. Range 0 to 250. At or below the minimum threshold, no packets are dropped. The range between the minimum and maximum thresholds is divided equally into eight increasing levels of drop probability.
- *max-thresh*—The maximum threshold to end dropping at the configured maximum drop probability for each color and for non-TCP packets. Range 0 to 250. Above the maximum threshold, 100% of matching packets are dropped.
- *drop-prob-scale*—The maximum drop probability. Range 0-100. This is the drop probability for a packet when the maximum threshold is reached. Above the maximum threshold, 100% of matching packets are dropped.
- **ecn**—Enables ECN marking for the selected CoS queues. Packets marked as ECN capable are not dropped when selected for discard by WRED.

NOTE: The ecn parameter is not supported on the N1500 series switch.

Default Configuration

The table below shows the default green, yellow, and red TCP and non-TCP minimum/maximum drop thresholds and the green, yellow and red TCP and non-TCP drop probabilities. The thresholds for each color and CoS queue are configured independently and may overlap. By default, WRED is not enabled for any CoS queue and ECN is not enabled for any CoS queue.

Queue ID	WRED Minimum Threshold	WRED Maximum Threshold	WRED Drop Probability Scale	ECN Enabled
0	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
1	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
2	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
3	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
4	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
5	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No
6	40/30/20/100	100/ 90/ 80/100	10/ 10/ 10/ 10	No

Command Mode

Global Configuration mode, Interface Configuration mode (Ethernet and port-channel), Interface Range mode

User Guidelines

Interface configuration overrides the global configuration.

WRED Processing

WRED is intended to provide feedback to protocols (e.g. TCP) that depend on packet loss to adjust their transmission rate. WRED drop behavior only occurs when an interface is congested within the ranges specified. If congestion exceeds the upper limit, queued packets will be dropped at the rate of traffic ingressing the system, e.g. 100%. If the congestion is less than the lower limit, no packets will be dropped.

Traffic ingressing the switch can be assigned to one of four drop precedences based on a set of matching criteria. There are 3 drop precedences for TCP traffic (green, yellow, and red) and one drop precedence for non-TCP traffic (all colors). Users may configure the congestion thresholds at which packets experiencing congestion are dropped randomly for each drop precedence and may also configure the probability of a packet being dropped.

Packets are dropped at 100% when the egress queue size exceeds the maximum value and at 0% when the queue size is below the minimum value.

Configuring a queue with a drop probability of 0% effectively applies tail-drop behavior when the queue length exceeds the maximum threshold.

If the max-thresh parameter is less than the corresponding min-thresh parameter, it is adjusted to be the min-thresh plus one.

For a given network, the minimum and maximum WRED thresholds should be calculated to give a reasonable amount of buffering to TCP flows given the switch buffer capacity. WRED thresholds are applied individually to each physical interface. For the Dell EMC NetworkingN2000/N3000-ON Series switches, a threshold of 100% corresponds to a buffer occupancy of 295428 bytes queued for transmission on an interface.

Use the **classofservice dot1p-mapping** command or the **classofservice ip-dscp-mapping** command in conjunction with the **classofservice trust** command to assign packets to a CoS queue based upon values contained within the packet.

WRED Drop Probabilities:

Between the minimum and maximum thresholds, the drop probability is divided into eight discrete levels of increasing probability of packet drop. The levels are as follows:

0 - 6.25% of maximum drop probability

1 - 18.75% of maximum drop probability

2 - 30.25% of maximum drop probability

3 - 43.75% of maximum drop probability

4 - 56.25% of maximum drop probability

5 - 68.75% of maximum drop probability

6 - 81.25% of maximum drop probability

7 - 92.75% of maximum drop probability

As an example, with a drop probability of 50%, a minimum threshold of 10% and a maximum threshold of 90%, the drop probability from 10% to 20% congestion is 3.125%, from 21% to 30% congestion is 9.375%, ...

The drop probability scale supports values in the range 0-10% and the discrete values 25%, 50%, 75%, and 100%. Other values are silently truncated to the next lower value by the hardware.

Explicit Congestion Notification (ECN):

ECN capability is an end-to-end feedback mechanism. Both ends of the TCP connection must participate. When ECN is enabled, packets marked as ECN capable and selected for discard by WRED are marked CE and are not dropped. In cases of extreme congestion, ECN capable packets may be dropped.

Use the **show interfaces traffic** command to see color aware drops and congestion levels.

ECN capability can be enabled in Windows Server 2008 and later releases using the following command:

```
netsh interface tcp set global ecncapability=enabled
```

N1500 Series Switches

N1500 Series switches only support a simple RED capability. The N1500 Series switch does not support configuration of the maximum threshold nor can the threshold or drop probability be configured for non-TCP traffic.

Dell EMC Networking N1500 Series switches implements a simple Random Early Discard (RED) capability. Only the minimum threshold (min-thresh) and drop probability (drop-prob-scale) may be configured for the TCP colors green/yellow/red. The maximum threshold may not be configured nor can the threshold or drop probability be configured for non-TCP traffic. ECN capability is not supported.

Simple RED may be enabled/disabled for any CoS queue on the Dell EMC Networking N1500 Series switches, however, the drop probability must be one of the values given below. The percentage before the dash indicates the actual drop probability. The number after the dash indicates the value entered in the drop-prob-scale parameter.

0.097%: 1

0.195%: 2

0.391%: 4

0.781%: 8

1.563%: 16

3.125%: 31

6.250%: 63

100%: 100

Examples

This example configures simple RED on an N1500 series switch. CoS queue 1 is globally configured for simple RED with a congestion threshold of 50% and a drop probability of 0.781% for green colored traffic.

```
console(config)# random-detect queue-parms 1 min-thresh 50 0 0 drop-prob-
scale  8 0 0
console(config)#cos-queue random-detect 1
```

random-detect exponential-weighting-constant

Use the random-detect exponential-weighting-constant command to configure the decay in the calculation of the average queue size user for WRED on an interface or all interfaces.

NOTE: This command is not available on the N1500 Series switches.

Syntax

random-detect exponential-weighting-constant *0-15*

no random-detect exponential-weighting-constant

- *0–15* — The weighting constant is used to smooth the calculation of the queue size using the following formula where the 0-15 value is N.

Default Configuration

The default value is 15. This value corresponds to maximum smoothing of the average queue size.

Command Mode

Global Configuration mode, Interface Configuration mode (Ethernet and port-channel), Interface Range mode

User Guidelines

The exponential weighting constant configuration is global and applies to all WRED colors and all CoS queues. To use the instantaneous queue size in the calculation of WRED drops, set the weighting constant to 0. Larger values of N reduce the effect of instantaneous changes. To update the current queue size to ½ the difference between the previous size and the current instantaneous queue size, set the weighting constant to 1. To update the current queue size to 1/4 the difference between the previous size and the current instantaneous queue size, set the weighting constant to 2, ...

The average queue size is calculated for each physical interface independently.

redirect

Use the **redirect** command in Policy-Class-Map Configuration mode to specify that all incoming packets for the associated traffic stream are redirected to a specific egress interface (physical port or port-channel).

NOTE: This command is not available on the N1500 Series switches.

Syntax

redirect *interface*

- *interface* — Specifies any valid interface. Interface is Ethernet port or port-channel (Range: po1-po32 or gi1/0/1-gi1/0/24)

Default Configuration

This command has no default configuration.

Command Mode

Policy-Class-Map Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example shows how to redirect incoming packets to port Gi1/0/1.

```
console(config-policy-classmap)#redirect gi1/0/1
```

service-policy

Use the **service-policy** command in either Global Configuration mode (for all system interfaces) or Interface Configuration mode (for a specific interface) to attach a policy to an interface. To return to the system default, use the **no** form of this command.

NOTE: This command is not available on the N1500 Series switches.

Syntax

service-policy {in|out} *policymapname*

no service-policy {in|out} *policymapname*

- *policymapname*—Specifies the DiffServ policy name as a unique case-sensitive alphanumeric string. (Range: 1–31 alphanumeric characters.)
- **in**—Apply the policy on ingress.
- **out**—Apply the policy on egress.

Default Configuration

No policies are applied by default.

Command Mode

Global Configuration mode (for all system interfaces)

Interface Configuration (Ethernet, Port-channel) mode (for a specific interface)

User Guidelines

This command applies a DiffServ policy to an interface and enables DiffServ on the interface. No separate interface administrative mode command for DiffServ is available. Use the policy-map command to configure the DiffServ policy. The service-policy direction must match the direction given for the policy map. DiffServ is enabled globally by default.

Ensure that no attributes within the policy definition exceed the capabilities of the interface. When a policy is attached to an interface successfully, any attempt to change the policy definition, such that it would result in a violation of the interface capabilities, causes the policy change attempt to fail. Applying a policy globally applies the policy to all physical interfaces. The policy appears in the running-config as part of the individual interface configuration.

Example

The following example shows how to attach a service policy named “DELL” to all interfaces for packets ingressing the switch.

```
console(config)#service-policy in DELL
```

show class-map

Use the **show class-map** command to display all configuration information for the specified class.

NOTE: This command is not available on the N1500 Series switches.

Syntax

show class-map [*classname*]

- *classname* — Specifies the valid name of an existing DiffServ class. (Range: 1–31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays all the configuration information for the class named “Dell”.

```
console#show class-map

                                  Class
```

```
          Class Name            Type  ACL Identifier or Reference Class Name
------------------------------- ----- ----------------------------------------
cee                             All   acl                             (IP )
ipv4                            All
stop_http_class                 Any

console#show class-map ipv4

Class Name..................................... ipv4
Class Type..................................... All
Match Rule Count............................... 1

      Match Criteria                         Values
---------------------------- --------------------------------------------
Source IP Address            2.2.2.2 (255.255.255.0)

console#show class-map stop_http_class

Class Name..................................... stop_http_class
Class Type..................................... Any
Match Rule Count............................... 2

      Match Criteria                         Values
---------------------------- --------------------------------------------
Source IP Address            2001:db8::/32
Source Layer 4 Port          80(http/www)
```

show classofservice dot1p-mapping

Use the **show classofservice dot1p-mapping** command to display the current IEEE 802.1p priority mapping to internal traffic classes for a specific interface.

Syntax

show classofservice dot1p-mapping [{**gigabitethernet** unit/slot/port **| port-channel** *port-channel-number* **| tengigabitethernet** unit/slot/port **| fortygigabitethernet** unit/slot/port}]

Default Configuration

By default, interfaces are configured to trust the IEEE 802.1p value in received packets and utilize the dot1p-mapping to assign packets to CoS queues.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If the interface is specified, the IEEE 802.1p mapping table of the interface is displayed. If omitted, the global configuration settings are displayed.

The following table lists the parameters in the example and gives a description of each.

Parameter	Description
User Priority	The 802.1p user priority value.
Traffic Class	The traffic class internal queue identifier to which the user priority value is mapped.

Example

The following example displays the default 802.1p traffic class mapping and user priorities.

```
console#show classofservice dot1p-mapping
 User Priority    Traffic Class
 -------------    ---------------
       0              1
       1              0
       2              0
       3              1
       4              2
       5              2
       6              3
       7              3
```

show classofservice ip-dscp-mapping

Use the **show classofservice ip-dscp-mapping** command to display the current IP DSCP mapping to internal traffic classes for a specific interface.

Syntax

show classofservice ip-dscp-mapping

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show classofservice ip-dscp-mapping

    IP DSCP       Traffic Class
 -------------    -------------
   0(be/cs0           1
   1                  1
   2                  1
   3                  1
   4                  1
   5                  1
   6                  1
   7                  1
   8(cs1)             0
   9                  0
   10(af11)           0
   11                 0
   12(af12)           0
   13                 0
   14(af13)           0
   15                 0
   16(cs2)            0
   17                 0
   18(af21)           0
   19                 0
   20(af22)           0
   21                 0
   22(af23)           0
   23                 0
   24(cs3)            1
   25                 1
   26(af31)           1
   27                 1
```

```
28(af32)            1
29                  1
30(af33)            1
31                  1
32(cs4)             2
33                  2
34(af41)            2
35                  2
36(af42)            2
37                  2
38(af43)            2
39                  2
40(cs5)             2
41                  2
42                  2
43                  2
44                  2
45                  2
46(ef)              2
47                  2
48(cs6)             3
49                  3
50                  3
51                  3
52                  3
53                  3
54                  3
55                  3
56(cs7)             3
57                  3
58                  3
59                  3
60                  3
61                  3
62                  3
63                  3
```

show classofservice trust

Use the **show classofservice trust** command to display the current trust mode setting for a specific interface.

Syntax

show classofservice trust [{**gigabitethernet** unit/slot/port| **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port / **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If the interface is specified, the port trust mode of the interface is displayed. If omitted, the port trust mode for global configuration is shown.

Example

The following example displays the current trust mode settings for the specified port.

```
console#show classofservice trust gigabitethernet 1/0/2
Class of Service Trust Mode: Dot1P
```

show diffserv

Use the **show diffserv** command to display the DiffServ general information, which includes the current administrative mode setting as well as the current and maximum number of DiffServ components.

NOTE: On the N1500 Series switches, enable Simple RED since the hardware is not capable of Weighted RED.

Syntax

show diffserv

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the DiffServ information.

```
console#show diffserv
DiffServ Admin mode......................... Enable
Class Table Size Current/Max................ 5 / 25
Class Rule Table Size Current/Max........... 6 / 150
Policy Table Size Current/Max............... 2 / 64
Policy Instance Table Size Current/Max...... 2 / 640
Policy Attribute Table Size Current/Max..... 2 / 1920
Service Table Size Current/Max.............. 26 / 214
```

show diffserv service interface

Use this command to display policy service information for the specified interface.

NOTE: This command is not available on the N1500 Series switches.

Syntax

show diffserv service interface {*interface-id*} {in|out}

- ***interface-id***—An Ethernet or port-channel identifier.
- **in**—Show ingress policies.
- **out**—Show egress policies.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show diffserv service interface gigabitethernet 1/0/1 in

DiffServ Admin Mode.......................... Enable
Interface.................................... Gi1/0/1
Direction.................................... In
No policy is attached to this interface in this direction.
```

show diffserv service brief

Use the **show diffserv service brief** command to display all interfaces in the system to which a DiffServ policy has been attached.

NOTE: This command is not available on the N1500 Series switches.

Syntax

show diffserv service brief

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows how to display all interfaces in the system to which a DiffServ policy has been attached.

```
console(config)#show diffserv service brief
DiffServ Admin Mode........................... Enable
 Interface   Direction  OperStatus         Policy Name
----------- ----------- ---------- -------------------------------
```

```
Po47          In            Down          DELL
Gi1/0/1       In            Down          DELL
Po48          In            Down          DELL
Gi1/0/2       In            Down          DELL
```

show interfaces cos-queue

Use the **show interfaces cos-queue** command to display the class-of-service queue configuration for the specified interface.

Syntax

show interfaces cos-queue [{**gigabitethernet** unit/slot/port **|** **port-channel** *port-channel-number* **|** **tengigabitethernet** unit/slot/port **|** **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If the interface is specified, the class-of-service queue configuration of the interface is displayed. If omitted, the most recent global configuration settings are displayed.

Examples

The following example displays the COS configuration with no unit/slot/port or port-channel parameter.

```
console#show interfaces cos-queue

Global Configuration
Interface Shaping Rate........................ 0

Queue Id    Min. Bandwidth    Scheduler Type    Queue Management Type
--------    --------------    --------------    --------------
0           0                 Weighted          Tail Drop
1           0                 Weighted          Tail Drop
```

```
2           0                 Weighted         Tail Drop
3           0                 Weighted         Tail Drop
4           0                 Weighted         Tail Drop
5           0                 Weighted         Tail Drop
6           0                 Weighted         Tail Drop
```

This example displays the COS configuration for the specified interface Gi1/0/1.

```
console#show interfaces cos-queue gigabitethernet 1/0/1
Interface...................................... Gi1/0/1
Interface Shaping Rate......................... 0

Queue Id    Min. Bandwidth    Scheduler Type    Queue Management Type
--------    --------------    --------------    --------------
0           0                 Weighted         Tail Drop
1           0                 Weighted         Tail Drop
2           0                 Weighted         Tail Drop
3           0                 Weighted         Tail Drop
4           0                 Weighted         Tail Drop
5           0                 Weighted         Tail Drop
6           0                 Weighted         Tail Drop
```

The following table lists the parameters in the examples and gives a description of each.

Parameter	**Description**
Interface	The port of the interface. If displaying the global configuration, this output line is replaced with a global configuration indication.
Intf Shaping Rate	The maximum transmission bandwidth limit for the interface as a whole. It is independent of any per-queue maximum bandwidth values in effect for the interface. This value is a configured value.
Queue Mgmt Type	The queue depth management technique used for all queues on this interface.
Queue	An interface supports *n* queues numbered 0 to (*n*-1).The specific *n* value is platform-dependent. Internal egress queue of the interface; queues 0–6 are available.

Parameter	Description
Minimum Bandwidth	The minimum transmission bandwidth guarantee for the queue, expressed as a percentage. A value of 0 means bandwidth is not guaranteed and the queue operates using best-effort scheduling. This value is a configured value.
Scheduler Type	Indicates whether this queue is scheduled for transmission using a strict priority or a weighted scheme. This value is a configured value.

show interfaces random-detect

Use the **show interfaces random-detect** command to display the global WRED policy or for an interface.

Syntax

show interfaces random-detect *interface-id*

- *interface-id*—Specify an optional interface type. Valid interfaces include physical ports and port channels.

Default Configuration

For the N1500, the default drop probability is 8 – 0.781% and the default minimum thresholds for Red/Yellow/Green colored packets are 40/30/20 percent respectively.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays the globally configured policy if no interface parameter is given. If an interface parameter is given, it displays the configured interface policy. The per CoS queue display for an interface displays the minimum and maximum thresholds, drop probability, and ECN capability per TCP packet color in the order: green, yellow, red, and non-TCP. Absent a metering policy (see police-simple, police-one-rate or police-two-rate commands), all packets are colored green. Use the show interfaces cos-queue command to show the global or per interface scheduler type and queue management types.

The N1500 Series switch does not support configuration of the maximum threshold nor can the threshold or drop probability be configured for non-TCP traffic.

Example

Example 1

This example shows ECN enabled for green color packets on CoS queues 0 and 1.

```
console#show interfaces random-detect

Global Configuration

                  WRED                    WRED                 WRED
Queue ID Minimum Threshold Maximum Threshold Drop Probability   ECN Enabled
-------- ----------------- ----------------- ----------------- -------------
0         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     1/  0/  0/  0
1         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     1/  0/  0/  0
2         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     0/  0/  0/  0
3         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     0/  0/  0/  0
4         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     0/  0/  0/  0
5         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     0/  0/  0/  0
6         40/ 30/ 20/100   100/ 90/ 80/100    10/ 10/ 10/ 10     0/  0/  0/  0
```

Example 2

This example show ECN enabled for green color packets on CoS queue 0 and on an N1500 Series switch:

```
console#show interfaces random-detect
Global Configuration
                 SRED                  SRED Drop
Queue ID Minimum Threshold Probability Scale ECN Enabled
-------- ----------------- ----------------- -------------
0        40/ 30/ 20          8/   8/   8        1/ 0/ 0
1        40/ 30/ 20          8/   8/   8        1/ 0/ 0
2        40/ 30/ 20          8/   8/   8        0/ 0/ 0
3        40/ 30/ 20          8/   8/   8        0/ 0/ 0
4        40/ 30/ 20          8/   8/   8        0/ 0/ 0
5        40/ 30/ 20          8/   8/   8        0/ 0/ 0
6        40/ 30/ 20          8/   8/   8        0/ 0/ 0
```

show interfaces traffic

Use the **show interfaces traffic** command to display traffic information.

Syntax

show interfaces traffic [*interface-id*]

interface-id—A valid Ethernet interface specifier. Port-channels are not allowed with this command as the queuing and drops occur on the individual interfaces and not on the port channel.

Default Configuration

The default is to show the global traffic class group configuration.

Command Mode

Privileged Exec mode

User Guidelines

The *interface-id* parameter is optional. The following information is displayed:

Field	Description
Congestion drops	Packets dropped due to congestion. This includes packets that exceeded an upper WRED threshold and packet dropped by WRED. ECN marked packets are not counted as dropped.
Tx Queue	The instantaneous number of cells queued for egress on the interface. Cells are 208 bytes.
Rx Queue	The instantaneous number of cells queued for ingress on the switch. Cells are 208 bytes. If a port is configured for PFC, cells are buffered on ingress. If not, cells are buffered on egress.
Color drops	The number of packets dropped due to WRED dropping of packets. Packets exceeding the upper WRED threshold are counted in the drops bucket. ECN marked packets are not counted as dropped.

Field	Description
WRED TX Queue	The instantaneous number of packets queued for transmission on the interface as smoothed by the exponential weighting function.

The above counters are cleared by the **clear counters** command. The queue sizes cannot be cleared as they are instantaneous. The N1100-ON Series switches do not support accounting for color drops. The color drop counters are fixed at 0 on those switches.

Example

This example shows Gi1/0/1 is suffering from congestion (Tx Queue high) and is dropping packets, either due to WRED drops or due to exceeding the internal buffer limits.

```
console#show interfaces traffic
 Intf     Congestion   Tx Queue Rx Queue     Color Drops  (Pkts)     Tx Queue
 Name    Drops (Pkts)  (Cells)   (Cells)     Yellow         Red        (Pkts)
------- ------------ -------- -------- ------------ ------------ --------
Gi1/0/1        18981      132        0            0            0       13
Gi1/0/2            0        0        0            0            0        0
Gi1/0/3            0        0        0            0            0        0
```

show interfaces utilization

Use this command to display interface utilization.

Syntax

show interfaces utilization [*interface-id*]

- *interface-id*—A Ethernet or port-channel interface identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays interface transmit and receive utilization in bits/sec and packets/sec. The transmit utilization and transmit packet counts include packets generated by the CPU.

Buffer utilization is the count of cells queued for transmission on a port. A buffer utilization value of less than 10 generally indicates that the port is not experiencing congestion and packets are transmitted as soon as they are queued for output. A value above 10 that increases and decreases indicates a port that is experiencing burstiness. A persistent value above 10 indicates a port that is experiencing congestion (incast); if the cell count continues to increase over time, the port begins discarding packets when reaching the tail drop threshold.

The value of 10 cells above corresponds to one and one-half maximum length packets queued for transmission. For the N1100-ON, N2000, N2100-ON, N2200-ON, N3000-ON, N3100-ON, and N3200-ON switches, the cell size is 208 bytes; for the N1500, the cell size is 128 bytes. If jumbo frames are enabled (MTU 9200), the expected size of a single maximum length packet is 45 cells (9200/208 = 44.2). Allowing for a frame and a half to be buffered on average, a value of 75 is perhaps more appropriate to consider as the indicator for determining if congestion exists on a port.

The clear counters command clears the underlying counters for transmit and receive utilization values, transmit and receive packets per second values, and the drops counter. The count of buffered packets is not a sampled counter and cannot be cleared.

This command displays the following interface transmit and receive utilization in bits/sec and packets/sec.

Field	Description
Port	The interface for which information is displayed.
Load Interval	The load interval for the interface.
Oper. Speed	The operational speed, which is the speed at which the interface is currently operating (e.g., 1M, 10M, 100M, 1G, 10G, 40G).

Field	Description
Rx Util	The receive utilization which is the link utilization in the receive direction as a percentage of operational speed (range 0-100). The utilization is derived by dividing the link speed by the number of bytes received averaged over the last sampling interval.
Tx Util	The transmit utilization. The link utilization in the transmit direction as a percentage of operational speed (range 0-100). The utilization is derived by dividing the link speed by the number of bytes received averaged over the last sampling interval.
Rx PPS	The received packets per second. This value is the average number of packets received over the last sampling interval.
Tx PPS	The transmitted packets per second. This value is the average number of packets transmitted over the last sampling interval.
Buffer Size	The number of bytes queued for egress on the interface. This value is calculated as the number of cells multiplied by the cell size (cell size is hardware specific) and is read directly from the hardware, i.e. this value is not sampled.
Drop Count	The number of packets queued for egress that are dropped for any reason. It is the same value as shown for “Transmit Packets Discarded” in the **show statistics** command.

Example

The following example shows a classical incast situation on interface Gi1/0/2 where the port is fully utilized or nearly fully utilized, buffering many frames (with increased latency) and beginning to drop frames as the internal thresholds for buffering on the port are reached. A conscientious network operator might want to examine why the devices attached to Gi1/0/5 and Gi1/0/6 are sending so much traffic to Gi1/0/2 attached devices and either re-distribute the devices, rate-limit traffic egressing the devices attached to Gi1/0/5 and Gi1/0/6, or increase the number of links available for the device attached to Gi1/0/2.

```
console#show interfaces utilization

Port      Load     Oper.  Rx    Tx    Rx      Tx       Buffer   Drop
          Interval Speed  Util  Util  PPS     PPS       Size    Count
--------- -------- ------ ----- ----- ------- -------- -------- ---------
Gi1/0/1   300      10M        1     0     296        0        0         0
Gi1/0/2   300      1G         0    99       0   674500   938098      1102
Gi1/0/3   300      1G         0    15       0   112428        7         0
Gi1/0/4   300      0          0     0       0        1        0         0
Gi1/0/5   300      1G        37     0  249565        1        0         1
Gi1/0/6   300      1G        88     1  593560        3        0         0
Gi1/0/7   300      0          0     0       0        0        0         0
Gi1/0/8   300      0          0     0       0        1        0         0
```

show policy-map

Use the **show policy-map** command to display all configuration information for the specified policy.

NOTE: This command is not available on the N1500 Series switches.

Syntax

show policy-map [*policyname*]

- *policyname* — Specifies the name of a valid existing DiffServ policy. (Range: 1-31)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the DiffServ information.

```
console#show policy-map
Policy Name  Policy Type  Class Members
-----------  -----------  -------------
POLY1        xxx           DellClass
DELL         xxx            DellClass
```

show policy-map interface

Use the **show policy-map interface** command to display policy-oriented statistics information for the specified interface.

NOTE: This command is not available on the N1500 Series switches.

Syntax

show policy-map interface {*interface-id*} {in|out}

- *interface-id*—An Ethernet or port-channel identifier.
- **in**—Show inbound service policies. The offered value indicates the number of packets received by the classifier.
- **out**—Show outbound service policies. The discarded value indicates the number of packets discarded by the policy.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the statistics information for port te1/0/1.

```
console#show policy-map interface te1/0/1 in
Interface..................................... Te1/0/1
Operational Status............................ Down
Policy Name................................... DELL
Interface Summary:
Class Name.................................... Dell EMC Networking
In Offered Packets............................ 1003
In Discarded Packets.......................... 11
```

show service-policy

Use the **show service-policy** command to display a summary of policy-oriented statistics information for all interfaces.

Syntax

show service-policy {in | out}

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays a summary of policy-oriented statistics information.

```
console#show service-policy in
       Oper           Policy
Intf   Stat            Name
------ ----- -------------------------------
Gi1/0/1   Down  DELL
Gi1/0/2   Down  DELL
```

```
Gi1/0/3   Down  DELL
Gi1/0/4   Down  DELL
Gi1/0/5   Down  DELL
Gi1/0/6   Down  DELL
Gi1/0/7   Down  DELL
Gi1/0/8   Down  DELL
Gi1/0/9   Down  DELL
Gi1/0/10   Down  DELL
```

traffic-shape

Use the **traffic-shape** command in Global Configuration mode and Interface Configuration mode to specify the maximum transmission bandwidth limit for the interface as a whole. To restore the default interface shaping rate value, use the **no** form of this command.

Syntax

traffic-shape *bw* **kbps**

no traffic-shape

- *bw* — Maximum transmission bandwidth value expressed in Kbps. (Range: 64 - 4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode, Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

Traffic shaping, also known as rate shaping, has the effect of smoothing temporary traffic bursts over time so that the transmitted traffic rate is bounded. This command implements a true egress shaper where bursts of traffic are buffered and smoothed. Shaping occurs if the average rate exceeds the configured limit or a burst exceeds 2% of the configured limit. Effectively, all CoS queues are configured with the configured rate limit in the scheduler.

Traffic shaping may cause congestion and packet loss if the aggregate ingress rate for an interface persistently exceeds the egress traffic shape rate.

Example

The following example rate limits interface gi1/0/1 to a maximum bandwidth of 1024 Kbps.

```
console(config-if-Gi1/0/1)#traffic-shape 1024 Kbps
```

vlan priority

Use the vlan priority command to assign a default VLAN priority tag for untagged frames ingressing an interface.

Syntax

vlan priority *cos-value*

- *cos-value* – A value ranging from 0-7.

Default Configuration

By default, untagged frames are processed with VLAN priority 0. The VLAN priority is mapped to a class of service value which determines the handling of the frame. Use the **show interfaces detail** command to display the configured priority. Use the **show classofservice dot1p-mapping** command to display the mapping of VLAN priorities to COS values.

Command Modes

Interface (physical) Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the default VLAN priority to 1 for untagged frames ingressing interface Te1/0/1.

```
console(config-if-Te1/0/1)#vlan priority 1
```

Spanning Tree Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The Multiple Spanning Tree Protocol (MSTP) component complies with IEEE 802.1 by efficiently segregating VLAN traffic over separate interfaces for multiple instances of Spanning Tree. IEEE 802.1D, Spanning Tree and IEEE w, Rapid Spanning Tree are supported through the IEEE 802.1s implementation. The difference between the RSTP and STP (IEEE 802.1D) is the ability to configure and recognize full-duplex connectivity and ports that are connected to end stations. The difference enables RSTP to rapidly transition to the **Forwarding** state and to suppress the Topology Change Notification PDUs, where possible.

A VLAN ID does not have to be preconfigured before mapping it to an MST instance.

Management of MSTP is compliant with the requirements of RFC5060.

The following features are supported by Dell EMC Networking MSTP:

STP Loop Guard - The Loop Guard feature is an enhancement of the Multiple Spanning Tree Protocol. Loop guard protects a network from forwarding loops induced by BPDU packet loss. It can be configured to prevent a blocked port from transitioning to the forwarding state when the port stops receiving BPDUs for some reason (such as a uni-directional link failure).

STP BPDU Guard - The STP BPDU guard allows the network administrator to enforce the STP domain borders and keep the active topology consistent and predictable. The switches behind the edge ports that have STP BPDU guard enabled are not able to influence the overall STP topology. At the reception of BPDUs, the BPDU guard operation diagnostically disables a port that is configured with this option. Use the **spanning-tree bpdu-protection** command to enable BPDU guard.

STP Root Guard - The root guard ensures that the port on which root guard is enabled is the designated port. In a root bridge ports are all designated ports, unless two or more ports of the root bridge are connected together. If the bridge receives superior STP BPDUs on a root guard enabled port, root guard moves this port to a root inconsistent STP state. This root inconsistent state is effectively equal to a listening state. No traffic is forwarded across this port. In this way, the root guard enforces the position of the root bridge. In MSTP scenario the port may be designated in one of the instances while being alternate in the CIST, and so on. Root guard is a per port (not a per port per instance command) configuration so all the MSTP instances this port participates in should not be in root role.

STP BPDU Filtering - STP BPDU filtering applies to all operational edge ports. An Edge Port is supposed to be connected to hosts that typically do not generate BPDUs. Ports on which BDPU filtering is enabled will drop both transmitted and received BPDUs. As a result, loops may be formed on ports for which BPDU filtering is enabled.

STP BPDU Flooding - STP BPDU flooding feature applies to an STP disabled switch. To enable BPDU flooding on a port, STP must be disabled on the switch administratively. When this feature is enabled on the switch, it floods all the ports which have the BPDU flood feature enabled.

BPDU Storm Protection - If STP BPDUs are received at a rate of 15 pps or greater for 3 consecutive seconds on a port, the port will be diagnostically disabled. A message of the following form is logged:

```
<188> MAY 04 09:45:23 10.10.10.10-1 DOT1S[276072720]: dot1s_ih.c(1587)
15855515 %% Diagnostically disabling interface 2/0/41
```

Use the **no shut** command to return the port to service.

clear spanning-tree detected-protocols

Use the **clear spanning-tree detected-protocols** command to restart the protocol migration process (force the renegotiation with neighboring switches) on all interfaces or on the specified interface.

Syntax

clear spanning-tree detected-protocols [*interface-id*]

- *interface-id*—An Ethernet or port channel interface identifier

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode

User Guidelines

This feature is used only when working in RSTP or MSTP mode.

Example

The following example restarts the protocol migration process (forces the renegotiation with neighboring switches) on Gi1/0/1.

```
console#clear spanning-tree detected-protocols gigabitethernet 1/0/1
```

exit (mst)

Use the **exit** command in MST mode to exit the MST configuration mode and apply all configuration changes.

Syntax

exit

Default Configuration

MST configuration.

Command Mode

MST mode

User Guidelines

This command has no user guidelines.

Example

The following example shows how to exit the MST configuration mode and save changes.

```
console(config)#spanning-tree mst configuration
console(config-mst)#exit
```

instance (mst)

Use the **instance** command in MST mode to map VLANS to an MST instance.

Syntax

instance *instance-id* {**add** | **remove**} **vlan** *vlan-list*

- *instance-ID* — ID of the MST instance. (Range: 1-4094)
- *vlan-list* — VLANs to be added to the existing MST instance. To specify a range of VLANs, use a hyphen. To specify a series of VLANs, use a comma. (Range: 1-4094)

Default Configuration

VLANs are mapped to the common and internal spanning tree (CIST) instance (instance 0).

Command Mode

MST mode

User Guidelines

Before mapping VLANs to an instance use the **spanning-tree mst enable** command to enable the instance.

All VLANs that are not explicitly mapped to an MST instance are mapped to the common and internal spanning tree (CIST) instance (instance 0) and cannot be unmapped from the CIST.

For two or more switches to be in the same MST region, they must have the same VLAN mapping, the same configuration revision number, and the same configuration name.

Dell EMC Networking MSTP supports mapping of VLANs to MST instances, even though the underlying VLAN may not be defined on the switch. Traffic received on VLANs not defined on the port received is dropped.

For interoperability purposes, VLAN 4094 may be mapped to an MSTI, however, VLAN 4094 is reserved internally and may not be used to forward traffic.

Example

The following example maps the entire range of VLANs to MST instances (MST instance 0 is mapped to VLAN 1 by default). Additionally, two 10G ports have some, but not all, of the VLANs mapped to MST instances.

```
console(config)#spanning-tree mode mst
console(config)#spanning-tree mst 1 priority 8192
console(config)#spanning-tree mst 2 priority 28672
console(config)#spanning-tree mst configuration
console(config-mst)#instance 1 add vlan 2-199
console(config-mst)#instance 1 add vlan 350
console(config-mst)#instance 1 add vlan 400-449
console(config-mst)#instance 1 add vlan 500-1999
console(config-mst)#instance 1 add vlan 2200-2499
console(config-mst)#instance 1 add vlan 2600-2799
console(config-mst)#instance 1 add vlan 3000-4093
console(config-mst)#instance 2 add vlan 200-349
console(config-mst)#instance 2 add vlan 351-399
console(config-mst)#instance 2 add vlan 450-499
console(config-mst)#instance 2 add vlan 2000-2199
console(config-mst)#instance 2 add vlan 2500-2599
console(config-mst)#instance 2 add vlan 2800-2999
console(config-mst)#exit
console(config)#interface te1/1/1
console(config-if-Te1/1/1)#switchport mode trunk
console(config-if-Te1/1/1)#switchport trunk allowed vlan add 2-150
console(config-if-Te1/1/1)#spanning-tree mst 1 port-priority 16
console(config-if-Te1/1/1)#interface te1/1/2
console(config-if-Te1/1/2)#switchport mode trunk
console(config-if-Te1/1/2)#switchport trunk allowed vlan add 200-349
console(config-if-Te1/1/2)#spanning-tree mst 2 port-priority 16
console(config-if-Te1/1/2)#exit
```

name (MST)

Use the **name** command in MST mode to define the region name. To return to the default setting, use the **no** form of this command.

Syntax

name *string*

- *string — Case sensitive* MST configuration name. (Range: 1-32 characters)

Default Configuration

Bridge address.

Command Mode

MST mode

User Guidelines

When configuring the switch in MSTP mode, be sure to configure the MST region name. For multiple switches to become members of the same region, the configuration name, the configuration revision and mapping of VLANs to MSTIs must be identical.

Example

The following example sets the configuration name to “region1”.

```
console(config)#spanning-tree mst configuration
console(config-mst)#name region1
```

revision (mst)

Use the **revision** command in MST mode to identify the configuration revision number. To return to the default setting, use the **no** form of this command.

Syntax

revision *version*

no revision

- *version* — Configuration revision number. (Range: 0-65535)

Default Configuration

Revision number is 0.

Command Mode

MST mode

User Guidelines

When configuring the switch in MSTP mode, be sure to configure the MST region name. For multiple switches to become members of the same region, the configuration name, the configuration revision and mapping of VLANs to MSTIs must be identical.

Example

The following example sets the configuration revision to 1.

```
console(config)#spanning-tree mst configuration
console(config-mst)#revision 1
```

show spanning-tree

Use the **show spanning-tree** command to display the spanning-tree configuration.

Syntax

show spanning-tree [{**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}] [**instance** *instance-id*]

show spanning-tree [**detail**] [**active** | **blockedports**] | [**instance** *instance-id*]

show spanning-tree mst-configuration

show spanning-tree {**uplinkfast** | **backbonefast**}

- **detail**—Displays detailed information.
- **active**—Displays active ports only.
- **blockedports**—Displays blocked ports only.
- **mst-configuration**—Displays the MST configuration identifier.
- *instance -id* —ID of the spanning tree instance.
- **uplinkfast**—Displays Direct Link Rapid Convergence information.
- **backbonefast**—Displays Indirect Link Rapid Convergence information.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Command History

Modified in version 6.5 firmware.

Examples

The following examples display spanning-tree information. MST information is shown in this form of the command regardless of the spanning tree mode.

```
console#show spanning-tree
Spanning Tree: Enabled
Mode: rstp
BPDU Flooding: Disabled
Portfast BPDU Filtering: Enabled
Portfast BPDU Guard: Disabled
CST Regional Root: 80:00:00:1E:C9:AA:AD:1B
Regional Root Path Cost: 0
ROOT ID
Priority 32768
Address 0010.1882.1C53
Path Cost 20000
Root Port Gi1/0/1
Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec TxHoldCount
6 sec
Bridge ID
Priority 32768
Address 001E.C9AA.AD1B
Hello Time 2 Sec Max Age 20 sec Forward Delay 15 sec
Interfaces
Name   State    Prio.Nbr   Cost      Sts  Role  Restricted
------ -------- --------- --------- ---- ----- ----------
Gi1/0/1 Enabled 128.1     20000     FWD  Root  No
Gi1/0/2 Enabled 128.2     0         DIS  Disb  No
Gi1/0/3 Enabled 128.3     0         DIS  Disb  No
Gi1/0/4 Enabled 128.4     0         DIS  Disb  No
```

```
console#show spanning-tree gi1/0/1
Port: Gi1/0/1   Enabled
State: Forwarding                                 Role: Designated
Port ID: 128.1                                    Port Cost: 20000
Port Fast: No                                     Root Protection: No
Designated Bridge Priority: 32768                 Address: 001E.C9DE.D447
Designated Port ID: 128.1                         Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47
Root Guard..................................... False
Loop Guard..................................... False
TCN Guard...................................... False
Auto Portfast.................................. True
BPDU Filter Mode............................... Disabled
Time Since Counters Last Cleared............... 0d0h2m46s
BPDUs: Sent: 74, Received: 0


console#show spanning-tree detail
Spanning Tree: Enabled    (BPDU Flooding: Disabled)
Mode: rstp Portfast BPDU Filtering: Disabled
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0
              Address         80:00:00:1E:C9:DE:D4:47
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s Transmit Hold
Count: 6s
              Bridge Max Hops: 20
Number of topology changes: 1 Last Change Occurred: 0d0h3m6s ago
Times: Hold: 6, Hello: 2, Max Age: 20, Forward Delay: 15
Port: Gi1/0/1 Enabled
State: Forwarding                                 Role: Designated
Port ID: 128.1                                    Port Cost: 20000
Root Protection: No
Designated Bridge Priority: 32768                 Address: 001E.C9DE.D447
Designated Port ID: 128.1                         Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47       CST Port Cost: 0
BPDUs: Sent: 83, Received: 0
Port: Gi1/0/2 Enabled
State: Forwarding                                 Role: Designated
Port ID: 128.2                                    Port Cost: 20000
Root Protection: No
Designated Bridge Priority: 32768                 Address: 001E.C9DE.D447
Designated Port ID: 128.2                         Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47       CST Port Cost: 0
BPDUs: Sent: 84, Received: 2
Port: Gi1/0/3 Enabled
```

```
State: Disabled                                     Role: Disabled
Port ID: 128.3                                      Port Cost: 0
Root Protection: No
Designated Bridge Priority: 32768                   Address: 001E.C9DE.D447
Designated Port ID: 0.0                             Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47          CST Port Cost: 0
BPDUs: Sent: 0, Received: 0


console#show spanning-tree detail active
Spanning Tree: Enabled    (BPDU Flooding: Disabled)
Mode: rstp Portfast BPDU Filtering: Disabled
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0
ROOT ID
              Address         80:00:00:1E:C9:DE:D4:47
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s Transmit Hold
Count: 6s
              Bridge Max Hops: 20
Number of topology changes: 1 Last Change Occurred: 0d0h4m13s ago
Times: Hold: 6, Hello: 2, Max Age: 20, Forward Delay: 15
Port: Gi1/0/1 Enabled
State: Forwarding                                   Role: Designated
Port ID: 128.1                                      Port Cost: 20000
Root Protection: No
Designated Bridge Priority: 32768                   Address: 001E.C9DE.D447
Designated Port ID: 128.1                           Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47          CST Port Cost: 0
BPDUs: Sent: 112, Received: 0
Port: Gi1/0/2 Enabled
State: Forwarding                                   Role: Designated
Port ID: 128.2                                      Port Cost: 20000
Root Protection: No
Designated Bridge Priority: 32768                   Address: 001E.C9DE.D447
Designated Port ID: 128.2                           Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47          CST Port Cost: 0
BPDUs: Sent: 113, Received: 2
Port: Te1/0/1 Enabled
State: Forwarding                                   Role: Designated
Port ID: 128.49                                     Port Cost: 2000
Root Protection: No
Designated Bridge Priority: 32768                   Address: 001E.C9DE.D447
Designated Port ID: 128.49                          Designated Path Cost: 0
CST Regional Root: 80:00:00:1E:C9:DE:D4:47          CST Port Cost: 0
BPDUs: Sent: 113, Received: 1
```

```
console#show spanning-tree blockedports
Spanning Tree: Enabled (BPDU Flooding: Disabled) Mode: rstp
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0
###### MST 0 Vlan Mapped:   1-10
ROOT ID
              Priority        32768
              Address         001E.C9DE.D447
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces
Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Te1/0/2   Enabled  128.50    2000      DSC  Bkup  No


console(config)#show spanning-tree uplinkfast
Directlink rapid convergence is enabled
BPDU update rate : 150 packets/sec
Directlink rapid convergence Statistics
---------------------
Directlink rapid convergence transitions (all VLANs).. 0
Proxy multicast addresses transmitted (all VLANs)..... 0
Name                             Interface list
---------------                  ------------------------------------
VLAN0001                         Gi1/0/2(fwd)
VLAN0002
VLAN0003
VLAN0004
VLAN0005
VLAN0006
VLAN0007
VLAN0008
VLAN0009
VLAN0010


console(config)#show spanning-tree backbonefast

Indirectlink rapid convergence is enabled

Indirectlink rapid convergence Statistics
---------------------
Transitions via indirectlink rapid convergenc.. 0
Inferior BPDUs received (all VLANs)............ 7
RLQ request PDUs received (all VLANs).......... 0
```

```
RLQ response PDUs received (all VLANs)......... 0
RLQ request PDUs sent (all VLANs)............. 0
RLQ response PDUs sent (all VLANs)............ 0
```

This example shows spanning-tree configured in mstp mode. Output is shown for each VLAN that is a member of an MST domain.

```
 console(config-mst)#show spanning-tree active

Spanning Tree: Enabled    (BPDU Flooding: Disabled)
Mode: rstp Portfast BPDU Filtering: Disabled
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0


###### MST 0 Vlan Mapped:   1
ROOT ID
              Priority        32768
              Address         001E.C9DE.D447
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces

Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     0         FWD  Desg  No
Gi1/0/2   Enabled  128.2     0         FWD  Desg  No
Te1/0/1   Enabled  128.49    0         FWD  Desg  No
Te1/0/2   Enabled  128.50    0         DSC  Bkup  No

###### MST 1 Vlan Mapped:   2
ROOT ID
              Priority        32768
              Address         001E.C9DE.D447
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces

Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     20000     FWD  Desg  No
Gi1/0/2   Enabled  128.2     20000     FWD  Desg  No

###### MST 2 Vlan Mapped:   3-5
ROOT ID
              Priority        4096
              Address         001E.C9DE.D447
```

```
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces

Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     20000     FWD  Desg  No
Gi1/0/2   Enabled  128.2     20000     FWD  Desg  No

###### MST 3 Vlan Mapped:   6-10
ROOT ID
              Priority        32768
              Address         001E.C9DE.D447
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces

Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     20000     FWD  Desg  No
Gi1/0/2   Enabled  128.2     20000     FWD  Desg  No

console(config)#show spanning-tree instance 2

Spanning Tree: Enabled    BPDU Flooding: Disabled
Mode: mstp Portfast BPDU Filtering: Disabled
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0

###### MST 2 Vlan Mapped:   3-5
ROOT ID
              Priority        4096
              Address         001E.C9DE.D447
              Path Cost       0
              Root Port
Bridge ID
              Priority        4096
              Address         001E.C9DE.D447
              Hello Time: 2s Max Age: 20s Forward Delay: 15s Transmit Hold
Count: 6s

Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     0         FWD  Desg  No
Gi1/0/2   Enabled  128.2     0         FWD  Desg  No
Gi1/0/3   Enabled  128.3     0         DIS  Disb  No
Gi1/0/4   Enabled  128.4     0         DIS  Disb  No
```

```
Gi1/0/5   Enabled  128.5     0         DIS  Disb  No
Gi1/0/6   Enabled  128.6     0         DIS  Disb  No
Gi1/0/7   Enabled  128.7     0         DIS  Disb  No
Gi1/0/8   Enabled  128.8     0         DIS  Disb  No
```

This example shows spanning-tree configured in rstp mode. Output is shown for each interface.

```
console(config)#show spanning-tree active
Spanning Tree: Enabled    (BPDU Flooding: Disabled)
Mode: rstp Portfast BPDU Filtering: Disabled
CST Regional Root:        80:00:00:1E:C9:DE:D4:47
Regional Root Path Cost:  0
###### MST 0 Vlan Mapped:   1-10
ROOT ID
              Priority        32768
              Address         001E.C9DE.D447
              This Switch is the Root.
              Hello Time: 2s Max Age: 20s Forward Delay: 15s
Interfaces
Name      State    Prio.Nbr  Cost      Sts  Role  RestrictedPort
--------- -------- --------- --------- ---- ----- --------------
Gi1/0/1   Enabled  128.1     20000     FWD  Desg  No
Gi1/0/2   Enabled  128.2     20000     FWD  Desg  No
Te1/0/1   Enabled  128.49    2000      FWD  Desg  No
Te1/0/2   Enabled  128.50    2000      DSC  Bkup  No
```

This example shows spanning-tree configured in rapid-pvst mode. Output is shown for each VLAN that is actively running a spanning tree instance.

```
console(config)#show spanning-tree active
Spanning-tree enabled protocol rpvst
VLAN    1
 RootID    Priority        32768
           Address         F8B1.562B.A1D6
           Cost            20000
           Port            2(Gi1/0/2)
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority        32769 (priority 32768 sys-id-ext 1)
           Address         001E.C9DE.D447
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300 sec
Interface State     Prio.Nbr  Cost    Status        Role
--------- --------- --------- ------- ------------- -----------
Gi1/0/1   Enabled   128.1     20000   Forwarding    Designated
```

```
Gi1/0/2   Enabled   128.2     20000   Forwarding    Root
Te1/0/1   Enabled   128.49    2000    Forwarding    Designated
Te1/0/2   Enabled   128.50    2000    Discarding    Backup
VLAN    2
 RootID    Priority        32770
           Address         001E.C9DE.D447
           Cost            0
           Port            This switch is the root
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
 BridgeID  Priority        32770 (priority 32768 sys-id-ext 2)
           Address         001E.C9DE.D447
           Hello Time 2 sec Max Age 20 sec Forward Delay 15 sec
           Aging Time 300 sec
Interface State     Prio.Nbr  Cost    Status        Role
--------- --------- --------- ------- ------------- -----------
Gi1/0/1   Enabled   128.1     20000   Forwarding    Designated
Gi1/0/2   Enabled   128.2     20000   Forwarding    Designated
```

show spanning-tree summary

Use the **show spanning-tree summary** command to display spanning tree settings and parameters for the switch.

Syntax

show spanning-tree summary

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Field	Description

Spanning Tree Admin Mode	Enabled or disabled
Spanning Tree Version	Version of currently supported (IEEE 802.1s, IEEE 802.1w, or IEEE 802.1d) based upon the mode parameter.
BPDU Protection Mode	Enabled or disabled.
BPDU Filter Mode	Enabled or disabled.
BPDU Flooding Mode	Enabled or disabled.
IndirectLink Rapid Convergence	Backbone-fast for RSTP-PV is enabled or disabled.
DirectLink Rapid Convergence	Enables/Disables DRC by setting switch priority to 49152.
Configuration Name	Identifier used to identify the configuration currently being used.
Configuration Revision Level	Identifier used to identify the configuration currently being used.
Configuration Digest Key	A generated Key used in the exchange of the BPDUs.
Configuration Format Selector	Specifies the version of the configuration format being used in the exchange of BPDUs. The default value is zero.
MST Instances	List of all multiple spanning tree instances configured on the switch.

Example

```
console#show spanning-tree summary
Spanning Tree Admin Mode.......... Enabled
Spanning Tree Version............. IEEE 802.1w
BPDU Guard Mode................... Disabled
BPDU Flood Mode................... Disabled
IndirectLink Rapid Convergence.... Disabled
DirectLink Rapid Convergence...... Disabled
BPDU Filter Mode.................. Disabled
Configuration Name................ 14-18-77-0C-9D-D8
Configuration Revision Level...... 0
Configuration Digest Key.......... 0xac36177f50283cd4b83821d8ab26de62
```

```
Configuration Format Selector..... 0
```

show spanning-tree vlan

Use the **show spanning-tree vlan** command to display spanning tree information per VLAN and also list out the port roles and states as well as port cost.

Syntax

show spanning-tree vlan { *vlan-list* | **all** }

- *vlan-list* — A list of VLANs or VLAN ranges separated by commas and with no embedded blank spaces. VLAN ranges are of the form X-Y where X and Y are valid VLAN identifiers and X < Y.
- **all**—Show all VLANs.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec and above

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#show spanning-tree vlan 2
VLAN    2
 Spanning Tree: Enabled Mode: rapid-pvst
 RootID    Priority        32770
           Address         001E.C9DE.D447
           Cost            0
           Port            This switch is the root
           Hello Time: 2s Max Age: 20s Forward Delay: 15s
 BridgeID  Priority        32770 (priority 32768 sys-id-ext 2)
           Address         001E.C9DE.D447
           Hello Time: 2s Max Age: 20s Forward Delay: 15s
           Aging Time 300 sec
Interface Role       Sts           Cost      Prio.Nbr
--------- ---------- ------------- --------- --------
```

```
Gi1/0/1   Designated Forwarding    20000     128.1
Gi1/0/2   Designated Forwarding    20000     128.2
```

spanning-tree

Use the **spanning-tree** command in Global Configuration mode to enable spanning-tree functionality. To disable spanning-tree functionality, use the **no** form of this command.

Syntax

spanning-tree

no spanning-tree

Default Configuration

Spanning-tree is enabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enables spanning-tree functionality.

```
console(config)#spanning-tree
```

spanning-tree auto-portfast

Use the **spanning-tree auto-portfast** command to set the port to auto portfast mode. This enables the port to become a portfast port if it does not see any BPDUs for 3 seconds after a link up event. Use the **no** form of this command to disable auto portfast mode.

Syntax

spanning-tree auto-portfast

no spanning-tree auto-portfast

Default Configuration

Auto portfast mode is enabled by default.

Command Mode

Interface Configuration (Ethernet, Port Channel) mode

User Guidelines

There are no user guidelines for this command.

Example

The following example enables spanning-tree functionality on Gigabit ethernet interface 4/0/1.

```
console#config
console(config)#interface gigabitethernet 4/0/1
console(config-if-4/0/1)#spanning-tree auto-portfast
```

spanning-tree backbonefast

Use the **spanning-tree backbonefast** command to enable the detection of indirect link failures and accelerate spanning tree convergence on STP-PV/RSTP-PV configured switches using Indirect Link Rapid Convergence (IRC). IRC accelerates finding an alternative path when an indirect link to the root port goes down. Use the **no** form of the command to disable the IRC feature.

Syntax

spanning-tree backbonefast

no spanning-tree backbonefast

Default Configuration

This command has no default configuration.

Command Modes

Global Configuration Mode

User Guidelines

IRC can be configured even if the switch is configured for MST(RSTP) or RSTP-PV mode. It only has an effect when the switch is configured for STP-PV mode.

If an IRC-enabled switch receives an inferior BPDU from its designated switch on a root or blocked port, it sets the maximum aging time on the interfaces on which it received the inferior BPDU if there are alternative (blocked) paths to the designated switch. This allows a blocked port to immediately move to the listening state where the port can be transitioned to the forwarding state in the normal manner.

Example

```
console(config)#spanning-tree backbonefast
```

spanning-tree bpdu flooding

The **spanning-tree bpdu flooding** command allows flooding of BPDUs received on non-spanning-tree ports to all other non-spanning-tree ports. Use the "no" form of the command to disable flooding.

Syntax

spanning-tree bpdu flooding

no spanning-tree bpdu flooding

Default Configuration

This feature is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#spanning-tree bpdu flooding
```

spanning-tree bpdu-protection

Use the **spanning-tree bpdu-protection** command in Global Configuration mode to enable BPDU guard on a switch. Use the **no** form of this command to resume the default status of BPDU guard function.

Syntax

spanning-tree bpdu-protection

no spanning-tree bpdu-protection

Default Configuration

BPDU guard is not enabled.

Command Mode

Global Configuration mode

User Guidelines

The administrator should ensure that interfaces on which BDPU guard is enabled are configured as edge ports. To configure an interface as an edge port, use the **spanning-tree portfast** command.

An edge port is generally connected to a user terminal (such as a desktop computer) or file server directly and is configured as an edge port to implement a fast transition to the forwarding state. When the port receives a BPDU packet, the system sets it to non-edge port and recalculates the spanning tree topology, which may cause network topology flapping. In normal cases, edge ports do not receive any BPDU packets. However, an attacker may forge BPDU packets to maliciously disrupt the switch and cause network flapping.

Dell spanning-tree provides a BPDU guard function against such attacks. If an interface enabled for BPDU guard receives a BPDU packet, the interface is diagnostically disabled and a message is written to the log. The port may be re-enabled using the **no shutdown** command after disconnecting the offending device from the interface.

Example

The following example enables BPDU protection.

```
console(config)#spanning-tree bpdu-protection
```

spanning-tree cost

Use the **spanning-tree cost** command in Interface Configuration mode to configure the externally advertised spanning-tree path cost for a port. To return to the default port path cost, use the **no** form of this command.

The path cost is used in the selection of an interface for the forwarding or blocking states. Use the **no** form of the command to automatically select the path cost based upon the speed of the interface.

Syntax

spanning-tree [vlan ***vlan-list***] **cost** *cost*

no spanning-tree cost

- *cost* — The port path cost.

Default Configuration

The default cost value (0) causes the switch to select the path cost based on the link speed.

- **40G Port path cost** — 1400
- **10G Port path cost** — 2000
- **1000 Mbps (giga)** — 20,000
- **100 Mbps** — 200,000
- **10 Mbps** — 2,000,000
- Port Channel—200,000,000 divided by the sum of the unidirectional link speed (in Mbps) of each active member multiplied by 10 per section 13.6.1 of IEEE 802.1s.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

Dell EMC Networking spanning tree uses long values for spanning tree costs. The range for path cost for a port is 0-200,000,000. The range for path cost for a VLAN is 1-200,000,000. Use the **no** form of the command to calculate the cost based on the interface speed. A zero path cost causes the switch to calculate the path cost based upon the speed of the interface.

If the VLAN parameter is given, the path cost is configured only for the selected VLANs (applies only when pvst or rapid-pvst mode is selected). Configuration without the VLAN parameter configures the interface path cost for STP, RSTP, and the MSTP common instance.

If an interface is configured with both the **spanning-tree vlan** *vlan-id* **cost** *cost* command and the **spanning-tree cost** *cost* command, the **spanning-tree vlan** *vlan-id* **cost** *cost* value is used in the spanning tree calculation for RSTP, STP, and MST. Use the **spanning-tree vlan cost** command to change the cost for RSTP-PV and STP-PV.

Example

The following example configures the external path cost to be 8192 for VLANs 12, 13, 24, 25, and 26.

```
console(config-if-Gi1/0/1)#spanning-tree vlan 12,13,24-26 cost 8192
```

spanning-tree disable

Use the **spanning-tree disable** command in Interface Configuration mode to disable spanning-tree on a specific port. To enable spanning-tree on a port, use the **no** form of this command.

Syntax

spanning-tree disable

no spanning-tree disable

Default Configuration

By default, all ports are enabled for spanning-tree.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example disables spanning-tree on Gi1/0/5.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if-Gi1/0/5)#spanning-tree disable
```

spanning-tree forward-time

Use the **spanning-tree forward-time** command in Global Configuration mode to configure the spanning-tree bridge forward time, which is the amount of time a port remains in the listening and learning states before entering the forwarding state.

To reset the default forward time, use the **no** form of this command.

Syntax

spanning-tree forward-time *seconds*

no spanning-tree forward-time

- *seconds* — Time in seconds. (Range: 4–30)

Default Configuration

The default forwarding-time for IEEE Spanning-tree Protocol (STP) is 15 seconds.

Command Mode

Global Configuration mode.

User Guidelines

When configuring the Forward-Time the following relationship should be satisfied:

2*(Forward-Time - 1) >= Max-Age.

Example

The following example configures spanning-tree bridge forward time to 25 seconds.

```
console(config)#spanning-tree forward-time 25
```

spanning-tree guard

The **spanning-tree guard** command selects whether loop guard or root guard is enabled on an interface. If neither is enabled, the port operates in accordance with the multiple spanning tree protocol. Use the “no” form of this command to disable loop guard or root guard on the interface.

Syntax

spanning-tree guard {**root** | **loop** | **none**}

- **root** — Enables root guard.
- **loop** — Enables loop guard
- **none** — Disables root and loop guard.

Default Configuration

Neither root nor loop guard is enabled.

Command Mode

Interface Configuration (Ethernet, Port Channel) mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example disables spanning-tree guard functionality on Gigabit ethernet interface 4/0/1.

```
console#config
console(config)#interface gigabitethernet 4/0/1
console(config-if-4/0/1)#spanning-tree guard none
```

spanning-tree loopguard

Use the **spanning-tree loopguard** command to enable loop guard on all ports. Use the “no” form of this command to disable loop guard on all ports.

Syntax

spanning-tree loopguard default

no spanning-tree loopguard default

Default Configuration

Loop guard is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

The following example enables spanning-tree loopguard functionality on all ports.

```
console(config)#spanning-tree loopguard default
```

spanning-tree max-age

Use the **spanning-tree max-age** command in Global Configuration mode to configure the spanning-tree bridge maximum age. To reset the default maximum age, use the **no** form of this command.

Syntax

spanning-tree max-age *seconds*

no spanning-tree max-age

- *seconds* -Time in seconds. (Range: 6–40)

Default Configuration

The default max-age for IEEE STP is 20 seconds.

Command Mode

Global Configuration mode

User Guidelines

When configuring the Max-Age the following relationships should be satisfied:

2*(Forward-Time - 1) >= Max-Age

Max-Age >= 2*(Hello-Time + 1)

Example

The following example configures the spanning-tree bridge maximum-age to 10 seconds.

```
console(config)#spanning-tree max-age 10
```

spanning-tree max-hops

Use the **spanning-tree max-hops** command to set the MSTP Max Hops parameter to a new value for the common and internal spanning tree. Use the "no" form of this command to reset the Max Hops to the default.

Syntax

spanning-tree max-hops *hops*

no spanning-tree max-hops

- *hops* — The maximum number of hops to use (Range: 6 to 40).

Default Configuration

The maximum number of hops is 20 by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#spanning-tree max-hops 32
```

spanning-tree mode

Use the **spanning-tree mode** command in Global Configuration mode to configure the spanning-tree protocol. To return to the default configuration, use the **no spanning-tree** form of this command.

Syntax

spanning-tree mode {**stp** | **rstp** | **mst** | **pvst** | **rapid-pvst**}

- **stp** — Spanning Tree Protocol (STP) is enabled.
- **rstp** — Rapid Spanning Tree Protocol (RSTP) is enabled.
- **mst** — Multiple Spanning Tree Protocol (MSTP) is enabled.
- **pvst**— Spanning-tree operates in STP-PV mode.
- **rapid-pvst**— Spanning-tree operates in RSTP-PV mode.

Default Configuration

Rapid Spanning Tree Protocol (RSTP) is enabled.

Command Mode

Global Configuration mode

User Guidelines

In RSTP mode, the switch uses STP when the neighbor switch is using STP. In MSTP mode, the switch uses RSTP when the neighbor switch is using RSTP and uses STP when the neighbor switch is using STP.

Only one of STP, RSTP, MSTP (RSTP), STP-PV or RSTP-PV can be enabled on a switch. This command stops all spanning-tree instances in the current mode and enables spanning-tree per VLAN in the new mode. By default, RSTP is enabled.

If configuring the switch to MSTP mode, be sure to configure the MST region name. For multiple switches to become members of the same region, the configuration name, the configuration revision and mapping of VLANs to MSTIs must be identical.

In the STP-PV or RSTP-PV modes, BPDUs contain per-VLAN information instead of the common spanning-tree information (MST/RSTP).

RSTP-PV maintains independent spanning tree information about each configured VLAN. RSTP-PV uses IEEE 802.1Q trunking and allows a trunked VLAN to maintain blocked or forwarding state per port on a per VLAN basis. This allows a trunk port to be forwarding for some VLANs and blocked on other VLANs.

RSTP-PV extends the IEEE 802.1w standard. It supports faster convergence than IEEE 802.1D. RSTP-PV is compatible with IEEE 802.1D spanning tree. RSTP-PV sends BPDUs on all ports instead of only the root bridge sending BPDUs and supports the discarding, learning, and forwarding states.

When the mode is changed to rapid-pvst, version 0 STP BPDUs are no longer transmitted and version 2 RSTP-PV BPDUs that carry per-VLAN information are transmitted on the VLANs enabled for spanning-tree. If a version 0 BPDU is seen, RSTP-PV reverts to sending version 0 BPDUs.

RSTP-PV embeds support for STP-PV Indirect Link Rapid Convergence and Direct Link Rapid Convergence. There is no provision to enable or disable these features in RSTP-PV.

Example

The following example configures the spanning-tree protocol to MSTP.

```
console(config)#spanning-tree mode mst
```

spanning-tree mst configuration

Use the **spanning-tree mst configuration** command in Global Configuration mode to enable configuring an MST region by entering the multiple spanning-tree (MST) mode.

Syntax

spanning-tree mst configuration

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

For two or more switches to be in the same MST region, they must have the same VLAN mapping, the same configuration revision number and the same name.

Example

The following example configures an MST region.

```
console (config)#spanning-tree mst configuration
console (config-mst)#instance 1 add vlan 10-20
console (config-mst)#name region1
console (config-mst)#revision 1
```

spanning-tree mst cost

Use the **spanning-tree mst cost** command in Interface Configuration mode to configure the internal path cost for multiple spanning tree (MST) calculations. If a loop occurs, the spanning tree considers path cost when selecting an interface to put in the forwarding state. To return to the default port path cost, use the **no** form of this command.

Syntax

spanning-tree mst *instance-id* **cost** *cost*

no spanning-tree mst *instance-id* **cost**

- *instance-ID* — ID of the spanning -tree instance. (Range: 1-4094)
- *cost* — The port path cost. (Range: 0–200,000,000)

Default Configuration

The default cost is 0, which signifies that the cost will be automatically calculated based on port speed.

The default configuration is:

- Ethernet (10 Mbps) — 2,000,000
- Fast Ethernet (100 Mbps) — 200,000
- Gigabit Ethernet (1000 Mbps) — 20,000
- Port-Channel — 20,000

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

Use the **spanning-tree cost** command to configure MST instance 0 (the common spanning tree instance). Use the **show spanning-tree active** command to display the spanning tree costs.

Example

The following example configures the MSTP instance 1 path cost for Gigabit Ethernet interface 1/0/9 to 4.

```
console(config)#interface gigabitethernet 1/0/9
console(config-if-Gi1/0/9)#spanning-tree mst 1 cost 4
```

spanning-tree mst port-priority

Use the **spanning-tree mst port-priority** command in Interface Configuration mode to configure port priority. To return to the default port priority, use the **no** form of this command.

Syntax

spanning-tree mst *instance-id* **port-priority** *priority*

no spanning-tree mst *instance-id* **port-priority**

- *instance-id*—ID of the spanning-tree instance. (Range: 1-4094)
- *priority*—The port priority. (Range: 0-240 in multiples of 16.)

Default Configuration

The default port-priority for IEEE STP is 128. The default priority for a port-channel is 96.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

The priority will be set to the nearest multiple of 4096 if not an exact multiple of 4096.

Example

The following example configures the port priority of Gigabit Ethernet interface 1/0/5 to 144.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if)#spanning-tree mst 1 port-priority 144
```

spanning-tree mst priority

Use the **spanning-tree mst priority** command in Global Configuration mode to set the switch priority for the specified spanning-tree instance. To return to the default setting, use the **no** form of this command.

Syntax

spanning-tree mst *instance-id* **priority** *priority*

no spanning-tree mst *instance-id* **priority**

- *instance-id*—ID of the spanning-tree instance. (Range: 1-4094)
- *priority*—Sets the switch priority for the specified spanning-tree instance. This setting affects the likelihood that the switch is selected as the root switch. A lower value increases the probability that the switch is selected as the root switch. (Range: 0-61440)

Default Configuration

The default bridge priority for IEEE STP is 32768.

Command Mode

Global Configuration mode

User Guidelines

The priority value must be a multiple of 4096. The priority will be set to the nearest multiple of 4096 if not an exact multiple of 4096.

Bridge priority configuration is given preference over the root primary/secondary configuration. Root primary/secondary configuration is given preference over the DRC configuration.

The switch with the lowest priority is selected as the root of the spanning tree.

Example

The following example configures the spanning tree priority of instance 1 to 4096.

```
console(config)#spanning-tree mst 1 priority 4096
```

spanning-tree portfast

Use the **spanning-tree portfast** command in Interface Configuration mode to enable portfast mode. In portfast mode, the interface is immediately put into the forwarding state upon linkup, without waiting for the timer to expire. To disable portfast mode, use the **no** form of this command.

Syntax

spanning-tree portfast

no spanning-tree portfast

Default Configuration

Portfast mode is disabled.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

User Guidelines

This command only applies to access ports. The command is to be used only with interfaces connected to end stations. Otherwise, an accidental topology loop could cause a data packet loop and disrupt switch and network operations.

An interface with portfast mode enabled is moved directly to the spanning tree forwarding state when linkup occurs without waiting the standard forward-time delay.

Example

The following example enables portfast on Gi1/0/5.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if-Gi1/0/5)#spanning-tree portfast
```

spanning-tree portfast bpdufilter default

The **spanning-tree portfast bpdufilter default** command disables the transmission and reception of BPDUs on portfast enabled ports. Use the “no” form of the command to enable the transmission and receipt of BPDUs.

Syntax

spanning-tree portfast bpdufilter default

no spanning-tree portfast bpdufilter default

Default Configuration

This feature is disabled by default.

Command Mode

Global Configuration mode, Interface Configuration mode (physical interface and port-channels)

User Guidelines

BPDU filtering disables both the sending and receiving of BPDUs on portfast enabled ports.

A port enabled for BPDU filtering does not receive or send any BPDUs. It is possible that a network loop may result if BPDU filtering is enabled on a port connected to anything other than an end system.

BPDU filtering is appropriate for configuration on portfast enabled interfaces that are connected to end system hosts where it is desired to not send BPDUs to the host or receive BPDUs from the host. Use the BPDU guard capability if it is desired to obtain a greater level of protection from rogue hosts or possible spanning-tree loops.

The administrator must ensure that interfaces enabled for BPDU filtering are configured as edge ports. Use the **spanning-tree portfast** command to configure the interface as an edge port.

Example

The following example discards BPDUs received on spanning-tree ports in portfast mode.

```
console(config)#spanning-tree portfast bpdufilter default
```

spanning-tree portfast default

Use the **spanning-tree portfast default** command to enable portfast mode on access ports. Interfaces configured as access mode ports are considered to be edge ports. Use the **no** form of this command to disable portfast mode on all ports.

Syntax

spanning-tree portfast default

no spanning-tree portfast default

Default Configuration

Portfast mode is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command only affects access ports.

NOTE: This command should be used with care. An interface with portfast mode enabled is moved directly to the spanning tree forwarding state when linkup occurs without waiting for the standard forward-time delay. Setting a port connected to another switch into portfast mode may cause an accidental topology loop and disrupt switch and network operations.

Example

The following example enables portfast mode on all access ports.

```
console(config)#spanning-tree portfast default
```

spanning-tree port-priority (Interface Configuration)

Use the **spanning**-tree port-priority command in Interface Configuration mode to configure the priority value of an edge-port or point-to-point interface to allow the operator to select the relative importance of the interface in the selection process for forwarding. Set this value to a lower number to prefer an operationally enabled interface for forwarding of frames. Use the **no** form of the command to return the priority to the default value.

Syntax

spanning-tree [vlan ***vlan-id***] **port-priority** *priority*

no spanning-tree [vlan ***vlan-id***] **port-priority**

- *vlan-id* — An optional parameter specifying the VLAN to which the priority applies when the port is configured as an edge-port. Range 1-4093.
- *priority* — The priority of the edge-port or point-to-point link in the forwarding port selection process. Range is 0 to 240 in increments of 16.

Default Configuration

The default port-priority for IEEE STP is 128.

Command Mode

Interface Configuration mode

User Guidelines

If the VLAN parameter is given, the priority is configured only for the selected VLANs (applies only when pvst or rapid-pvst mode is selected). Configuration without the VLAN parameter configures the port priority for RSTP, STP-PV, and RSTP-PV.

If an interface is configured with both the **spanning-tree vlan *vlan-id* port-priority *priority*** command and the **spanning-tree port-priority *priority*** command, the **spanning-tree vlan *vlan-id* port-priority *priority*** value is used as the port priority.

If a VLAN parameter is provided, the VLAN must have been previously configured or an error is thrown.

An edge port is a port with spanning-tree port-fast enabled. A point-to-point link is a link configured as full-duplex. Edge-ports and point-to-point links directly transition to the forwarding state and do not delay for the listening and learning stages of spanning-tree. An edge port that receives a BPDU is no longer considered an edge-port and will utilize the configured port priority value.

All interfaces and VLANs have 128 as priority value by default. By default, spanning-tree puts the lowest numbered operationally enabled interface in the forwarding state and blocks other interfaces. The priority value is used to override this default behavior. Interfaces with lower port priorities are preferred for forwarding over interfaces with numerically higher priority values. STP-PV/RSTP-PV uses the port priority value when the LAN port is configured as an edge port and uses the VLAN priority value when the interface is configured as a point-to-point link. MSTP uses the port priority regardless of whether the port is an edge port or not.

Example

The following example configures a port connected to a host to be least likely to be selected for forwarding to the root bridge, even if the host begins to send BPDUs.

```
console(config-if-Gi1/0/1)#spanning-tree port-priority 240
console(config-if-Gi1/0/1)#spanning-tree vlan 10 port-priority 240
```

spanning-tree priority

Use the **spanning-tree priority** command in Global Configuration mode to configure the spanning-tree priority. The priority value is used to determine which bridge is elected as the root bridge. To reset the default spanning-tree priority use the **no** form of this command.

Syntax

spanning-tree priority *priority*

no spanning-tree priority

- *priority* — Priority of the bridge. (Range: 0–61440)

Default Configuration

The default bridge priority for IEEE STP is 32768.

Command Mode

Global Configuration mode

User Guidelines

The priority value must be a multiple of 4096.

The switch with the lowest priority is the root of the spanning tree.

Bridge priority configuration is given preference over root primary/secondary configuration. Root primary/secondary configuration is given preference over DRC configuration.

Example

The following example configures spanning-tree priority to 12288.

```
console(config)#spanning-tree priority 12288
```

spanning-tree tcnguard

Use the **spanning-tree tcnguard** command to prevent a port from propagating topology change notifications. Use the “no” form of the command to enable TCN propagation.

Syntax

spanning-tree tcnguard

no spanning-tree tcnguard

Default Configuration

TCN propagation is disabled by default.

Command Mode

Interface Configuration (Ethernet, Port Channel) mode

User Guidelines

There are no user guidelines for this command.

Example

The following example configures spanning-tree tcnguard on 4/0/1.

```
console(config-if-4/0/1)#spanning-tree tcnguard
```

spanning-tree transmit hold-count

Use the **spanning-tree transmit hold-count** command to set the maximum number of BPDUs that a bridge is allowed to send within a hello time window (2 seconds). Use the **no** form of this command to reset the hold count to the default value.

Syntax

spanning-tree transmit hold-count <*value*>

no spanning-tree transmit

- *value* — The maximum number of BPDUs to send (Range: 1–10).

Default Configuration

The default hold count is 6 BPDUs.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
The following example sets the maximum number of BPDUs sent to 6.
console(config)#spanning-tree transmit hold-count 6
```

spanning-tree uplinkfast

Use the **spanning-tree uplinkfast** command to configure the rate at which gratuitous frames are sent (in packets per second) after a switchover to an alternate port on STP-PV and RSTP-PV configured switches and enable Direct Link Rapid Convergence on STP-PV switches. This command assists in accelerating spanning-tree convergence after switchover to an alternate port.

Use the **no** form of the command to return the configured rate to the default value (or disable uplinkfast on STP-PV configured switches).

Syntax

spanning-tree uplinkfast [**max-update-rate** *packets/s*]

no spanning-tree uplinkfast [max-update-rate]

- *max-update-rate*—The rate at which update packets are sent. (Range: 0-32000)

Default Configuration

The default rate is 150.

Command Modes

Global Configuration Mode

User Guidelines

DirectLink Rapid Convergence (DRC) can be configured even if the switch is configured for MST(RSTP) mode. It only has an effect when the switch is configured for STP-PV or RSTP-PV modes. Enabling DRC sets the switch priority to 49152. Path costs have an additional 3000 added when DRC is enabled. This reduces the probability that the switch will become the root switch.

DRC immediately changes to an alternate root port on detecting a root port failure and change the new root port directly to the forwarding state. A TCN is sent for this event.

After a switchover to an alternate port (new root port), DRC multicasts a gratuitous frame on the new root port on behalf of each attached machine so that the rest of the network knows to use the secondary link to reach that machine.

DRC is disabled when the administrator modifies the spanning-tree priority of a VLAN and is re-enabled only when the default priority is restored.

Configuration of the bridge priority is given preference over configuration of the root primary or root secondary configuration, which is given preference over the configuration of DirectLink Rapid Convergence.

RSTP-PV embeds support for IRC and DRC. There is no provision to enable or disable these features in RSTP-PV configured switches.

DRC is most useful for enterprise wiring-closet topologies with a limited number of VLANs. Do not enable DRC on backbone or distribution layer switches as DRC is not capable of completing the reconfiguration of large networks within the max age time.

Example

```
console(config)#spanning-tree uplinkfast
```

spanning-tree vlan

Use the **spanning-tree vlan** command to enable per VLAN spanning tree on a VLAN. Use the **no** form of the command to remove the VLAN as a separate spanning tree instance.

Syntax

spanning-tree vlan {*vlan-list*}

no spanning-tree vlan {*vlan-list*}

- *vlan-list*–A single VLAN ID or a list of VLAN IDs in comma delineated or range format with no embedded blanks. Range 1-4093.

Default Configuration

By default, each configured VLAN is automatically associated with a per VLAN spanning tree instance. If more than eight VLANs are configured, the excess VLANs do not participate in per VLAN spanning tree.

To change the allocation of spanning-tree instances to VLANs, use the **no spanning-tree vlan** command to disassociate a VLAN from a per VLAN spanning-tree instance and use the **spanning-tree vlan** command to associate the spanning-tree instance with the desired VLAN.

Command Modes

Global Configuration mode

User Guidelines

This command can be configured even if the switch is configured for MST(RSTP) mode. It is only used when the switch is configured for STP-PV or RSTP-PV modes.

Example

This example configures a switch to use per VLAN spanning tree for VLANS 12, 13 and 24-26

```
console(config)#spanning-tree vlan 12,13,24-26
```

spanning-tree vlan forward-time

Use the **spanning-tree vlan forward-time** command to configure the spanning tree forward delay time for a specified VLAN or a range of VLANs.

Use the **no** form of the command to return the forward time to its default value.

Syntax

spanning-tree vlan *vlan-list* **forward-time** *4-30*

no spanning-tree vlan *vlan-list* **forward-time**

- forward-time — The interval (time spent in listening and learning states) before transitioning a port to the forwarding state. (Range: 4-30 seconds)

Default Configuration

The default forward delay time is 15.

Command Modes

Global Configuration Mode

User Guidelines

Set this value to a lower number to accelerate the transition to forwarding. The network operator should take into account the end to end BPDU propagation delay, the maximum frame lifetime, the maximum transmission halt delay and the message age overestimate values specific to their network when configuring this parameter.

Forward delay is only application to STP modes. The forward delay setting is ignored in MSTP, RSTP and RSTP-PV modes as the designated port is transitioned to the forwarding state immediately.

Example

```
console(config)#spanning-tree vlan 3 forward-time 12
```

spanning-tree vlan hello-time

Use the **spanning-tree vlan hello-time** command to configure the spanning tree hello time for a specified VLAN or a range of VLANs.

Syntax

spanning-tree vlan *vlan-list* **hello-time** *1-10*

no spanning-tree vlan *vlan-list* **hello-time**

- Hello-time–The interval between sending successive BDPUs. Default: 2 seconds.

Default Configuration

The default hello time is 2 seconds.

Command Modes

Global Configuration Mode

User Guidelines

This command can be configured even if the switch is configured for MST(RSTP) mode. It is only used when the switch is configured for STP-PV or RSTP-PV modes.

Set this value to a lower number to accelerate discovery of topology changes.

Use the ***no*** form of the command to return the hello time to its default value.

Example

```
console(config)#spanning-tree vlan 3 hello-time 1
```

spanning-tree vlan max-age

Use the **spanning-tree vlan max-age** command to configure the spanning tree maximum age time for a set of VLANs. Use the **no** form of the command to return the maximum age timer to the default value.

Syntax

spanning-tree vlan *vlan-list* **max-age** *6-40*

no spanning-tree vlan *vlan-list*> **max-age**

- max-age — The maximum age time before a bridge port saves its configuration information.

Default Configuration

The default maximum aging time is 20 seconds.

Command Modes

Global Configuration Mode

User Guidelines

Set this value to a lower number to accelerate discovery of topology changes. The network operator must take into account the end to end BPDU propagation delay and message age overestimate for their specific topology when configuring this value.

The default setting of 20 seconds is suitable for a network of diameter 7, lost message value of 3, transit delay of 1, hello interval of 2 seconds, overestimate per bridge of 1 second, and a BPDU delay of 1 second. For a network of diameter 4, a setting of 16 seconds is appropriate if all other timers remain at their default values. IEEE 802.1Q notes that RSTP and MSTP treat the common spanning tree message age field as a hop count. Section 13.37 Performance discusses appropriate and recommended values and further refers the network operator to the discussion in IEEE 802.1D section 17.14. In particular, operators should make themselves of the requirement that bridges must enforce the following constraint:

2 × (*Bridge_Forward_Delay* – 1.0 *seconds*) >= *Bridge_Max_Age* >= 2 × (*Bridge_Hello_Time* + 1.0 *seconds*)

Example

```
console(config)#spanning-tree vlan 3 max-age 18
```

spanning-tree vlan root

Use the **spanning-tree vlan root primary** command to configure the switch to become the root bridge or standby root bridge by modifying the bridge priority from the default value to a lower value calculated to ensure the bridge is the root (or standby) bridge. Use the **no** form of the command to let the network elect the root bridge.

Syntax

spanning-tree vlan *vlan-list* **root** {**primary** | **secondary**}

no spanning tree vlan *vlan-list* **root**

Default Configuration

The default bridge priority value is 32768.

Command Modes

Global Configuration mode

User Guidelines

This command can be configured even if the switch is configured for MST (RSTP) mode. It is only used when the switch is configured for STP-PV or RSTP-PV modes.

The logic sets the bridge priority to a value lower (primary) or next lower (secondary) than the lowest bridge priority for the specified VLAN or a range of VLANs. This command only applies when STP-PV or RSTP-PV is enabled.

Configuration of the bridge priority is given preference over configuration of the root primary or root secondary configuration, which is given preference over the configuration of DirectLink Rapid Convergence.

Example

```
console(config)#spanning-tree vlan 3 root primary
```

spanning-tree vlan priority

Use the **spanning-tree vlan priority** command to configure the bridge priority of a VLAN. The bridge priority is combined with the MAC address of the switch and is used to select the root bridge for the VLAN. Use the **no** form of the command to return the priority to the default value.

Syntax

spanning-tree vlan {*vlan-list*} **priority** *priority*

no spanning-tree vlan {*vlan-list*} **priority**

- *vlan-list*–A single VLAN ID or a list of VLAN IDs in comma delineated or range format with no embedded blanks. Range 1-4093.
- *priority* –The bridge priority advertised when combined with the switch MAC address. Range 0-61440.

Default Configuration

The default bridge priority is 32768.

Valid values are 0, 4096, 8192, 12288, 16384, 20480, 24576, 28672, 32768, 36864, 40960, 45056, 49152, 53248, 57344, and 61440. The default value is 32768.

If the value configured is not among the specified values, it will be rounded off to the nearest valid value.

Command Modes

Global Configuration mode

User Guidelines

This command can be configured even if the switch is configured for MST(RSTP) mode. It is only used when the switch is configured for STP-PV or RSTP-PV modes.

The root bridge for a VLAN should be carefully selected to provide optimal paths for traffic through the network. Generally, this means selecting a switch that is well-connected with other switches in the network.

Configuration of the bridge priority is given preference over configuration of the root primary or root secondary configuration, which is given preference over the configuration of DirectLink Rapid Convergence.

Example

This example configures a switch to be the spanning tree root bridge for VLANs 12, 13, 24, 25, and 26. This presumes other switches in the network utilize the default bridge priority configuration.

```
console(config)#spanning-tree vlan 12,13,24-26 priority 8192
```

UDLD Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The UDLD feature detects unidirectional links on physical ports. A unidirectional link is a forwarding anomaly in a Layer 2 communication channel in which a bi-directional link stops passing traffic in one direction. UDLD must be enabled on the both sides of the link in order to detect a unidirectional link. The UDLD protocol operates by exchanging packets containing information about neighboring devices.

UDLD enabled devices send announcements to the multicast destination address 01-00-0c-cc-cc-cc. UDLD packets are transmitted using SNAP encapsulation, with OUI value 0x00000c (Cisco) and protocol ID 0x0111.

UDLD is supported on individual physical ports that are members of port channel interface. If any of the aggregated links becomes unidirectional, UDLD detects it and disables the individual link, but not the entire port channel. This improves fault tolerance of port-channel.

UDLD PDUs act as network control packets. They are unaffected by Spanning Tree state. Thus, they are transmitted and received regardless of Spanning Tree state.

For the successful operation of UDLD, it is required that its neighbors are UDLD-capable and UDLD is enabled on the corresponding ports. All ports should also be configured to use the same mode of UDLD, either normal or aggressive mode.

Detecting Unidirectional Links on a Device Port

A device detects unidirectional links on its port via UDLD. Every UDLD-capable device distributes service information over the network via a layer 2 broadcast frame. This service frame contains information about sender (source device) and all discovered neighbors. Every sender expects to receive an UDLD echo frame. If an echo frame is received, but does not contain information about the sender itself, it implies that the sender's frames have not reached the neighbors. This can happen when the link is able to receive traffic but cannot send traffic. In other words, a UDLD-capable device can recognize only the sending failures on unidirectional links. If all devices in the network support UDLD, this functionality is enough to detect all unidirectional links.

Processing UDLD Traffic from Neighbors

Every UDLD-capable device collects information about all other UDLD-capable devices. Each device populates UDLD echo packets with collected neighbor information to help neighbors identify unidirectional links. Every frame basically contains the device ID of the sender and the collection of device IDs of its discovered neighbors.

UDLD in Normal-mode

In normal mode, a port's state is classified as **undetermined** if an anomaly exists. These include the absence of its own information in received UDLD messages or the failure to receive UDLD messages. The state of **undetermined** has no effect on the operation of the port. The port is not disabled and continues operating as it previously did. When in normal mode, a port is diagnostically disabled for the following cases:

- **a** UDLD PDU is received from partner that does not have the port's own details (echo).
- **b** When there is a loopback, information sent out on a port is received back as is.

UDLD in Aggressive-mode

Aggressive mode differs from normal UDLD mode – it can diagnostically disable a port if the port does not receive any UDLD echo packets after a bidirectional connection was established. It expands the cases when port can be disabled. There can be several causes for a port not to receive UDLD echoes. These include:

- A link is up on one side and down on the other. This can occur on fiber ports if the transmit port is unplugged on one side.
- Loss of connectivity, i.e. the port is neither transmitting nor receiving, but the port also reports it is up.

UDLD will put the port into the diagnostically disabled state in the following cases:

- **a** When there is a loopback, the device ID and port ID sent out on a port is received back.
- **b** UDLD PDU is received from a partner does not have its own details (echo).
- **c** Bidirectional connection is established and no UDLD packets are received from the partner device within three times the message interval.
- **d** In aggressive mode, when the partner does not respond to an ECHO within 7 seconds.

udld enable (Global Configuration)

Use the **udld enable** command in Global Configuration mode to globally enable UDLD.

Use the no form of the command to globally disable UDLD.

Syntax

udld enable

no udld enable

Default Configuration

UDLD is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command globally enables UDLD. Interfaces must also be individually enabled for UDLD.

Example

This command globally enables UDLD.

```
console(config)#udld enable
```

udld reset

Use the **udld reset** command to reset (enable) all interfaces disabled by UDLD.

Syntax

udld reset

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The following commands will reset an interface disabled by UDLD:

- Use **udld reset** to reset all interfaces disabled by UDLD.
- The shutdown command followed by no shutdown interface configuration command.
- The no udld enable global configuration command followed by the udld enable command.
- The no udld port interface configuration command followed by the udld port or udld port aggressive interface configuration command.

Example

This example resets all UDLD disabled interfaces.

```
console#udld reset
```

udld message time

Use the **udld message time** command in Global Configuration mode to configure the interval between the transmission of UDLD probe messages on ports that are in the advertisement phase.

Use the **no** form of the command to return the message transmission interval to the default value.

Syntax

udld message time *message-interval*

no udld message time

- *message-interval*—UDLD message transmit interval in seconds. Range is 7 to 90 seconds.

Default Configuration

The default message transmit interval is 15 seconds.

Command Mode

Global Configuration mode

User Guidelines

Lower message time values will detect the unidirectional links more quickly at the cost of higher CPU utilization.

The message interval is also used to age out UDLD entries from the internal database. UDLD entries are removed after three times the message interval and the discovery process starts again.

Example

This example sets the UDLD message transmit interval to 10 seconds.

```
console(config)#udld message time 10
```

udld timeout interval

Use the **udld timeout interval** command in Global Configuration mode to configure the interval for the receipt of ECHO replies.

Use the **no** form of the command to return the value to the default setting.

Syntax

udld timeout interval *timeout-interval*

no udld timeout interval

- *timeout-interval*—UDLD timeout interval. Range is 5 to 60 seconds.

Default Configuration

The default timeout interval is 5 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command sets the time interval used to determine if the link has bidirectional or unidirectional connectivity. If no ECHO replies are received within three times the message interval, then the link is considered to have unidirectional connectivity.

Example

This example sets the UDLD timeout interval to 15 seconds.

```
console(config)#udld timeout interval 15
```

udld enable (Interface Configuration)

Use the **udld enable** command in Interface (physical) Configuration mode to enable UDLD on a specific interface.

Use the **no** form of the command to disable UDLD on an interface.

Syntax

udld enable

no udld enable

Default Configuration

UDLD is disabled by default on an interface. UDLD must be enabled globally and on an interface in order to operate.

Command Mode

Interface (physical) Configuration mode

User Guidelines

UDLD cannot be enabled on a port channel. Instead, enable UDLD on the physical interfaces of a port channel.

Example

This example enables UDLD on an interface. UDLD must also be enabled globally.

```
console(config-if-Te1/0/1)#udld enable
```

udld port

Use the **udld port** command in Interface (physical) Configuration mode to select the UDLD operating mode on a specific interface.

Use the **no** form of the command to reset the operating mode to the default (normal).

Syntax

udld port aggressive

no udld port

- aggressive—Sets the port to discover peers in aggressive mode.

Default Configuration

Normal mode is configured by default when UDLD is enabled on an interface.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

In aggressive mode, UDLD will attempt to detect a peer by sending an ECHO packet every seven seconds until a peer is detected.

Example

This example configure an interface to operate in UDLD aggressive mode.

```
console(config-if-Te1/0/1)#udld port aggressive
```

show udld

Use the **show udld** command in User Exec or Privileged Exec mode to display the global settings for UDLD.

Syntax

show udld [*interface-id*|all]

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec or User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

When no interface is specified, the following fields are shown:

Field	Description
Admin Mode	The global administrative mode of UDLD.
Message Interval	The time period (in seconds) between the transmission of UDLD probe packets.
Timeout Interval	The time period (in seconds) before making decision that link is unidirectional.

When an interface ID is specified, the following fields are shown:

Field	Description
Interface Id	The interface identifier in short form, e.g. te1/0/1.
Admin Mode	The administrative mode of UDLD configured on this interface. This is either **Enabled** or **Disabled**.
UDLD Mode	The UDLD mode configured on this interface. This is either **Normal** or **Aggressive**.

Field	Description
UDLD Status	The status of the link as determined by UDLD. The options are: • **Undetermined** – UDLD has not collected enough information to determine the state of the port. • **Not applicable** – UDLD is disabled, either globally or on the port. • **Shutdown** – UDLD has detected a unidirectional link and shutdown the port. That is, the port is in the D-Disable state. • **Bidirectional** - UDLD has detected a bidirectional link. • **Undetermined (Link Down)** – The port transitions into this state when the port link physically goes down due to any reasons other than the port being put into D-Disable mode by the UDLD protocol on the switch.

Command History

Modified in version 6.5 firmware.

Example

The output of the **show udld all** command must (at least) show the err-disable status for UDLD err-disabled interfaces and shutdown for the administratively disabled interfaces.

```
console#show udld all

Interface Admin Mode UDLD Mode   UDLD Status
--------- ---------- ----------- ----------------
Gi1/0/1   Enabled    Aggressive  Err-disabled (Link Down)
Gi1/0/2   Enabled    Aggressive  UDLD Err-disabled
Gi1/0/3   Enabled    Aggressive  Shutdown (Link Down)
Gi1/0/4   Disabled   Normal      Not Applicable
Gi1/0/5   Disabled   Normal      Not Applicable
```

VLAN Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking 802.1Q VLANs are an implementation of the Virtual Local Area Network, specification 802.1Q. Operating at Layer 2 of the OSI model, the VLAN is a means of parsing a single network into logical user groups or organizations as if they physically resided on a dedicated LAN segment of their own. In reality, this virtually defined community may have individual members scattered across a large, extended LAN. The VLAN identifier is part of the 802.1Q tag, which is added to an Ethernet frame by an Q-compliant switch or router. Devices recognizing 802.1Q-tagged frames maintain appropriate tables to track VLANs. The first three bits of the 802.1Q tag are used by 802.1p to establish priority for the packet.

Dell EMC Networking switches supports 802.1Q VLANs. As such, ports may simultaneously belong to multiple VLANs. VLANs allow a network to be logically segmented without regard to the physical locations of devices in the network.

Dell EMC Networking switches supports up to 4093 VLANs for forwarding. Interfaces can be configured in trunk mode (multiple VLAN support) or access mode (single VLAN support).

VLANs can be allocated by subnet and netmask pairs, thus allowing overlapping subnets. For example, subnet 10.10.128.0 with Mask 255.255.128.0 and subnet 10.10.0.0 with Mask 255.255.0.0 can have different VLAN associations.

Access, trunk and general mode VLAN configurations are maintained independently by the switch and take affect when the interface is configured in the relevant mode. In other words, trunk mode VLAN configuration only affects an interface when it is configured in trunk mode. When the interface is configured in trunk mode, access and general mode VLAN configuration is ignored.

Double VLAN Mode

An incoming frame is identified as tagged or untagged based on Tag Protocol Identifier (TPID) value it contains. The IEEE 802.1Q standard specifies a TPID value (0x8100) to recognize an incoming frame as tagged or untagged. Any valid Ethernet frame with a value of 0x8100 in the 12th and 13th bytes is recognized as a tagged frame.

Dell EMC Networking N-Series switches can be configured to enable the port in double-VLAN (QinQ) mode. In this mode, the switch looks for 12th, 13th, 16th, and 17th bytes for the tag status in the incoming frame. The outer tag TPID is identified by the 12th and 13th bytes values. The inner tag TPID is identified by 16th and 17th bytes values. These two TPID values can be different or the same. VLAN normalization, source MAC learning, and forwarding are based on the outer value in a received frame.

Independent VLAN Learning

Independent VLAN Learning (IVL) allows unicast address-to-port mappings to be created based on a MAC Address in conjunction with a VLAN ID.

This arrangement associates the MAC Address only with the VLAN on which the frame was received. Therefore, frames are forwarded based on their unicast destination address as well as their VLAN membership. This configuration affords multiple occurrences of an address in the forwarding database. Each address associates with a unique VLAN. Care must be taken in the administration of networks, as multiple instances of a MAC address, each on a different VLAN, can quickly eat up address entries.

Each VLAN is associated with its own forwarding database. Hence the number of forwarding databases equals the number of VLANs supported.

The MAC address stored is supplemented by a 2-byte VLAN ID. The first 2 bytes of a forwarding database entry contain the VLAN ID associated, and the next 6 bytes contain the MAC address. There is a one-to-one relationship between VLAN ID and FID (forwarding database ID).

Protocol Based VLANs

The main purpose of Protocol-based VLANs (PBVLANs) is to selectively process packets based on their upper-layer protocol by setting up protocol-based filters. Packets are bridged through user-specified ports based on their protocol.

In PBVLANs, the VLAN classification of a packet is based on its protocol (IP, IPX, NetBIOS, and so on). PBVLANs help optimize network traffic because protocol-specific broadcast messages are sent only to end stations using that protocol. End stations do not receive unnecessary traffic, and bandwidth is used more efficiently. It is a flexible method that provides a logical grouping of users. An IP subnet or an IPX network, for example, can each be assigned its own VLAN. Additionally, protocol-based classification allows an administrator to assign nonrouting protocols, such as NetBIOS or DECnet, to larger VLANs than routing protocols like IPX or IP. This maximizes the efficiency gains that are possible with VLANs.

In port-based VLAN classification, the Port VLAN Identifier (PVID) is associated with the physical ports. The VLAN ID (VID) for an untagged packet is equal to the PVID of the port. In port-and protocol-based VLAN classifications, multiple VIDs are associated with each of the physical ports. Each VID is also associated with a protocol. The ingress rules used to classify incoming packets include the use of the packet's protocol, in addition to the PVID, to determine the VLAN to which the packet belongs. This approach requires one VID on each port for each protocol for which the filter is desired.

IP Subnet Based VLANs

This feature allows an untagged packet to be placed in a configured VLAN based upon its IP address.

MAC-Based VLANs

This feature allows an untagged packet to be placed in a configured VLAN based upon its MAC address.

Private VLAN Commands

The Dell EMC Networking Private VLAN feature separates a regular VLAN domain into two or more subdomains. Each subdomain is defined (represented) by a primary VLAN and a secondary VLAN. The primary VLAN ID is the same for all subdomains that belong to a private VLAN. The secondary VLAN ID differentiates subdomains from each another and provides Layer 2 isolation between ports of the same private VLAN. There are the following types of VLANs within a private VLAN:

- Primary VLAN

  Forwards the traffic from the promiscuous ports to isolated ports, community ports and other promiscuous ports in the same private VLAN. Only one primary VLAN can be configured per private VLAN. All ports within a private VLAN share the same primary VLAN.

- Isolated VLAN

  Is a secondary VLAN. It carries traffic from isolated ports to promiscuous ports. Only one isolated VLAN can be configured per private VLAN.

- Community VLAN

  Is a secondary VLAN. It forwards traffic between ports which belong to the same community and to the promiscuous ports. There can be multiple community VLANs per private VLAN.

Three types of port designations exist within a private VLAN:

- Promiscuous port

  Belongs to a primary VLAN and can communicate with all interfaces in the private VLAN, including other promiscuous ports, community ports and isolated ports. An endpoint connected to a promiscuous port is allowed to communicate with any endpoint within the private VLAN. Multiple promiscuous ports can be defined for a single private VLAN domain.

- Promiscuous trunk port

  An endpoint connected to a promiscuous trunk port is allowed to communicate with all the endpoints within the private VLAN and also with other ports participating in normal VLANs. These ports carry the traffic of multiple primary VLANs towards the upstream router as well as the traffic for regular VLANs.

- Isolated trunk port

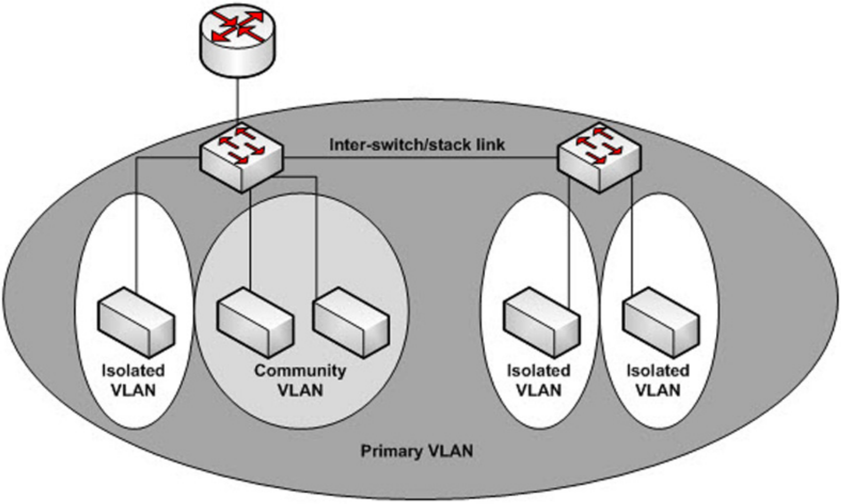
  Isolated trunk ports carry tagged traffic of multiple secondary (isolated) VLANs and regular VLANs to and from downstream devices that are private VLAN unaware. Downstream devices connected to isolated trunk ports communicate with the private VLAN aware switches using isolated VLANs and normal VLANs. Isolated trunk ports may be part of multiple private VLANs.

- Host port

  Belongs to a secondary VLAN and depending upon the type of secondary VLAN can either communicate with other ports in the same community (if the secondary VLAN is the community VLAN) and with the promiscuous ports or can communicate only with the promiscuous ports (if the secondary VLAN is an isolated VLAN).

The Private VLANs can be extended across multiple switches through inter-switch/stack links that transport primary, community and isolated VLANs between devices, as shown in Figure 3-1.

Figure 3-1. Private VLANs



Isolated VLAN

An endpoint connected over an isolated VLAN is allowed to communicate with endpoints connected to promiscuous ports only. Endpoints connected to adjacent endpoints over an isolated VLAN cannot communicate with each other.

Community VLAN

An endpoint connected over a community VLAN is allowed to communicate with the endpoints within the community and can also communicate with any configured promiscuous port. The endpoints which belong to one community cannot communicate with endpoints which belong to a different community or with endpoints connected over isolated VLANs.

Private VLAN Operation in the Switch Environment

The Private VLAN feature operates in a stacked or single switch environment. The stack links are transparent to the configured VLAN, thus there is no need for special private VLAN configuration. Any private VLAN port can reside on any stack member.

In order to enable Private VLAN operation across multiple switches which are not stacked, the inter-switch links should carry VLANs which belong to a private VLAN. The trunk ports which connect neighbor switches have to be assigned to the primary, isolated, and community VLANs of a private VLAN.

In regular VLANs, ports in the same VLAN switch traffic at L2. However for private VLAN, the promiscuous port is in the primary VLAN whereas the isolated or community ports are in the secondary VLAN. Similarly, for broadcasts, in regular VLANs, ports in the same VLAN receive broadcast traffic. However, for private VLANs, the ports to which the broadcast traffic is forwarded depend on the type of port on which the traffic was received. If the received port is a host port; the traffic is forwarded to all promiscuous and trunk ports. If the received port is community port the broadcast traffic is forwarded to promiscuous, trunk and community ports in the same VLAN. A promiscuous port sends traffic to other promiscuous ports, isolated and community ports.

interface vlan

Use the **interface vlan** command in Global Configuration mode to enable L3 on a VLAN and enter VLAN Interface Configuration mode. Use the **no** form of the command to disable routing on the VLAN.

Syntax

interface vlan {*vlan-id*}

no interface vlan { *vlan-id* }

- *vlan-id*—The ID of a valid VLAN (Range 1–4093).

Default Configuration

By default, Layer 3 is enabled on VLAN 1 on the N1100-ON/N1500/N2000/N2100-ON/N2200-ON Series switches. However, VLAN routing interfaces do not route packets until an IP address is assigned to the VLAN and IP routing is globally enabled. DHCP and Layer 3 are not enabled on VLAN 1 by default for the N3000-ON, N3100-ON, and N3200-ON Series switches. DHCP is enabled on VLAN 1 by default for the N1100-ON/N1500/N2000/N2100-ON/N2200-ON switches. The N1100-ON does not support routing.

Command Mode

VLAN Configuration or Global Configuration modes

User Guidelines

Assigning an IP address to a VLAN interface enables Layer 3 on the VLAN interface. If IP routing is globally enabled and an IP address is assigned, the router will route packets to and from the VLAN. When an interface is enabled for routing using the **interface vlan** command, the port will no longer be operationally enabled as a protected port on the interface.

Use the **no** form of the command to remove empty interface vlan entries from the running config.

Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the L3 address of the switch. Packets received over the configured VLAN which are addressed to the L3 address are processed by the switch CPU. This includes SNMP/HTTP/Telnet/SNMP and any other configured management protocols. If a subsequent VLAN is configured with an IP address, the prior VLAN configuration is removed. Dell EMC N1100-ON switches do not support routing.

When an interface is enabled for routing, the port will no longer be operationally enabled as a protected port on the interface. Routing cannot be operationally enabled on a port that is a member of a port-channel or a port mirroring probe port.

Examples

```
console(config-vlan10)# interface vlan 10
console(config-if-vlan10)#
```

interface range vlan

Use the **interface range vlan** command in Global Configuration mode to enable routing on a range of VLANs and to execute a command on multiple VLANs at the same time.

Syntax

interface range vlan {*vlan-id* **|** ***all***}

- *vlan-id* — A list of valid VLAN IDs to add. Separate nonconsecutive VLAN IDs with a comma and no spaces; use a hyphen to designate a range of IDs. (Range: 1–4093)
- **all** — All existing static VLANs.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The VLANs in the interface range must by configured and enabled for routing prior to use in the **vlan range** command. Commands used in the interface range context are executed independently on each interface in the range. If the command returns an error on one of the interfaces, an error message is displayed and execution continues on other interfaces.

Example

The following example groups VLAN 221 through 228 and VLAN 889 to execute the commands entered in interface range mode.

```
dellswitch(config)#vlan 2-5
dellswitch(config-vlan2-5)#exit
dellswitch(config)#interface vlan 2
dellswitch(config-if-vlan2)#interface vlan 3
dellswitch(config-if-vlan3)#interface vlan 4
dellswitch(config-if-vlan4)#interface vlan 5
dellswitch(config-if-vlan5)#interface range vlan 2-5
dellswitch(config-if)#
```

name (VLAN Configuration)

Use the **name** command in VLAN Configuration mode to configure the VLAN name. To return to the default configuration, use the **no** form of this command.

NOTE: This command cannot be configured for a range of interfaces (range context).

Syntax

name *vlan–name*

no name

- *vlan–name*—The name of the VLAN. Must be 1–32 characters in length.

Default Configuration

The default VLAN name is **default**.

Command Mode

VLAN Configuration mode

User Guidelines

The VLAN name may include any alphanumeric characters including a space, underscore, or dash. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may truncate entries at the first illegal character or reject the entry entirely. The name of VLAN 1 cannot be changed.

Example

The following example configures a VLAN name of **office2** for VLAN 2.

```
console(config)#vlan 2
console(config-vlan2)#name "RDU-NOC Management VLAN"
```

private-vlan

Use the **private-vlan** command in VLAN Configuration mode to define a private VLAN association between the primary and secondary VLANs.

Use the **no** form of the command to remove the private VLAN association.

Syntax

private-vlan {**primary**|**isolated**|**community**|**association** [**add**|**remove**] *vlan-list*}

no private-vlan [**association**]

- **association**—Defines an association between the primary VLAN and secondary VLANs.
- **primary**—Specify that the selected VLAN is the primary VLAN.
- **community**—Specify that the selected VLAN is the community VLAN.
- **isolated**—Specify that the selected VLAN is the isolated VLAN.
- **add**—Associates a secondary VLAN with the primary VLAN.
- **remove**—Deletes the secondary VLAN association with the primary VLAN.
- *vlan-list*—A list of secondary VLAN ids to be mapped to a primary VLAN. The VLAN list can contain multiple entries separated by commas and containing no spaces. Each entry can be a single VLAN id or a hyphenated range of VLANs.

Default Configuration

This command has no default setting.

Command Mode

VLAN Configuration mode

User Guidelines

A community VLAN carries traffic among community ports and from community ports to the promiscuous ports on the corresponding primary VLAN.

An isolated VLAN is used by isolated ports to communicate with promiscuous ports. It does not carry traffic to other community ports or other isolated ports with the same primary VLAN.

The primary VLAN is the VLAN that carries traffic from a promiscuous port to the private ports.

VLAN 1 cannot be configured in a private VLAN configuration.

Examples

```
console# configure terminal
console(config)# vlan 10
console(config-vlan)# private-vlan primary
console(config-vlan)# exit
```

```
console(config)# vlan 1001
console(config-vlan)# private-vlan isolated
console(config-vlan)# exit
console(config)# vlan 1002
console(config-vlan)# private-vlan community
console(config-vlan)# exit
console(config)# vlan 1003
console(config-vlan)# private-vlan community
console(config-vlan)# exit
console(config)# vlan 20
console(config-vlan)# private-vlan association 1001-1003
console(config-vlan)# end
```

protocol group

Use the **protocol group** command in VLAN Configuration mode to attach a VLAN ID to the protocol-based group identified by *groupid*. A group may only be associated with one VLAN at a time. However, the VLAN association can be changed. The referenced VLAN should be created prior to the creation of the protocol-based group except when GVRP is expected to create the VLAN.

To detach the VLAN from this protocol-based group identified by this *groupid*, use the **no** form of this command.

Syntax

protocol group *group-id vlan-id*

no protocol group *group-id vlan-id*

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command.
- *vlan-id* — A valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

VLAN Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to attach the VLAN ID “100” to the protocol-based VLAN group “3.”

```
console(config-vlan)#protocol group 3 100
```

protocol vlan group

Use the **protocol vlan group** command in Interface Configuration mode to add the physical unit/slot/port interface to the protocol-based group identified by *groupid*. A group may have more than one interface associated with it. Each interface and protocol combination can be associated with one group only. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command fails and the interface(s) are not added to the group. Ensure that the referenced VLAN is created prior to the creation of the protocol-based group except when GVRP is expected to create the VLAN.

To remove the interface from this protocol-based VLAN group that is identified by this *groupid*, use the **no** form of this command.

If you select **all**, all ports are removed from this protocol group.

Syntax

protocol vlan group *group-id*

no protocol vlan group *group-id*

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to add an Ethernet interface to the group ID of “2.”

```
console(config-if-Gi1/0/1)#protocol vlan group 2
```

protocol vlan group all

Use the **protocol vlan group all** command in Global Configuration mode to add all physical interfaces to the protocol-based group identified by *groupid*. A group may have more than one interface associated with it. Each interface and protocol combination can be associated with one group only. If adding an interface to a group causes any conflicts with protocols currently associated with the group, this command fails and the interface(s) are not added to the group. Ensure that the referenced VLAN is created prior to the creation of the protocol-based group except when GVRP is expected to create the VLAN.

To remove all interfaces from this protocol-based group that is identified by this *groupid*, use the **no** form of the command

Syntax

protocol vlan group all *group-id*

no protocol vlan group all *group-id*

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to add all physical interfaces to the protocol-based group identified by group ID “2.”

```
console(config)#protocol vlan group all 2
```

show dot1q-tunnel

Use the **show dot1q-tunnel** command to display the QinQ status for each interface.

Syntax

show dot1q-tunnel [**interface** *interface-id*]

Default Configuration

If no interfaces are specified, information is shown for all interfaces.

Command Mode

Privileged Exec mode and all show modes

User Guidelines

Up to three additional TPIDs can be configured. The 802.1Q tag is pre-defined in the system and cannot be removed.

It is not possible to configure an inner TPID value other than 0x8100.

The primary TPID is shown in the EtherType column. The primary TPID is placed in the outer tag for traffic egressing the interface. The interface will process incoming traffic as double tagged if any of the configured TPIDs is present in the frames outer VLAN tag. Traffic with a TPID other than the configured TPID is processed normally, i.e. as if it is not double tagged.

Example

```
console(config)#show dot1q-tunnel interface all

Interface Mode    EtherType
--------- ------- --------------
Gi1/0/1   Disable 802.1
Gi1/0/2   Disable 802.1
Gi1/0/3   Disable 802.1
Gi1/0/4   Disable 802.1
Gi1/0/5   Disable 802.1
Gi1/0/6   Disable 802.1
```

show interfaces switchport

Use the **show interfaces switchport** command to display the complete switchport VLAN configuration for all possible switch mode configurations: access, dot1q-tunnel, general, trunk, and (private VLAN) host or (private VLAN) promiscuous.

Syntax

show interfaces switchport {{**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port| **fortygigabitethernet** unit/slot/port}}

Default Configuration

If no interface parameter is given, all interfaces are shown.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Each of the switchport modes can be configured independently for a port or port channel. The configurations are retained even when the port is configured in a different mode.

It is recommended that the private VLAN host ports be configured as spanning-tree portfast.

The command displays the following information.

Parameter	Description
Private-vlan host-association	Displays the VLAN association for the private-VLAN host ports.
Private-vlan mapping	Displays the VLAN mapping for the private-VLAN promiscuous ports.
Private-vlan trunk native VLAN	Displays native VLAN for the promiscuous ports.
Private-vlan trunk normal VLANs	Displays a list of normal VLANs for the promiscuous trunk ports.
Private-vlan trunk mappings	Displays mappings of all the primary VLANs and their associated secondary VLANs of promiscuous trunk ports.
Private-vlan trunk associations	Displays associations of all the primary VLANs and their associated isolated VLANs of isolated trunk ports.
Operational Private VLANs	Displays operational private VLANs on this interface.

Examples

The following example displays switchport configuration individually for gi1/0/1.

```
switch-top(config-if-Gi1/0/1)#show interfaces switchport gi1/0/1

Port: Gi1/0/1
VLAN Membership Mode: Trunk Mode
Access Mode VLAN: 1 (default)
General Mode PVID: 1 (default)
General Mode Ingress Filtering: Enabled
General Mode Acceptable Frame Type: Admit All
General Mode Dynamically Added VLANs:
General Mode Untagged VLANs: 1
General Mode Tagged VLANs:
General Mode Forbidden VLANs:
Trunking Mode Native VLAN: 1 (default)
Trunking Mode Native VLAN Tagging: Disabled
Trunking Mode VLANs Enabled: 1-99,101-4093
Private VLAN Host Association: none
Private VLAN Mapping:
Private VLAN Operational Bindings:
```

```
Default Priority: 0
Protected: Disabled
Forbidden VLANS:
VLAN       Name
----       ---------
73         Out
```

show port protocol

Use the **show port protocol** command to display the Protocol-Based VLAN information for either the entire system or for the indicated group.

Syntax

show port protocol {*group-id* | **all**}

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command.
- **all** — Enter **all** to show all interfaces.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the Protocol-Based VLAN information for either the entire system.

```
console#show port protocol all
                Group
Group Name       ID     Protocol(s)  VLAN   Interface(s)
---------------  -----  ----------  ----   ------------
test             1      IP          1      gi1/0/1
```

show switchport ethertype

Use the **show switchport ethertype** to display the configured Ethertype for each interface.

Syntax

show switchport ethertype [**interface** *interface-id* **|** **all**]

- *interface-id*—A physical interface or port channel.
- **all**—All interfaces.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode and all Show modes

User Guidelines

Up to three additional TPIDs can be configured. The 802.1Q TPID is pre-configured in the system and may not be removed.

It is not possible to configure an inner VLAN TPID value other than 0x8100.

The primary TPID is shown in the EtherType column. The primary TPID is placed in the outer tag for traffic egressing the interface. The interface will process traffic as double tagged if any of the configured TPIDs is present in the frames outer VLAN tag. Traffic with a TPID other than the configured TPID is processed normally, i.e. as if it is not double tagged.

Example

This example shows the various invocations of the command.

```
console(config)#show switchport ethertype

Default TPID.................................. 802.1
Configured TPIDs.............................. vMAN Custom (1010)


console(config)#show switchport ethertype interface gi1/0/1
```

```
Interface EtherType Secondary TPIDs
--------- --------- ---------------
Gi1/0/1   802.1

console(config-vlan10)#show switchport ethertype interface all


console(config)#show switchport ethertype interface gi1/0/1

Interface EtherType Secondary TPIDs
--------- --------- ---------------
Gi1/0/1   802.1
Gi1/0/2   802.1     VMAN
Gi1/0/3   802.1
Gi1/0/4   802.1
Gi1/0/5   802.1
```

show vlan

Use the **show vlan** command to display detailed information, including interface information and dynamic VLAN type, for a specific VLAN or RSPAN VLAN. The ID is a valid VLAN identification number.

Syntax

show vlan [**id** *vlan-id* | *name vlan-name*]

- *vlan-id*—A VLAN identifier
- *vlan-name*—A valid VLAN name (Range 1-32 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

- VLAN—The VLAN identifier
- Name—The VLAN name

- Ports—The port membership for the VLAN
- Type—The type of VLAN (default, static, dynamic)

Example

This shows all VLANs and RSPAN VLANs.

```
console#show vlan

VLAN   Name                               Ports          Type
-----  ---------------                    -------------  --------------
1      default                            Po1-128,       Default
                                          Gi1/0/1-48
10                                                       Static

RSPAN Vlan
-------------------------------------------------------------------
10
```

This example shows information for a specific VLAN ID.

```
console#show vlan id 10

VLAN   Name                                Ports          Type
-----  ---------------                    -------------  --------------
10                                         Te1/0/1        Static

RSPAN Vlan
-------------------------------------------------------------------
Enabled
```

This example shows information for a specific VLAN name.

```
console#show vlan name myspan

VLAN   Name                                Ports          Type
-----  ---------------                    -------------  --------------
10     myspan                              Te1/0/1        Static

RSPAN Vlan
-------------------------------------------------------------------
Enabled
```

show vlan association mac

Use the **show vlan association mac** command to display the VLAN associated with a specific configured MAC address. If no MAC address is specified, the VLAN associations of all the configured MAC addresses are displayed.

Syntax

show vlan association mac [*mac-address*]

- *mac-address* — Specifies the MAC address to be entered in the list. (Range: Any valid MAC address)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

- MAC Address—The configured MAC address
- VLAN —The associated VLAN identifier

Example

The following example shows no entry in MAC address to VLAN cross-reference.

```
console#show vlan association mac
MAC Address              VLAN ID
-----------------------  -------
0001.0001.0001.0001        1
```

show vlan association subnet

Use the **show vlan association subnet** command to display the VLAN associated with a specific configured IP-Address and netmask. If no IP Address and net mask are specified, the VLAN associations of all the configured IP-subnets are displayed.

Syntax

show vlan association subnet [*ip-address ip-mask*]

- *ip-address* — Specifies IP address to be shown
- *ip-mask* — Specifies IP mask to be shown

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

- IP Address—The configured IP address
- IP Mask—The configured IP subnet mask
- VLAN ID—The associated VLAN identifier

Example

The following example shows the case if no IP Subnet to VLAN association exists.

```
console#show vlan association subnet
IP Address       IP Mask          VLAN ID
---------------- ---------------- -------
The IP Subnet to VLAN association does not exist.
```

show vlan private-vlan

Use the **show vlan private-vlan** command to display information about the configured private VLANs including primary and secondary VLAN IDs, type (community, isolated, or primary), and the ports which belong to a private VLAN.

Syntax

show vlan private-vlan [**type**]

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Do not configure private VLANs on ports configured with any of these features:

- Link Aggregation Control Protocol (LACP)
- Multicast VLAN Registration (MVR)
- Voice VLAN

It is recommended that the private VLAN host ports be configured as spanning-tree portfast.

The command displays the following information.

Parameter	Description
Primary	Primary VLAN ID.
Secondary	Secondary VLAN ID.
Type	Secondary VLAN type. Use the **type** parameter to display only private VLAN ID and its type.
Ports	Ports that are associated with a private VLAN.

switchport access vlan

Use the **switchport access vlan** command in Interface Configuration mode to configure the PVID VLAN ID when the interface is in access mode. To reconfigure the interface to use the default VLAN, use the **no** form of this command.

Syntax

switchport access vlan *vlan-id*

no switchport access vlan

- *vlan-id* — The identifier of the VLAN associated with the access port.

Default Configuration

This command has no default values.

Command Mode

Interface Configuration (Ethernet and port channel) mode

User Guidelines

This command configures the interface access mode VLAN membership. The **no** form of the command sets the access mode VLAN membership to VLAN 1. It is possible to configure the access mode VLAN identifier when the port is in general or trunk mode. Doing so does not change the VLAN membership of the interface until the interface is configured into access mode.

If the VLAN identified in the command has not been previously created, the system creates the VLAN, issues a message, and associates the VLAN with the interface.

Examples

The following example configures interface gi1/0/8 to operate in access mode with a VLAN membership of 23. Received untagged packets are processed on VLAN 23. Received packets tagged with VLAN 23 are also accepted. Other received tagged packets are discarded.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport access vlan 23
```

The following example sets the PVID for interface Gi1/0/12 to VLAN ID 33. Since VLAN 33 does not exist, it is automatically created.

```
console(config)# interface gi1/0/12
console(config-if-Gi1/0/12)# switchport access vlan 33
Access VLAN does not exist. Creating VLAN 33
```

switchport dot1q ethertype (Global Configuration)

Use the **switchport dot1q ethertype** command to define additional QinQ tunneling TPIDs for matching in the outer VLAN tag of received frames. Use the **no** form of the command to remove the configured TPIDs.

Syntax

switchport dot1q ethertype { **vman** | **custom** *1-65535* }

no switchport dot1q ethertype { **vman** | **custom** *1-65535* }

- **vman**—Define the Ethertype as 0x88A8.
- **custom**—Define the Ethertype as a 16 bit user defined value (in decimal).

Default Configuration

802.1Q is the default Ethertype for both inner and outer VLAN TPIDs. The 802.1Q TPID cannot be removed from the configuration.

By default QinQ processing of frames is disabled.

Command Mode

Global Configuration

User Guidelines

This command globally defines additional TPIDs for use by the system for matching of ingress packets in the outer tag. The switch uses the default primary TPID 0x8100 and any of the additional TPIDs to match packets in the outer tag on ingress. A TPID must be configured globally before it can be applied to an interface. Up to three additional TPIDs can be configured for acceptance in the outer VLAN tag on the SP port. Packets received on the SP port which do not contain one of the configured TPIDs or which do not contain the SP VLAN ID in the outermost VLAN tag are processed by the port as if they are not part of the QinQ tunnel.

Use the **no** form of the command to remove an additional TPID. Doing so removes the TPID from all interfaces. If the removed TPID is the primary TPID for an interface, the interface is configured to use the default primary TPID 0x8100.

Packets are always transmitted by the system using the primary TPID value in the outer VLAN tag.

It is not possible to configure an inner VLAN TPID value. The inner VLAN TPID value is always 802.1Q (0x8100).

Use the **switchport dot1q ethertype** Interface Configuration mode command to apply a configured TPID value to an interface.

Example

This example defines the VMAN (0x88A8) TPID for use on a service provider (SP) port and configures a service provider port (Te1/0/1) in general mode after creating the common SP/CE VLAN. The port is configured in general mode and to only allow tagged packets on ingress using the outer VLAN ID 10. Then, the port is configured to accept the VMAN TPID in the outer VLAN on ingress and further configured to tag packets with the VMAN TPID and VLAN ID 10 in the outer VLAN tag on egress.

This example configures an SP port using general mode.

```
console(config)#switchport dot1q ethertype vman
console(config)#vlan 10
console(config-vlan10)#exit
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#switchport mode general
console(config-if-Te1/0/1)#switchport general allowed vlan add 10 tagged
console(config-if-Te1/0/1)#switchport dot1q ethertype vman primary-tpid
```

This example configures an SP port using trunk mode.

```
console(config)#switchport dot1q ethertype vman
console(config)#vlan 10
console(config-vlan10)#exit
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#switchport mode trunk
console(config-if-Te1/0/1)#switchport trunk allowed vlan 10
console(config-if-Te1/0/1)#switchport trunk native vlan 10
console(config-if-Te1/0/1)#switchport dot1q ethertype vman primary-tpid
```

switchport dot1q ethertype (Interface Configuration)

Use the **switchport dot1q ethertype** command to apply previously defined QinQ tunneling TPIDs to a service provider interface. Use the **no** form of the command to remove the configured TPIDs.

Syntax

switchport dot1q ethertype { **802.1Q** | **vman** | **custom** *0-65535* } [**primary-tpid**]

no switchport dot1q ethertype { **802.1Q** |**vman** | **custom** *0-65535* } [**primary-tpid**]

- **802.1Q**—Allow ingress frames with Ethertype 0x8100.
- **vman**—Define the Ethertype as 0x88A8.
- **custom**—Define the Ethertype as a 16 bit user defined value (in decimal).
- **primary-tpid**—Set the outer VLAN tag TPID to be inserted in frames transmitted on an SP port. Also processes ingress frames with the configured Ethertype as double tagged.

Default Configuration

802.1Q is the default Ethertype for both inner and outer VLAN TPIDs.

By default QinQ processing of frames is disabled.

Command Mode

Interface Configuration mode (physical and port channel), Interface range mode (physical and port channel)

User Guidelines

This command applies a previously defined TPID to an interface. The TPID must be configured using the global configuration mode command before it can be applied to an interface. Up to 3 additional TPIDs for use in the outer VLAN tag may be configured.

The outer VLAN tag in tagged packets received on the interface is compared against the configured list of TPIDs. Frames that do not match any of the configured TPIDs are forwarded normally, i.e. without QinQ processing. Frames transmitted on the interface are always transmitted with the primary TPID inserted in the outer VLAN tag.

Use the **no** form of the command to remove the TPID from an interface.

Defining a new primary TPID command overwrites the existing primary TPID for an interface.

The **no** form of the command with the optional primary TPID specified sets the primary TPID value to 802.1Q (0x8100).

If the TPID value was not configured as a primary TPID and the no form the command includes the optional **primary-tpid** argument, the command will fail.

If the TPID value was configured as the primary TPID, and the no form of the command does not include the optional **primary-tpid** argument, the command will fail.

If a TPID value is configured as the primary TPID, and it is added again without the **primary-tpid** optional argument, the TPID will be treated as the primary TPID (the primary TPID includes the behavior of secondary TPIDs).

It is not possible to configure an inner VLAN TPID value. The inner VLAN TPID value is always 802.1Q (0x8100).

Example

This example defines the VMAN (0x88A8) TPID for use on a service provider port and configures a service provider port (Te1/0/1) in general mode. The general mode port is configured to only allow tagged packets on ingress using VLAN ID 10. Then, in the last command, the port is configured to accept the VMAN TPID in the outer VLAN on ingress and further configured to tag packets with the VMAN TPID in the outer VLAN tag on egress.

```
console(config)#switchport dot1q ethertype vman
console(config)#vlan 10
console(config-vlan10)#exit
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#switchport mode general
console(config-if-Te1/0/1)#switchport general allowed vlan add 10 tagged
console(config-if-Te1/0/1)#switchport dot1q ethertype vman primary-tpid
```

switchport general forbidden vlan

Use the **switchport general forbidden vlan** command in Interface Configuration mode to forbid adding specific VLANs to a general mode port. To revert to allowing the addition of specific VLANs to the port, use the **remove** parameter of this command.

Syntax

switchport general forbidden vlan {**add** *vlan-list* | **remove** *vlan-list*}

- **add** *vlan-list* — List of valid VLAN IDs to add to the forbidden list. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs.
- **remove** *vlan-list* — List of valid VLAN IDs to remove from the forbidden list. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs.

Default Configuration

All VLANs allowed.

Command Mode

Interface Configuration (Ethernet and port channel) mode

User Guidelines

This configuration only applies to ports configured in general mode. It is possible to configure the general mode VLAN membership of a port while the port is in access or trunk mode. Doing so does not change the VLAN membership of the port until it is configured to be in general mode.

Example

The following example forbids adding VLAN numbers 234 through 256 to port 1/0/8.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport general forbidden vlan add 234-256
```

switchport general acceptable-frame-type tagged-only

Use the **switchport general acceptable-frame-type tagged-only** command in Interface Configuration mode to discard untagged frames at ingress. To enable untagged frames at ingress, use the **no** form of this command.

Syntax

switchport general acceptable-frame-type tagged-only

no switchport general acceptable-frame-type tagged-only

Default Configuration

All frame types are accepted at ingress.

Command Mode

Interface Configuration (Ethernet and port channel) mode

User Guidelines

It is possible to configure the general mode acceptable frame types of a port while the port is in access or trunk mode. Doing so does not change the configuration of the port until it is configured to be in general mode.

Example

The following example configures 1/0/8 to discard untagged frames at ingress.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport general acceptable-frame-type tagged-only
```

switchport general allowed vlan

Use the **switchport general allowed vlan** command in Interface Configuration mode to add VLANs to or remove VLANs from a general port.

Syntax

switchport general allowed vlan add *vlan-list* [**tagged** | **untagged**]

switchport general allowed vlan remove *vlan-list*

- **add** *vlan-list* — List of VLAN IDs to add. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs.
- **remove** *vlan-list* — List of VLAN IDs to remove. Separate nonconsecutive VLAN IDs with a comma and no spaces. Use a hyphen to designate a range of IDs.
- **tagged** — Sets the port to transmit tagged packets for the VLANs. If the port is added to a VLAN without specifying tagged or untagged, the default is untagged.
- **untagged** — Sets the port to transmit untagged packets for the VLANs.

Default Configuration

Untagged.

Command Mode

Interface Configuration (Ethernet and port channel) mode

User Guidelines

Use this command to change the egress rule (for example, from tagged to untagged) without first removing the VLAN from the list.

It is possible to configure the general mode VLAN membership of a port while the port is in access or trunk mode. Doing so does not change the VLAN membership of the port until it is configured to be in general mode.

Example

The following example shows how to add VLANs 1, 2, 5, and 8 to the allowed list.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport general allowed vlan add 1,2,5,8
tagged
```

switchport general ingress-filtering disable

Use the **switchport general ingress-filtering disable** command in Interface Configuration mode to disable port ingress filtering. To enable ingress filtering on a port, use the **no** form of this command.

Syntax

switchport general ingress-filtering disable

no switchport general ingress-filtering disable

Default Configuration

Ingress filtering is enabled.

Command Mode

Interface Configuration Ethernet and port-channel mode

User Guidelines

Ingress filtering, when enabled, discards received frames that are not tagged with a VLAN for which the port is a member. If ingress filtering is disabled, tagged frames from all VLANs are processed by the switch.

Example

The following example shows how to enables port ingress filtering on Gigabit Ethernet interface 1/0/8.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport general ingress-filtering enable
```

switchport general pvid

Use the **switchport general pvid** command in Interface Configuration mode to configure the Port VLAN ID (PVID) when the interface is in general mode. Use the **switchport mode general** command to set the VLAN membership mode of a port to "general." To configure the default value, use the **no** form of this command.

Syntax

switchport general pvid *vlan-id*

no switchport general pvid

- *vlan-id* — PVID. The VLAN ID may belong to a non-existent VLAN.

Default Configuration

The default value for the *vlan-id* parameter is 1 when the VLAN is enabled. Otherwise, the value is 4093.

Command Mode

Interface Configuration Ethernet and port-channel mode

User Guidelines

Setting a new PVID does NOT remove the previously configured PVID VLAN from the port membership.

Example

The following example shows how to configure the PVID for 1/0/8, when the interface is in general mode.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport general pvid 234
```

switchport mode

Use the **switchport mode** command in Interface Configuration mode to configure the VLAN membership mode of a port. To reset the mode to the appropriate default for the switch, use the **no** form of this command.

Syntax

switchport mode {**access** | **trunk** | **general**}

no switchport mode

- **access**—An access port connects to a single end station belonging to a single VLAN. An access port is configured with ingress filtering enabled and will accept either an untagged frame or a packet tagged with the access port VLAN. Tagged packets received with a VLAN other than the access port VLAN are discarded. An access port transmits only untagged packets.
- **trunk**—A trunk port connects two switches. A trunk port may belong to multiple VLANs. A trunk port accepts only packets tagged with the VLAN IDs of the VLANs to which the trunk is a member or untagged packets if

configured with a native VLAN. A trunk port only transmits tagged packets for member VLANs other than the native VLAN and untagged packets for the native VLAN.

- **general**—Full 802.1Q support VLAN interface. A general mode port is a combination of both trunk and access ports capabilities. It is possible to fully configure all VLAN features on a general mode port. Both tagged and untagged packets may be accepted and transmitted.

Default Configuration

The default switchport mode is **access**.

Command Mode

Interface Configuration Ethernet and port-channel mode

User Guidelines

This command has no user guidelines.

Example

The following example configures Gi1/0/5 to access mode.

```
console(config)#interface gigabitethernet 1/0/5
console(config-if-Gi1/0/5)#switchport mode access
```

switchport mode dot1q-tunnel

Use the **switchport mode dot1q-tunnel** command to enable QinQ tunneling on customer edge (CE) interfaces. Use the **no** form of the command to return the interface to the default switchport mode (access).

Syntax

switchport mode dot1q-tunnel

no switchport mode dot1q-tunnel

Default Configuration

By default, QinQ processing of frames is disabled.

Command Mode

Interface mode (Ethernet and port channel), Interface range mode (Ethernet and port channel)

User Guidelines

This command configures a customer edge (CE) port for QinQ tunneling. The dot1q-tunnel mode is an overlay on switchport access mode. In particular, configuring the access mode PVID sets the outer dot1q-tunnel VLAN ID. Changing the switchport mode to access, general, or trunk, effectively disables tunneling on the interface.

Customer edge ports can be physical ports or port channels. Untagged frames received on the CE interface will be processed as if they belong to the PVID and will be transmitted out the SP interface with a single VLAN tag. Tagged frames received on the CE interface will be transmitted out the service provider (SP) interface with an outer tag containing the native VLAN ID and the inner tag as received on the CE interface.

CE interfaces must be configured in dot1q-tunnel mode with the PVID configured with the outer tag (native) VLAN ID for the associated service provider (SP) interface. Configure the outer VLAN ID using the **switchport access vlan** command. All MAC address learning and forwarding occurs on the outer VLAN tag. The VLAN ID must be common to both the SP port and the CE ports.

The service provider interface must be configured for egress tagging (trunk or general mode) with a native VLAN identical to the PVID of the associated CE ports. SP interfaces should be configured with a single VLAN ID. A trunk mode port will accept untagged packets on the native VLAN and be a member of any newly created VLANs by default. In general mode, it is possible to directly configure the port to only accept tagged packets with a single VLAN ID.

It is not possible to configure an inner VLAN TPID value. The inner VLAN TPID value is always Ethernet (0x8100).

Multiple groups of associated CE and SP ports can be defined by configuring the groups with unique VLAN IDs.

The port mirroring logic stage occurs after the after the tag processing stage on ingress and before the tag processing stage on egress. When mirroring packets associated with SP or CE ports, the outer VLAN tag may or may not appear in the frame. Due to the internal processing of QinQ tagging, the TPID of ingress frames mirrored from the SP port will always be 0x8100. In addition, packets forwarded internally across a stacking link may have different tags applied than packets forwarded on a local egress port. This is due to the processing required for forwarding across a stack.

Example

This example configures ports Gi1/0/10 through Gi1/0/24 as CE ports using VLAN 10 as the service provider VLAN ID. See the example for the **switchport dot1q ethertype** command to configure an associated SP port.

```
console(config)#vlan 10
console(config-vlan10)#exit
console(config)#interface range gi1/0/10-24
console(config-if)#switchport access vlan 10
console(config-if)#switchport mode dot1q-tunnel
console(config-if)#exit
```

switchport mode private-vlan

Use the **switchport mode private-vlan** command in Interface Configuration mode to define a private VLAN association for an isolated or community interface or a mapping for a promiscuous interface.

Use the **no** form of the command to remove the private VLAN association or mapping from the interface.

Syntax

switchport mode private-vlan {host|promiscuous | trunk promiscuous | trunk secondary}

no switchport mode private-vlan

- **host**—Configure the interface as a private VLAN host port. Host ports are community or isolated ports, depending on the VLAN to which they belong.
- **promiscuous**—Configure the interface as a private VLAN promiscuous port. Promiscuous ports are members of the primary VLAN.
- **trunk promiscuous**—Configures an interface as a private VLAN promiscuous trunk port. These ports can carry traffic of several primary VLANs and normal VLANs.

- **trunk secondary**—Configures an interface as a private VLAN isolated trunk port. These ports can carry traffic of several secondary VLANs and normal VLANs.

Default Configuration

This command has no default configuration. By default, a port is neither configured as promiscuous or host.

Command Mode

Interface Configuration (Ethernet or port-channel)

User Guidelines

Do not configure private VLANs on ports configured with any of these features:

- Link Aggregation Control Protocol (LACP)
- Multicast VLAN Registration (MVR)
- Voice VLAN

It is recommended that the private VLAN host ports be configured as spanning-tree portfast.

Command History

Syntax updated in version 6.6 firmware.

Example

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport mode private-vlan host
```

switchport private-vlan

Use the **switchport private-vlan** command in Interface Configuration mode to define a private VLAN association for an isolated or community port or a mapping for a promiscuous port.

Use the no form of the command to remove the private VLAN association or mapping from the interface.

Syntax

switchport private-vlan {**host-association** *primary-vlan-id secondary-vlan-id*| **mapping** *primary-vlan-id* {**add**|**remove**} *secondary-vlan-list*} | **mapping trunk** *primary-vlan-id* { *secondary-vlan-list* | **add** *secondary-vlan-list* | **remove** *secondary-vlan-list* } | **trunk** { **native vlan** *vlan-if* | **allowed vlan** *vlan-list* } | **association trunk** *primary-vlan-id secondary-vlan-id*}

no switchport private-vlan {**host-association**|**mapping** | **mapping trunk** *primary-vlan-id* | **trunk allowed** *vlan-list* | **trunk native vlan** *vlan-id* | **association trunk** *primary-vlan-id secondary-vlan-id*}}

no switchport private-vlan mapping trunk

no switchport private-vlan trunk allowed vlan *vlan-list*

no switchport private-vlan trunk native vlan *vlan-id*

no switchport private-vlan association trunk [**primary-vlan-id**]

no switchport private-vlan {**host-association**|**mapping**}

- **host-association**—Defines VLAN associations for community or host ports.
- **mapping**—Defines the private VLAN mapping for promiscuous ports.
- **primary-vlan-id**—Primary VLAN ID of a private VLAN.
- **secondary-vlan-id**—Secondary (isolated or community) VLAN ID of a private VLAN.
- **add**—Associates the secondary VLAN with the primary one.
- **remove**—Deletes the secondary VLANs from the primary VLAN association.
- **secondary-vlan-list**—A list of secondary VLANs to be mapped to a primary VLAN.
- **mapping trunk**—Maps the port to a primary VLAN and selected secondary VLANs.
- **trunk native vlan**—Defines the VLAN association for untagged packets on a trunk mode port. If not configured, untagged packets are dropped.
- **trunk allowed vlan**—Specifies the allowed normal VLANs on the trunk port.

- **association trunk**—Associates a primary VLAN with a secondary isolated VLAN. Multiple private VLAN pairs may be configured.

Default Configuration

This command has no default association or mapping configuration.

Command Mode

Interface Configuration (Ethernet or port-channel)

User Guidelines

The **no switchport private-vlan mapping trunk** primary-vlan-id syntax removes the mapping of the trunk port to the primary VLAN (and all the secondary VLANs) specified.

The **no switchport private-vlan mapping trunk** syntax removes the mapping of the trunk port to all the previously configured primary VLANs (and all the corresponding secondary VLANs).

The **no switchport private-vlan trunk allowed vlan** vlan-list syntax removes all the allowed normal VLANs on a promiscuous trunk port.

The **no switchport private-vlan trunk native vlan** vlan-id syntax removes the native VLANs on promiscuous trunk port.

The **no switchport private-vlan association trunk** syntax removes the associations of all the primary VLANs with the secondary VLANs on an isolated trunk port.

The **no switchport private-vlan association trunk** primary-vlan-id syntax removes the association of a specific primary VLAN on the isolated trunk port. The secondary VLAN association is also removed.

Command History

Syntax updated in version 6.6 firmware.

Example

```
console(config)#vlan 10,20
console(config-vlan10,20)#exit
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#switchport private-vlan host-association 10 20
```

switchport trunk

Use the **switchport trunk** command in Interface Configuration mode to configure VLAN membership for a trunk port or to set the native VLAN for an interface in Trunk Mode.

Syntax

switchport trunk {**allowed vlan** *vlan–list* | **native vlan** *vlan–id*}

no switchport trunk { allowed | native } vlan

- *vlan–list*—Set the list of allowed VLANs that can receive and send traffic on this interface in tagged format when in trunking mode. The default is **all**. The vlan–list format is as follows:

  The vlan-list format is all | [add | remove | except] vlan–atom [, vlan–atom...] where:

  – **all** specifies all VLANs from 1 to 4093. This keyword is not allowed on commands that do not permit all VLANs in the list to be set at the same time.

  – **add** adds the defined list of VLANs to those currently set instead of replacing the list.

  – **remove** removes the defined list of VLANs from those currently set instead of replacing the list. Valid IDs are from 1 to 4093; extended-range VLAN IDs of the form X-Y or X,Y,Z are valid in this command.

  – **except** lists the VLANs that should be calculated by inverting the defined list of VLANs. (VLANs are added except the ones specified.)

  – **vlan-atom** is either a single VLAN number from 1 to 4093 or a continuous range of VLANs described by two VLAN numbers, the lesser one first, separated by a hyphen.

- *valid–id*—A valid VLAN id in the range 1–4093. This is the native VLAN for the trunk port and will accept and send traffic on this VLAN in untagged format.

Default Configuration

A trunk port is a member of all VLANs by default.

VLAN 1 is the default native VLAN on a trunk port. The default allowed VLAN membership on a trunk port is all VLANs.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode

Interface Range mode

Port-Channel Range mode

User Guidelines

Untagged traffic received on a trunk port is forwarded on the native VLAN, if configured.

To drop untagged traffic on a trunk port, remove the native VLAN from the trunk port. (Ex. **switchport trunk allowed vlan remove 1**.) Management traffic is still allowed on the trunk port in this configuration.

The no form of the command sets the allowed or native VLAN membership back to the defaults.

It is possible to exclude VLANs that have not yet been created from trunk port membership. For example, it is possible to exclude VLANs learned dynamically via GVRP from being configured on a trunk port using this command.

Example

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#switchport trunk allowed vlan 1-1024
console(config-if-Gi1/0/1)#switchport trunk allowed vlan except
1,2,3,5,7,11,13
```

switchport trunk encapsulation dot1q

Use this command for compatibility. This command performs no action.

Syntax

switchport trunk encapsulation dot1q

Default Configuration

Dell EMC Networking switches use dot1q encapsulation on trunk ports by default.

Command Mode

Interface config mode, Interface range mode (including port-channels)

User Guidelines

This command performs no action. Dell EMC Networking switches always use dot1q encapsulation on trunk mode ports.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example demonstrates compatibility.

```
console(config-if-Gi1/0/1)#switchport trunk encapsulation dot1q
```

vlan

Use the **vlan** command in Global Configuration mode to configure a VLAN. To delete a VLAN, use the **no** form of this command.

Syntax

vlan {*vlan–list*}

no vlan {*vlan–list*}

- *vlan–list*—A list of one or more valid VLAN IDs. List separate, non-consecutive VLAN IDs separated by commas (without spaces). Use a hyphen to designate a range of IDs. (Range: 1–4093)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration (Config)

User Guidelines

Deleting the VLAN assigned as the PVID on an access port will cause VLAN 1 to be assigned as the PVID for the access port. Deleting the VLAN assigned as the native VLAN for a trunk port will cause the trunk port to discard untagged frames received on the port. Creating a VLAN adds it to the allowed list for all trunk ports except those where it is specifically excluded. Ports and port channels can be configured with VLANs that do not exist. They will not forward traffic on nonexisting VLANs.

Example

The following example shows how to create (add) VLAN IDs 22, 23, and 56.

```
console(config)#vlan 22,23,56
console(config-vlan)#
```

vlan association mac

Use the **vlan association mac** command in VLAN Configuration mode to associate a MAC address to a VLAN. The maximum number of MAC-based VLANs is 256. Only packets with a matching source MAC address are placed in the VLAN.

Syntax

vlan association mac *mac-address*

no vlan association mac *mac-address*

- *mac-address* — MAC address to associate to the VLAN. (Range: Any MAC address in the format xxxx.xxxx.xxxx or xx:xx:xx:xx:xx:xx)

Default Configuration

No assigned MAC address.

Command Mode

VLAN Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example associates MAC address with VLAN ID 1.

```
console(config)# vlan 1
console(config-vlan-1)#vlan association mac 0001.0001.0001
```

vlan association subnet

Use the **vlan association subnet** command in VLAN Configuration mode to associate a VLAN to a specific IP-subnet. Only packets with a matching source IP address are placed into the VLAN.

Syntax

vlan association subnet *ip-address subnet-mask*

no vlan association subnet *ip-address subnet-mask*

- *ip-address* — Source IP address. (Range: Any valid IP address)
- *subnet-mask* — Subnet mask. (Range: Any valid subnet mask)

Default Configuration

No assigned ip-subnet.

Command Mode

VLAN Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example associates the 192.168.0.xxx IP address with VLAN ID 1.

```
console(config)# vlan 1
console(config-vlan-1)#vlan association subnet 192.168.0.0 255.255.255.0
```

vlan makestatic

This command changes a dynamically created VLAN (one that is created by GVRP registration) to a static VLAN (one that is permanently configured and defined). The ID is a valid VLAN identification number. VLAN range is 2-4093.

Syntax

vlan makestatic *vlan-id*

- *vlan-id* — Valid VLAN ID. Range is 2–4093.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration Mode

User Guidelines

The dynamic VLAN (created via GRVP) should exist prior to executing this command. See the Type column in output from the show vlan command to determine that the VLAN is dynamic.

Example

The following changes vlan 3 to a static VLAN.

```
console(config-vlan)#vlan makestatic 3
```

vlan protocol group

Use the **vlan protocol group** command in Global Configuration mode to add protocol-based groups to the system. When a protocol group is created, it is assigned a unique group ID number. The group ID is used to identify the group in subsequent commands. Use the **no** form of the command to remove the specified VLAN protocol group name from the system.

Syntax

vlan protocol group *group-id*

no vlan protocol group *group-id*

- *group-id* — The protocol-based VLAN group ID, to create a protocol-based VLAN group. To see the created protocol groups, use the **show port protocol all** command.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)# vlan protocol group 1
```

vlan protocol group add protocol

Use the **vlan protocol group add protocol** command in Global Configuration mode to add a protocol to the protocol-based VLAN groups identified by *groupid*. A group may have more than one protocol associated with it. Each interface and protocol combination can be associated with one group only. If adding a protocol to a group causes any conflicts with interfaces currently associated with the group, this command fails and the protocol is not added to the group.

To remove the protocol from the protocol-based VLAN group identified by *groupid*, use the **no** form of this command.

Syntax

vlan protocol group add protocol *group-id* **ethertype** *value*

no vlan protocol group add protocol *group-id* **ethertype** *value*

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command.

- **ethertype** *value* — The protocol you want to add. The ethertype value can be any valid hexadecimal number in the range 0x0600 to 0xffff.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to add the “ip” protocol to the protocol based VLAN group identified as “2.”

```
console(config)#vlan protocol group add protocol 2 ethertype 0xXXXX
```

vlan protocol group name

This is a new command for assigning a group name to **vlan protocol group id**.

Syntax

vlan protocol group name *group-id groupName*

no vlan protocol group name *group-id*

- *groupid*—The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command
- *groupName*—The group name you want to add. The group name can be up to 16 characters length. It can be any valid alpha numeric characters.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)# vlan protocol group name 1 usergroup
```

vlan protocol group remove

Use the **vlan protocol group remove** command in Global Configuration mode to remove the protocol-based VLAN group identified by *groupid.*

Syntax

vlan protocol group remove *group-id*

- *group-id* — The protocol-based VLAN group ID, which is automatically generated when you create a protocol-based VLAN group with the **vlan protocol group** command. To see the group ID associated with the name of a protocol group, use the **show port protocol all** command.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays the removal of the protocol-based VLAN group identified as "2."

```
console(config)#vlan protocol group remove 2
```

Switchport Voice VLAN Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches Series Switches

The Voice VLAN feature enables switch ports to carry voice traffic with an administrator-defined priority so as to enable prioritization of voice traffic over data traffic. Using Voice VLAN helps to ensure that the sound quality of an IP phone is protected from deterioration when the data traffic utilization on the port is high.

Voice VLAN is the preferred solution for applying QoS to voice traffic in an enterprise environment. Voice VLAN scales with the number of ports and does not make significant demands on the switch CPU for classification of voice traffic. On a given port, any VLAN may be configured as a voice VLAN. The switch supports configuring multiple VLANs as voice VLANs. However, Voice VLAN does require the administrator to perform the additional configuration step of defining the QoS policy to be applied to voice traffic.

The switch can be configured to support voice VLAN on a port connecting to the VoIP phone. When a VLAN is associated with a voice VLAN-enabled port, the VLAN ID information is passed onto the VoIP phone using LLDP-MED. Voice data coming from the VoIP phone is tagged by the phone with the transmitted VLAN ID; regular data arriving on the switch is given the default PVID of the port.

When an IEEE 802.1p priority is associated with a voice VLAN-enabled port, the priority information is passed to the VoIP phone using LLDP-MED. It is expected that the voice data coming from the VoIP phone is tagged with VLAN 0 or the voice VLAN and with the transmitted priority. Configure the **voice vlan data priority** on the port to enable the switch to transmit the IEEE 802.1p or DSCP values to the phone in the LLDP-MED Network Policy TLV. Regular data arriving on the switch is given the default priority of the port (default 0) and the voice traffic is received with the priority assigned by the phone, allowing the switch to provide distinguished service to the voice traffic.

The switch can be configured to override the voice traffic CoS by entering an internal ACL associated with the MAC address of the IP phone. Alternatively, a diffserv policy can be configured for the voice VLAN which assigns voice traffic to a queue and also remarks the CoS or DSCP values in the voice traffic. See the *User Configuration Guide* for more information. Voice VLAN is recommended for enterprise-wide deployment of voice services on the IP network.

switchport voice vlan

This command is used to enable the voice VLAN capability on the switch.

Syntax

switchport voice vlan

no switchport voice vlan

Command Mode

Global Configuration

User Guidelines

Voice VLAN must be configured on access or general mode ports. It is not supported on trunk mode ports.

Command History

Syntax updated in version 6.5 firmware.

Default Value

This feature is disabled by default.

Example

```
console(config)#switchport voice vlan
console(config)#no switchport voice vlan
```

switchport voice vlan (Interface)

This command is used to assign the voice VLAN ID on the interface.

Syntax

switchport voice vlan {*vlan-id* | **dot1p** *priority* | **none** | **untagged** | **priority extend trust**|**override-authentication**| **dscp** *value*}

no switchport voice vlan [**priority extend**] [**override-authentication**]

- *vlan-id*—Configure an existing VLAN as the voice VLAN. This VLAN ID is also sent to the phone via LLDP-MED/CDP unless the none parameter is also specified.
- **dot1p**—Enable LLDP-MED/CDP to configure the phone to send the specified 802.1p priority in voice packets.
- **none**—Do not send LLDP-MED information to the phone. Allow the phone to use it's own configuration for voice packets.
- **untagged**—Enable LLDP-MED/CDP to configure the phone to send untagged or priority tagged voice traffic.
- **priority extend trust**—Configure the switch to trust the priority of received voice packets. Use the **no** form of the command to configure the switch to ignore the received priority of voice packets and remark voice VLAN packets.
- **dscp** ***value***—Enable LLDP-MED/CDP to configure the phone to send the specified DSCP value in voice packets.
- **override-authentication**—Allow access to the voice VLAN regardless of the 802.1X port authentication state. Use the **no** form of the command to require authentication to use the voice VLAN. Use the **no** form of the command for 802.1X-capable IP phones configured to use 802.1X authentication.

Default Configuration

The default DSCP value is 46. The default CoS is 5 for voice packets received on untrusted ports. The default is tagged voice VLAN traffic. The default priority for data packets is to trust the received CoS value. The default override-authentication value is to require authentication (not enabled). No voice VLAN ID is configured by default. The default 802.1p value is none.

Command Mode

Interface Configuration (Ethernet) mode.

User Guidelines

Enable voice VLAN using the following steps:

- Create one or more voice VLANs on the switch.
- Configure the interface in access or general mode.
- Enable voice VLAN globally and add a voice VLAN on the desired interfaces.
- Optionally configure 802.1X MAC or port-based authentication on the interface and globally.

If using MAC based authentication, also:

- Configure one or more RADIUS servers on the switch.
- Configure the RADIUS servers to send the VSA traffic-class = voice in the Access-Accept.
- Enable 802.1X authentication on the phone.
- Ensure the IP phone connected ports are configured in general mode.
- Optionally enable critical voice VLAN.

If using auto authentication:

- Optionally configure the interface to override authentication. If authentication is not overridden, the IP phone must authenticate using 802.1X.

Voice VLAN may be configured on general or access mode ports. It is not supported on trunk mode ports.

Use the **switchport voice vlan** *vlan-id* command to enable voice VLAN on an interface.

Voice VLAN information is transmitted to the phone via LLDP-MED in the Network Policy TLV (Application Type Voice, Tagged Yes, …). Voice VLAN information is transmitted to the phone via CDP in the Appliance VLAN TLV. The voice VLAN must be configured on the switch and must be different than the data VLAN. The configured or default priority is sent to the phone Class of Service (CoS) TLV. The trust status is sent to the phone via CDP in the Extended trust TLV. The configured or default priority/DSCP is sent to the phone via LLDP in the MED TLVs. LLDP and CDP packets are exchanged regardless of the 802.1X authentication state.

In authentication host-mode multi-domain-multi-host, a voice packet is switched based on the source MAC address of the IP phone. If override authentication is enabled, voice packets received are switched regardless of the 802.1X authentication state. Likewise, voice packets from the switch are transmitted over the port regardless of the 802.1x authentication state when the override option is enabled.

In authentication host-mode multi-domain-multi-host, the switch identifies a device as a voice device when an Access-Accept is received from the AAA service with the proprietary VSA device-traffic-class = voice. A voice VLAN must be configured on the port. Additionally, the RADIUS Access-Accept may include a VLAN assignment in conjunction with the VSA device-traffic-class = voice. If the VLAN exists on the switch, the voice device is assigned to the received VLAN ID.

When 802.1X authenticates a device onto the voice VLAN, the device is also allowed access over the data VLAN for approximately thirty seconds after authentication succeeds. This allows the device to learn the voice VLAN via non-standard mechanism such as DHCP, HTTP or TFTP.

If trust mode is disabled, the switch remarks the priority and/or DSCP value of received voice VLAN packets to the configured or default values (priority 5 and DSCP 46). If trust mode is enabled, voice packets are not remarked.

If trust mode is disabled, the switch classifies the voice packets into CoS queue 2. If trust mode is enabled, voice packets are classified per the switch configuration.

Use of the override-authentication option allows packets to flow over the voice VLAN regardless of the AAA authentication status. The switch cannot distinguish among voice and other packets in the voice VLAN. Use of this option should be carefully considered as it may allow malevolent users unrestricted access to network resources, particularly if authentication host-mode multi-domain-multi-host is not enabled.

The voice VLAN may not be configured as a PVID. The switch enforces this restriction by not configuring the voice VLAN, if the VLAN is the PVID of any port, or by failing the PVID assignment if the VLAN is a voice VLAN.

The voice VLAN may not be configured as the unauthenticated VLAN and vice-versa.

The voice VLAN may not be configured as the guest VLAN and vice-versa.

The voice VLAN may not be configured as a private VLAN host port.

Command History

Description updated in 6.3.0.5 release. Syntax updated in release 6.5.1.0.

Example

This example configures an interface to use VLAN 100 as the voice VLAN and sends LLDP configuration in the Network Policy TLV to the phone to assign VLAN 100 to 802.1p priority 5. The data priority is trusted by default.

```
console(config)#vlan 100
console(config-vlan100)#interface gi1/0/1
console(config-if-Gi1/0/1)#voice vlan 100
console(config-if-Gi1/0/1)#voice vlan dot1p 5
```

In this example, the IP phone will use its own configuration (no policy is sent via LLDP).

```
console(config-if-Gi1/0/1)#voice vlan none
console(config-if-Gi1/0/1)#voice vlan untagged
```

This example shows the configuration for a switch with a directly connected IP phone that is *not* 802.1X capable. All devices will have access to the voice VLAN regardless of the authentication state of the data device.

1. Create the voice VLAN.

   ```
   console#configure
   console(config)#vlan 25
   console(config-vlan25)#exit
   ```

2. Enable the Voice VLAN feature on the switch.

   ```
   console(config)#switchport voice vlan
   ```

3. Configure port 10 to be in access mode. The data VLAN ID is 1 and uses untagged packets.

   ```
   console(config)#interface gi1/0/10
   console(config-if-Gi1/0/10)#switchport mode access
   ```

4. Enable port-based 802.1X authentication on the port for the data traffic.

   ```
   console(config-if-Gi1/0/10)#authentication port-control auto
   ```

```
console(config-if-G11/0/10)#authentication host-mode multi-auth
```

5 Enable the voice VLAN feature on the interface. Voice packets are tagged using VLAN 25.

```
console(config-if-Gi1/0/10)#switchport voice vlan 25
```

6 Allow access to the voice VLAN regardless of the 802.1X port authentication state.

```
console(config-if-Gi1/0/10)#switchport voice vlan override-
authentication
console(config-if-Gi1/0/10)#show voice vlan interface gi1/0/10

     Interface...................................... Gi1/0/10
     Voice VLAN Interface Mode...................... Enabled
     Voice VLAN ID.................................. 25
     Voice VLAN COS Override........................ False
     Voice VLAN DSCP Value.......................... 46
     Voice VLAN Port Status......................... Disabled
     Voice VLAN Authentication...................... Disabled
```

switchport voice vlan priority

This command is to either trust or not trust (untrust) the data traffic arriving on the voice VLAN port.

Syntax

switchport voice vlan priority {**trust** | **untrust**}

- **trust**—Trust the IEEE 802.1p user priority contained in tagged packets arriving on the voice VLAN port.
- **untrust**—Do not trust the IEEE 802.1p user priority contained in packets arriving on the voice VLAN port. If a distinguished service for voice traffic is required, an ACL or diffserv policy must be configured.

Command Mode

Interface Configuration

Default Value

trust

Example

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)#voice vlan data priority untrust
console(config-if-Gi1/0/1)#voice vlan data priority trust
```

authentication event server dead action authorize voice

Use the **authentication event server dead action authorize voice** command to allow voice VLAN access when no AAA server can be contacted. Use the **no** form of the command to disable voice VLAN access in such cases.

Syntax

authentication event server dead action authorize voice

no authentication event server dead action authorize voice

Default Configuration

Critical voice VLAN is disabled by default.

Command Mode

Interface Configuration mode (Ethernet)

User Guidelines

During authentication, the switch identifies a device as a voice device when an Access-Accept is received from the AAA service with Cisco proprietary VSA device-traffic-class=voice. Phones/devices using the voice VLAN are periodically reauthenticated. If no AAA server is available during reauthentication, access to the voice VLAN is removed when authentication fails.

Critical voice VLAN supports voice VLAN access on an interface connected to an 802.1X-capable host during RADIUS server outages. Use of this command allows traffic to continue to flow over the voice VLAN when no RADIUS server is available to reauthenticate the IP phone. Newly authenticating phones do not have access to the critical voice VLAN service. Only 802.1X-capable devices are eligible for critical voice VLAN treatment. This restriction is not enforced by configuration.

Enable critical voice VLAN using the following steps:

- Create the voice VLAN on the switch.
- Configure the interface in access or general mode.
- Configure MAC based authentication on the interface.
- Configure one or more RADIUS servers on the switch and enable 802.1X globally.
- Configure the RADIUS servers to send the VSA traffic-class=voice in the Access-Accept.
- Enable 802.1X authentication on the interface connected to the phone.
- Configure a voice VLAN on the interface and enable voice VLAN globally.
- Enable critical voice VLAN and configure a critical voice VLAN.

IP phones that bypass authentication (**switchport voice vlan auto override-authentication**) do not interoperate with the critical voice VLAN. If override authentication is enabled, voice packets received are switched, regardless of the 802.1X authentication state. Likewise, voice packets from the switch are transmitted over the port, regardless of the 802.1x authentication state when the override option is enabled.

The voice VLAN must be configured on the interface and must be different than the data VLAN (PVID).

Command History

Command introduced in version 6.5 firmware.

show voice vlan

This command displays information about the voice VLAN.

Syntax

show voice vlan [**interface** {**gigabitethernet** unit/slot/port | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}|all]

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

- When the **interface** parameter is not specified, only the global mode of the voice VLAN is displayed.
- When the **interface** parameter is specified, the following is displayed:

Output	Description
Interface	The interface ID.
Voice VLAN Interface Mode	The admin mode of the voice VLAN on the interface.
Voice VLAN ID	The voice VLAN ID.
Voice VLAN Priority	The 802.1p priority for the voice VLAN on the port. This is only displayed if configured.
Voice VLAN Untagged	The tagging option for the voice VLAN traffic.
Voice VLAN COS Override	The Override option for the voice traffic arriving on the port.
Voice VLAN Status	The operational status of voice VLAN on the port.

When the **all** parameter is used for the interface, all interfaces are displayed.

Example

```
(console)#show voice vlan interface gi1/0/1

Interface..................................... Gi1/0/1
Voice VLAN Interface Mode..................... Enabled
Voice VLAN Priority........................... 2
Voice VLAN COS Override....................... True
Voice VLAN DSCP Value......................... 46
Voice VLAN Port Status........................ Disabled
Voice VLAN Authentication..................... Disabled
```

Multiple MAC Registration Protocol Commands

Dell EMC Networking N2000/N2100X-ON/N2200X-ON/N3000E-ON/N3100X-ON/N3200-ON Series Switches

This section covers commands related to Multiple MAC Registration Protocol (MMRP). MMRP is an implementation of IEEE 802.1ak. MMRP supports registration of MAC address/VLAN pairs in support of Audio-Visual Bridging.

clear mmrp statistics

This command clears the MMRP statistics for an interface or all interfaces.

Syntax

clear mmrp statistics [*interface-id* **|** **all**]

- All—Clear MMRP statistics for all interfaces
- *interface-id*—Clear statistics for the specified interface.

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec

User Guidelines

MMRP is not compatible the GMRP. Do NOT enable GMRP/GVRP on MMRP enabled switches.

The **clear counters** command also clears all MMRP statistics for all interfaces in addition to clearing other counters.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example clears the MMRP counters on port channel 1

```
console#clear mmrp statistics po1
```

mmrp

This command enables MMRP on a specific interface. Use the **no** form of the command to disable MMRP on an interface.

Syntax

mmrp

no mmrp

Default Configuration

By default, MMRP is disabled globally and on all interfaces.

Command Mode

Interface Configuration (Ethernet and port channel) and Interface Range (Ethernet and port channel)

User Guidelines

MMRP is not compatible with GVRP/GMRP. Do not enable MMRP on switches enabled for GVRP/GMRP.

Enabling MMRP on an interface automatically disables dynamic MFDB entry creation. MFDB entries are only configured via MMRP when MMRP is enabled.

Enabling MMRP on a port channel associated Ethernet interface has no effect as long as the interface is a member of the port channel.

MMRP must also be enabled globally in order to become operational.

This command is only available on the Dell EMC Networking N4000 Series switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables MMRP on port channel 1.

```
console(config)#interface po1
console(config-if-Po1)#mmrp
```

mmrp global

Use the **mmrp global** command to globally enable MMRP. Use the **no** form of the command to globally disable MMRP.

Syntax

mmrp global

no mmrp global

Default Configuration

By default, MMRP is disabled globally and on all interfaces.

Command Mode

Global Configuration

User Guidelines

MMRP is not compatible with GVRP/GMRP. Do not enable MMRP on switches enabled for GVRP/GMRP.

IGMP snooping can interfere with MMRP/MVRP. Disable IGMP snooping if using MMRP/MVRP.

IGMP snooping can interfere with MMRP/MVRP. Disable IGMP snooping if using MMRP/MVRP.

MMRP propagates VLAN registration information to allow switches in the network to dynamically learn and configure VLANs. Refer to IEEE Std. 802.1Q-2005 and IEEE Std. 802.1Qbe-2010 for further information. In particular, MMRP must also be enabled on the individual interfaces to become operational.

MMRP does not support configuration of default group filtering behavior. MMRP does not support the optional Registrar Administrative Control for MAC addresses.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables MMRP globally.

```
console(config)#mmrp global
```

mmrp periodic state machine

Use this command to globally enable the MMRP periodic state machine. Use the no form of the command to globally disable the MMRP periodic state machine.

Syntax

mmrp periodic state machine

no mmrp periodic state machine

Default Configuration

By default, the MMRP periodic state machine is disabled globally.

Command Mode

Global Configuration

User Guidelines

The MMRP periodic state machine ages out unused MMRP entries. Use the **show mmrp summary** command to display the global MMRP administrative status.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables the MMRP periodic state machine.

```
console(config)#mmrp periodic state machine
```

show mmrp

Use this command to display the MMRP configuration for an interface or globally.

Syntax

show mmrp [**summary** | **interface** [*interface-id* | **summary**]]

- **summary**—Show the global MMRP configuration.
- *interface-id*—Show the MMRP configuration for the specified interface.
- **interface summary**—Show the per interface MMRP configuration for all interfaces.

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec, Global Configuration, and all submodes

User Guidelines

MMRP is not compatible the GMRP. Do not enable GMRP/GVRP on MMRP enabled switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show mmrp summary

MMRP Global Admin Mode......................... Disabled
MMRP Periodic State Machine.................... Disabled

console#show mmrp interface Gi1/0/12

MMRP Interface Admin Mode...................... Disabled

console#show mmrp interface summary

Intf      Mode
```

```
--------- ---------
Gi1/0/1   Disabled
Gi1/0/2   Disabled
Gi1/0/3   Disabled
Gi1/0/4   Disabled
```

show mmrp statistics

Use this command to display the MMRP statistics for an interface or globally.

Syntax

show mmrp statistics {*interface-id*}

- *interface-id*—Displays the MMRP statistics for the specified interface.

Default Configuration

By default, the global statistics are displayed.

Command Mode

Privileged Exec, Global Configuration, and all submodes

User Guidelines

MMRP is not compatible with GMRP. Do not enable GMRP on MMRP enabled switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show mmrp statistics gi1/0/12

Port........................................... Gi1/0/12
MMRP messages received......................... 21
MMRP messages received with bad header......... 0
MMRP messages received with bad format......... 0
MMRP messages transmitted...................... 8
MMRP messages failed to transmit............... 0
```

Multiple VLAN Registration Protocol Commands

Dell EMC Networking N2000/N2100X-ON/N2200X-ON/N3000E-ON/N3100X-ON/N3200-ON Series Switches

This section covers commands related to Multiple VLAN Registration Protocol (MVRP). MVRP is an implementation of IEEE 802.1ak in support of Audio-Video Bridging. Dell EMC Networking MVRP supports registration (dynamic VLAN creation) and propagation of VLAN membership information.

clear mvrp statistics

This command clears the MVRP statistics for an interface or all interfaces.

Syntax

clear mvrp statistics [*interface-id* **|** **all**]

- All—Clear MVRP statistics for all interfaces
- *interface-id*—Clear statistics for the specified interface.

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec

User Guidelines

MVRP is not compatible with GVRP. Do not enable GMRP/GVRP on MVRP enabled switches.

The **clear counters** command also clears all MVRP statistics for all interfaces in addition to clearing other counters.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example clears the MVRP counters on port channel 1

```
console#clear mmrp statistics po1
```

mvrp

This command enables MVRP on a specific interface. Use the **no** form of the command to disable MVRP on an interface.

Syntax

mvrp

no mvrp

Default Configuration

By default, MVRP is disabled globally and on all interfaces.

Command Mode

Interface Configuration (Ethernet and port channel) and Interface Range (Ethernet and port channel)

User Guidelines

MVRP is not compatible with GVRP/GMRP. Do not enable MVRP on switches enabled for GVRP/GMRP.

MVRP operates in dynamic mode only. It both propagates VLAN configuration and learns (and creates) VLANs learned from the link peer.

Enabling MVRP on a port channel associated interface has no effect as long as the interface is a member of the port channel.

MVRP is not compatible with private VLAN configured interfaces. Do not enable GVRP on private VLAN enabled interfaces.

MVRP must also be enabled globally in order to become operational.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables MVRP on port channel 1

```
console(config)#interface po1
console(config-if-Po1)#mvrp
```

mvrp global

Use the **mvrp global** command to globally enable MVRP. Use the **no** form of the command to globally disable MVRP.

Syntax

mvrp global

no mvrp global

Default Configuration

By default, MVRP is disabled globally and on all interfaces.

Command Mode

Global Configuration mode

User Guidelines

MVRP is not compatible with GVRP/GMRP. Do not enable MVRP on switches enabled for GVRP/GMRP.

MVRP propagates VLAN registration information to allow switches in the network to dynamically learn and configure VLANs. Refer to IEEE Std. 802.1Q-2005 and IEEE Std. 802.1Qbe-2010 for further information. In particular, MVRP must also be enabled on the individual interfaces to become operational.

MVRP does not support configuration of default group filtering behavior. MVRP does not support the optional Registrar Administrative Control for VLANs.

If a VLAN is statically configured on an interface and MVRP requests registration (dynamic creation) of the VLAN, it is deleted and added back as a tagged static VLAN. If subsequently deleted by the operator, the VLAN is dynamically created.

If a VLAN is configured as forbidden on an interface and MVRP requests registration (dynamic creation) of the same VLAN, MVRP does not configure the port association.

MVRP is only supported on trunk or general mode ports.

This command is only available on the N4000 Series switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables MVRP globally.

```
console(config)#mvrp global
```

mvrp periodic state machine

Use this command to globally enable the MVRP periodic state machine. Use the no form of the command to globally disable the MVRP periodic state machine.

Syntax

mvrp periodic state machine

no mvrp periodic state machine

Default Configuration

By default, the MVRP periodic state machine is disabled globally.

Command Mode

Global Configuration

User Guidelines

The periodic state machine ages out MVRP created dynamic VLANs. Use the **show mvrp summary** command to display the global MVRP administrative status.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example enables the MVRP periodic state machine.

```
console(config)#mvrp periodic state machine
```

show mvrp

Use this command to display the MVRP configuration for an interface or globally.

Syntax

show mvrp [**summary** | **interface** [*interface-id* | **summary**]]

- **summary**—Show the global MMRP configuration.
- *interface-id*—Show the MMRP configuration for the specified interface.
- **interface summary**—Show the per interface MMRP configuration for all interfaces.

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec, Global Configuration, and all submodes

User Guidelines

MVRP is not compatible with GMRP. Do not enable GMRP/GVRP on MVRP enabled switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following shows example CLI display output for the command.

```
console#show mvrp summary

MVRP global state............................. Disabled
MVRP Periodic State Machine state............. Disabled
VLANs created via MVRP........................ 20-45, 3001-3050
The following shows example CLI display output for the command.
(Switching) #show mvrp interface 0/12

MVRP interface state.......................... Enabled
VLANs declared................................ 20-45, 3001-3050
VLANs registered.............................. none
```

show mvrp statistics

Use this command to display the MVRP statistics for an interface or globally.

Syntax

show mvrp statistics {*interface-id*}

- *interface-id*—Displays the MVRP statistics for the specified interface.

Default Configuration

By default, the global statistics are displayed.

Command Mode

Privileged Exec, Global Configuration, and all submodes

User Guidelines

MVRP is not compatible with GMRP/GVRP. Do not enable GVRP on MMRP enabled switches.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following shows example CLI display output for the command.

```
console#show mvrp statistics summary

MVRP messages received........................ 45
```

```
MVRP messages received with bad header......... 0
MVRP messages received with bad format......... 0
MVRP messages transmitted...................... 16
MVRP messages failed to transmit............... 0
MVRP Message Queue Failures.................... 0

The following shows example CLI display output for the command.
(Switching) #show mvrp statistics 0/12

Port........................................... 0/12
MVRP messages received......................... 21
MVRP messages received with bad header......... 0
MVRP messages received with bad format......... 0
MVRP messages transmitted...................... 8
MVRP messages failed to transmit............... 0
MVRP failed reservations....................... 0
```

4

Security Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Security commands enable network operators to administer security for administrator access to the switch management console or web interface as well as to configure restrictions of network access for network attached devices.

This section of the document contains the following security commands:

AAA Commands	Captive Portal Commands
Administrative Profiles Commands	Denial of Service Commands
E-mail Alerting Commands	Management ACL Commands
RADIUS Commands	Password Management Commands
TACACS+ Commands	SSH Commands
802.1x NAS Commands	–

AAA Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking switches support authentication of network users and switch administrators via a number of methods. Management access to the switch is via telnet, HTTP, SSH, or the serial console (SNMP access is discussed in the SNMP Commands section). To ensure that only authorized users can access or change the configuration of the switch, the administrator can require that administrative access be authenticated.

Administrative Authentication

Switch administrators can be authenticated based on:

- Login mode
- Switch access method
- Access to Privileged Exec mode
- Two levels of access:
  - 1 = Read-only
  - 15 = Read-Write

The supported authentication methods for switch management access are:

- Local: The user's locally stored ID and password are used for authentication.
- RADIUS: The user's ID and password are authenticated using the RADIUS server.
- TACACS+: The user's ID and password are authenticated using the TACACS+ server.
- None: No authentication is used.
- Enable: Uses the enable password for authentication.
- Line: Uses the line password for authentication.
- Authentication Preference Lists (APLs): An Authentication Preference List is an ordered list of authentication methods.

To authenticate a switch administrator, the authentication methods in the APL for the access line are attempted in order until an authentication attempt returns a success or failure return code. If a method times out, the next method in the list is attempted. The component requesting authentication is unaware of the ultimate authentication source. If a method in the preference list does not support the concept of time-out, subsequent entries in the list are never attempted. For example, the local authentication method implementation does not supply a time-out value. If a list contains the local method, followed by the RADIUS authentication method, the RADIUS method is not attempted.

Once an APL is created, a reference to that APL can be stored in the access line configuration to determine how specific components should authenticate users. The APL and associated component ID are stored together. A single APL can be referenced by multiple methods.

The administrator can enable/disable/reorder authentication methods on a per method basis (see above).

Administrative Accounting

The administrator may choose to account administrative activity on the switch. The following accounting types are supported:

- User exec sessions: User login and logout times are noted and conveyed to an external AAA server.
- User executed commands: Commands executed by the user and the time of execution are accounted and conveyed to an external AAA server.

Administrator activity can be accounted for at the end and/or at the beginning of the activity. For this purpose, the following record-types are defined:

- Start-stop

  Accounting notifications are sent when the administrator logs into the switch and when the administrator exits exec mode. Accounting notifications are also sent at the beginning and at the end of each administrator executed command. Command execution does not wait for the accounting notification to be recorded at the AAA server.

- Stop-only

Accounting notification is sent when the administrator exits exec mode. The duration of the exec session is logged in the accounting notice. Accounting notifications are sent at the end of each administrator executed command. In the case of commands like reload, and clear config, an exception is made and the stop accounting notice is sent at the beginning of the command.

Accounting Method Lists

An Accounting Method List (AML) is an ordered list of accounting methods that can be applied to the accounting types (exec or commands). Accounting Method Lists are identified by the **default** keyword or by a user-defined name. TACACS+ and RADIUS are supported as accounting methods.

TACACS+ accounts all accounting types (exec and commands). RADIUS only accounts exec sessions.

Access Line Modes

AMLs can be applied to the following access line modes for accounting purposes:

- Console: This mode is used when user logs in to the switch using serial console.
- Telnet: This mode is used when user logs in through Telnet.
- SSH: This mode is used when user logs in through SSH.

By default, no accounting is enabled for any line Configuration modes.

The following default Accounting Methods List are available.

Default List Name	Accounting Type	Record Type	Accounting Method
Default Exec List	exec	Start-stop	TACACS+
Default Command List	commands	Stop-only	TACACS+

The default lists are not applied to any line-configuration modes by default.

See Line Commands for information on associating an accounting method list (AML) to a login session (console, SSH, Telnet).

Command Authorization

Dell EMC Networking switches support per command or enable authorization using a TACACS server. See the **authorization** command in this section for further information. Additionally, the RADIUS or TACACS server can be configured to assign an administrative profile to a switch administrator. The administrative profile identifies groups of commands which may be executed by the administrator. See the Administrative Profiles Commands section for further information on this capability.

Network Authentication

The network administrator can require that devices attached to the network be authenticated prior to gaining access to network resources. This is most often performed by the use of IEEE 802.1x in conjunction with a RADIUS or TACACS authentication server. Dell EMC Networking switches support use of RADIUS or TACACS authentication servers as well as a local, switch based, authentication server. Refer to the RADIUS Commands section for information on configuring a RADIUS server for authentication of network devices. See the 802.1x Commands section for information on configuring device access to network resources.

Dell EMC Networking switches support an internal authentication capability that allows configuration of authentication preference lists for network connected devices. The authentication preference lists support authentication methods such as IEEE 802.1x, internal authentication, and no authentication. MAC Authentication Bypass may be configured to allow IEEE 802.1x unaware devices access to the network. Refer to the section below for information on configuring authentication preference lists for network device access.

Local 802.1x Authentication Server

The Dell EMC Networking switch supports a dedicated database for local authentication of users for network access through the 802.1x feature. This functionality is distinct from management access for the switch. See the 802.1x Commands section for information on configuring IEEE 802.1x access to the network using an external authentication server.

The Internal Authentication Server feature provides support for the creation of users for IEEE 802.1x access only, i.e. without switch management access. This feature maintains a separate database of users allowed for 802.1x access.

The authentication method **ias** is available in the list of methods supported by authentication to support user database lookup. The **ias** method cannot be added in the same authentication list that has other methods like local, radius and reject.

Whenever an operator configures a port in 802.1x authentication mode and selects the authentication method as **ias**, then the user credentials received from the 802.1x supplicant are validated against the user database by the 802.1x component. The 802.1x application accesses the 802.1x user database to check whether the user credentials present in the authentication message corresponds to a valid user or not. If so then an event is generated which triggers the 802.1x state machine to send a challenge to the supplicant. Otherwise a failure is returned to the 802.1x state machine and the user is not granted access to the port.

If user(s) credentials are changed, the existing user connection(s) are not disturbed and the changed user(s) credentials are only used when a new EAP request arises.

A CLI configuration mode is added in order to configure 802.1x users and their attributes. The 802.1x maintained user database can also be exported (uploaded) or imported (downloaded) to/from a central location using a TFTP server. Use the **aaa ias-user username** command to add users to the internal database.

MAC Authentication Bypass

Today, IEEE 802.1x has become the recommended port-based authentication method at the access layer in enterprise networks. However, there may be 802.1x unaware devices such as printers, fax-machines, etc., that would require access to the network without 802.1x authentication. MAC Authentication Bypass (MAB) is a supplemental authentication mechanism to allow 802.1x unaware clients to authenticate to the network. It uses the 802.1x infrastructure. MAB cannot be supported independently of the 802.1x component.

MAC Authentication Bypass (MAB) provides 802.1x unaware clients controlled access to the network using the devices' MAC address as an identifier. This requires that the known and allowable MAC address and corresponding access rights be prepopulated in the authentication server.

Port access by MAB clients is allowed via local authentication if the user database has corresponding entries added for the MAB clients with user name and password attributes set to the MAC address of MAB clients. Alternatively, a RADIUS authentication server can be configured with the MAC addresses of the MAB clients. In this configuration, the switch uses EAP-MD5, CHAP, and PAP authentication to communicate with the authentication server. No other authentication or privacy protocol is supported for server side authentication.

Guest VLAN

The Guest VLAN feature allows a Dell EMC Networking switch to provide a distinguished service to unauthenticated network devices (not rogue devices that fail authentication). This feature provides a mechanism to allow network devices to have network access to reach an external network while restricting their ability to access the internal LAN.

When a client that does not support 802.1x is connected to an unauthorized port that is 802.1x-enabled, the client does not respond to the 802.1x requests from the switch. The port remains in the unauthorized state and the client is not granted access to the network. If a guest VLAN is configured for that port, then the client is placed in the configured guest VLAN, and the client is moved to the authorized state, allowing network access to the client over the guest VLAN. RADIUS accounting records are not transmitted for 802.1X client placed into guest VLAN.

Authentication is periodically re-attempted for hosts placed into the guest VLAN. The re-authentication period is calculated as follows:

```
Re-authentication period = (max-reauth-req + 1) × tx-period
```

The `max-reauth-req` and `tx-period` are configured using the following commands:

- dot1x max-reauth-req
- dot1x timeout tx-period. See dot1x timeout.

Unauthenticated VLAN

The Unauthenticated VLAN feature allows a Dell EMC Networking switch to provide a distinguished service to unauthorized network devices that attempt and fail authentication. This feature provides a mechanism to allow network devices to have network access to an external network while restricting their ability to access the internal LAN.

When a client network device that supports 802.1x is connected to an unauthorized port that is 802.1x enabled with no unauthenticated VLAN configured and the client attempts and fails to authenticate, the port remains in the unauthorized state and the client is not granted access to the network. If an unauthenticated VLAN is configured for the port and the 802.1x client fails to authenticate for the configured number of attempts, the port is placed in the authorized state on the unauthenticated VLAN and the client is granted access to the network.

Authentication is periodically re-attempted for hosts placed into the unauthenticated VLAN. The re-authentication period is calculated as follows:

```
Re-authentication period = (max-reauth-req + 1) × tx-period
```

The `max-reauth-req` and `tx-period` are configured using the following commands:

- dot1x max-reauth-req
- dot1x timeout tx-period. See dot1x timeout.

aaa accounting

Use this command to configure an accounting method list for User Exec sessions, user-executed commands or 802.1X or to enable accounting. The **no** version of the command deletes the accounting method list.

Use the **no** form of the command to delete an accounting method list or disable accounting.

Use either the **aaa accounting dot1x default none or no aaa accounting** command to disable dot1x accounting.

Syntax

aaa accounting {**exec** | **commands** | **dot1x**} {**default** | list-name} {**start-stop** | **stop-only** |**none**} {**radius**|**tacacs**|**radius tacacs**|**tacacs radius**}

- exec—Provides accounting for a User Exec terminal sessions.
- commands—Provides accounting for all user executed commands.
- dot1x—Provides accounting for DOT1X user commands. Only the default method is available for dot1x.
- default—The default list of methods for accounting services.
- list-name—Character string used to name the list of accounting methods.
- start-stop—Sends a start accounting notice at the beginning of a process, and a stop accounting notice at the end of a process.
- stop-only—Sends a stop accounting notice at the end of the requested user process.
- none—Disables accounting services on this line or for 802.1X.
- method—Use either TACACS or RADIUS server for accounting purposes.

Default Configuration

Accounting is not enabled by default.

Command Mode

Global Configuration

User Guidelines

An accounting list is identified by the **default** keyword or a user-specified **list_name**. Accounting records, when enabled for a line-mode, can be sent at both the beginning and at the end of the session (**start-stop**) or only at the end (**stop-only**). If **none** is specified, accounting is disabled for the specified list. If **tacacs** is specified as the accounting method, accounting records are transmitted to a TACACS+ server. If **radius** is the specified accounting method, accounting records are transmitted to a RADIUS server.

Note the following:

- A maximum of five Accounting Method lists can be created for each exec and commands type.
- Only the default Accounting Method list can be created for RADIUS. There is no provision to create more.

- The same list-name can be used for both exec and commands accounting type
- AAA Accounting for commands with RADIUS as the accounting method is not supported.
- Start-stop or None are the only supported record types for RADIUS accounting. Start-stop enables accounting and None disables accounting.
- RADIUS is the only accounting method type supported for 802.1X accounting.
- For the same set of accounting type and list name, the administrator can change the record type or the methods list, without having to first delete the previous configuration.
- Interim accounting is enabled using the **aaa accounting update** command.
- Use either the **aaa accounting dot1x default none** or **no aaa accounting dot1x default** command to disable dot1x accounting.
- Use the **no aaa accounting exec** or **no aaa accounting** commands to disable aaa accounting and optionally delete an accounting method list.

Example

The following shows several examples of the command.

```
(console)#configure
(console-config)#aaa accounting commands default stop-only tacacs
(console-config)#aaa accounting exec default start-stop radius
(console-config)#aaa accounting dot1x default start-stop radius
(console-config)#aaa accounting dot1x default none
(console-config)#exit
```

For the same set of accounting type and list name, the administrator can change the record type, or the methods list, without having to first delete the previous configuration. The first **aaa** command creates a method list for exec sessions with the name ExecList, with **record-type** as stop-only and the **method** as TACACS+. The second command changes the **record type** to start-stop from stop-only for the same method list. The third command for the list changes the **methods list** to {tacacs,radius} from {tacacs}.

```
(console)#configure
(console-config)#aaa accounting exec ExecList stop-only tacacs
(console-config)#aaa accounting exec ExecList start-stop tacacs
(console-config)#aaa accounting exec ExecList start-stop tacacs radius
(console-config)#exit
```

This example shows how to enable dot1x accounting to RADIUS server for start, interim and stop reports. Interim reports are sent every 60 minutes.

```
(console)#configure
(console-config)#aaa accounting dot1x default start-stop radius
(console-config)#aaa accounting update periodic 60
```

The following shows an example of the no version of the command.

```
(console)#configure
(console-config)#aaa accounting commands userCmdAudit stop-only tacacs
(console-config)#no aaa accounting commands userCmdAudit
(console-config)#exit
```

aaa accounting delay-start

Use the **aaa accounting delay-start** command to delay the sending of Acct-Start packets to RADIUS accounting server(s).

Syntax

aaa accounting delay-start [**extended-time** *delay_value*]

no aaa accounting delay-start

- delay_value—The maximum number of seconds to wait before sending the Acct-Start packet to the RADIUS accounting server. Range: 1 to 300 seconds.

Default Configuration

By default, the switch will wait up to the maximum of maximum number of retries (**radius server retransmit**) multiplied by the timeout (**radius server timeout**).

Command Mode

Global Configuration mode

User Guidelines

Dell EMC recommends that a fixed time be configured for the delay in order to ensure timely delivery of Acct-Start packets to the RADIUS accounting server. Acct-Interim and Acct-Stop messages are not delayed, nor are any Authentication messages delayed by configuration of this command.

If the switch discovers that the host has obtained an IPv4/IPv6 address, it may send the Acct-Start packet before the expiry of the delay period.

The delay is accounted for in the Acct-Delay-Time attribute sent to the RADIUS accounting server.

Use the **show authentication clients** command to display the discovered IPv4 address/IPv6 address received from RADIUS server, if any.

Command History

Command introduced in firmware release 6.5.2.

aaa accounting update

Use the **aaa accounting update** command to enable the sending of interim accounting packets to RADIUS accounting server(s).

Syntax

aaa accounting update {[**newinfo**] [**periodic** *minutes*]}

no aaa accounting update

- periodic minutes—The number of minutes to wait before sending the Interim-Update packet to the RADIUS accounting server. The range for minutes is from 1 to 10081.
- newinfo—Send the Interim-Update packet to the RADIUS accounting server whenever new information is available.

Default Configuration

By default, the sending of Interim-Update packets is disabled. There is no default time period.

Command Mode

Global Configuration mode

User Guidelines

User of the newinfo keyword can cause congestion if many accounted sessions are present on the switch.

The Interim-Update packet contains the accounting information recorded for the user session since the last time an accounting record was sent.

If both the periodic and newinfo keywords are configured, Interim-Update messages are sent whenever new information is available and when the periodic timer expires.

Use the **show authentication clients** command to display the discovered IPv4 address/IPv6 address received from the RADIUS server, if any.

Command History

Command introduced in firmware release 6.5.2.

aaa authentication dot1x default

Use the **aaa authentication dot1x default** command in Global Configuration mode to specify an authentication method for 802.1x clients to access network resources. Use the **no** form of the command to return the authentication method to its default settings.

Syntax

aaa authentication dot1x default {ias|none|radius}

no aaa authentication dot1x default

The following methods may be configured:

- **ias**—Use the internal authentication server user database for authentication. This method cannot be used in conjunction with any other method.
- **none**—Do not use any authentication.
- **radius**—Use the configured RADIUS server(s) for authentication.

Default Configuration

No default authentication method is defined, however, switch administrators are allowed access to the switch console via 802.1X. Use the dot1x user command to restrict the ports over which users (or switch administrators) may authenticate.

Command Mode

Global Configuration mode

User Guidelines

Only one default method may be configured. If the authentication method fails, for example, the user-supplied password does not match, the user is denied access.

For the RADIUS authentication method, if no RADIUS server can be contacted, the supplicant fails authentication unless a critical voice or data VLAN is configured.

The **none** method always allows access to the network and should therefore be used with caution.

The **ias** method utilizes the internal authentication server for authentication. Configure the ias database with the **aaa ias-user** command. Authentication via the internal authentication server only supports the EAP-MD5 method.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example configures 802.1x authentication to use no authentication. Absent any other configuration, this command allows all 802.1x users to pass traffic through the switch.

```
console(config)# aaa authentication dot1x default none
```

The following example configures 802.1x authentication to use a RADIUS server. A RADIUS server must be configured previously using the **radius server host auth** command for the radius method to succeed.

```
console(config)#aaa authentication dot1x default radius
```

aaa authentication enable

Use the **aaa authentication enable** command in Global Configuration mode to set authentication for accessing higher administrator privilege levels when logged in to the switch console. To return to the default configuration, use the **no** form of this command.

Syntax

aaa authentication enable {**default** | *list-name*} {*method1* [*method2...*]}

no aaa authentication enable {**default** | *list-name*}

- **default** — Uses the listed authentication methods that follow this argument as the default list of methods, when using higher privilege levels.
- *list-name* — Character string used to name the list of authentication methods activated, when using access higher privilege levels. (Range: 1-15 characters)
- *method1* [*method2...*] — Specify at least one from the following table:

Keyword	Source or destination
enable	Uses the enable password for authentication.
line	Uses the line password for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Default Configuration

The default enable list is **enableList**. It is used by console, telnet, and SSH and only contains the method **enable** and **none**.

Command Mode

Global Configuration mode

User Guidelines

The default and optional list names created with the **aaa authentication enable** command are used with the **enable authentication** command.

Create a list by entering the **aaa authentication enable** *list-name method* command where *list-name* is any character string used to name this list. The *method* argument identifies the list of methods that the authentication algorithm tries in the given sequence.

The additional methods of authentication are used only if the previous method returns an error, not if it fails to authenticate the administrator. Only the RADIUS or TACACS methods can return an error. For example, if **none** is specified as an authentication method after **radius**, no authentication is used if the RADIUS server is down.

To ensure that the authentication succeeds even if all methods return an error, specify **none** as the final method in the command line. Note that **enable** will not succeed for a privilege level one administrator if no authentication method is defined. A privilege level one administrator must authenticate to get to Privileged Exec mode.

NOTE: Requests sent by the switch to a RADIUS server include the username "$enabx$", where x is the requested privilege level in decimal. For enable to be authenticated on RADIUS servers, add "$enabx$" users to them. The login user ID is also sent to TACACS+ servers for enable authentication.

Example

The following example configures enable authentication to use the enable method for accessing higher privilege levels.

```
console(config)# aaa authentication enable default enable
```

aaa authentication login

Use the **aaa authentication login** command in Global Configuration mode to create and enable the authentication method required for administrative access to the switch. To return to the default configuration and optionally delete an authentication list, use the **no** form of this command.

Syntax

aaa authentication login {**default** | *list-name*} {*method1* [*method2...*]}

no aaa authentication login {**default** | *list-name*}

- **default** — Uses the listed authentication methods that follow this argument as the default list of methods when an administrator logs in.
- *list-name* — Character string used to name the list of authentication methods activated when an administrator logs in to the switch. (Range: 1-15 characters)
- *method1* [*method2...*] — Specify at least one from the following table:

Keyword	Source or destination
enable	Use the enable password for authentication.
line	Use the line password for authentication.
local	Use the local username database for authentication.
none	Use no authentication.
radius	Use the list of all RADIUS servers for authentication.
tacacs	Use the list of all TACACS+ servers for authentication.

Default Configuration

The default login lists are **defaultList** and **networkList**. **defaultList** is used by the console and only contains the method ***none***. **networkList** is used by telnet and SSH and only contains the method ***local***.

Command Mode

Global Configuration mode

User Guidelines

The default and optional list names created with the **aaa authentication login** command are used with the **login authentication** command. Create a list by entering the **aaa authentication login** *list-name method* command for a particular protocol, where *list-name* is any character string used to name this list. The *method* argument identifies the list of methods that the authentication algorithm tries, in the given sequence.

The additional methods of authentication are attempted only if the previous method returns an error, not if there is an authentication failure. Only the RADIUS, TACACS+, local and enable methods can return an error. To ensure that authentication succeeds even if all methods return an error, specify **none** as the final method in the command line. For example, if **none** is specified as an authentication method after **radius**, no authentication is used if the RADIUS server is down. If specified, **none** must be the last method in the list.

NOTE: Auth-Type:=Local does not work for recent versions of FreeRadius. FreeRadius ignores the configuration if Local is used. Administrators should remove `Auth-Type=Local` and use the PAP or CHAP modules instead.

Example

The following example configures the default authentication login to attempt RADIUS authentication, then local authentication, then enable authentication, and then, if all the previous methods returned an error, allows the administrator access to the switch console (via the none method).

```
console(config)# aaa authentication login default radius local enable none
```

aaa authorization

Use the **aaa authorization** command to enable authorization and optionally create an authorization method list. A list may be identified by a user-specified **list-name** or the keyword **default**.

Use the **no** form of the command to disable authorization and optionally delete an authorization list.

Syntax

aaa authorization {**commands**|**exec**|**network**}{**default**|*list-name*} {method1 [method2]}

no aaa authorization {**commands**|**exec**|**network**} {**default**|*list-name*}

- **exec**—Provides Exec authorization. All methods are supported.
- **commands**—Performs authorization of user commands. Only none and TACACs methods are supported.
- **network**—Performs RADIUS authorization. Only the default list is supported.
- **default**—The default list of methods for authorization services. The list dfltCmdAuthList is the default list for command authorization and the list dfltExecAuthList is the default list for Exec authorization.
- *list-name*—Character string used to name the list of authorization methods. The list name can consist of any alphanumeric character up to 20 characters in length. Use quotes around the list name if embedded blanks are contained in the list name.
- method—The following authorization methods are supported:
  - local—Perform local authorization.
  - none—Do not perform authorization. All functions are authorized.

- radius—Request authorization from the configured RADIUS servers.
- tacacs—Request authorization from the configured TACACS+ servers.

Default Configuration

When authorization is enabled, the switch attempts to authorize the listed function using the configured method.

Authorization is not enabled by default. Authorization supports Exec authorization and network authorization for RADIUS. Only TACACS is supported for command authorization. Setting a **none** or **local** method for authorization authorizes Exec access for all functions.

The following default Authorization Methods List is present by default:

Default List Name	Description	Authorization Method
dfltCmdAuthList	Default Command List	None
dfltExecAuthList	Default Exec list	None

Command Mode

Global Configuration mode

User Guidelines

A maximum of five authorization method lists may be created for exec and command types. The default methods may not be deleted.

When command authorization is configured for a line mode, the switch sends information about the entered command to the AAA server. The AAA server validates the received command and responds with a PASS or FAIL. If a PASS response is received, the command is executed. If a FAIL response is received, the command is not executed and a message is displayed to the user. Command authorization attempts authorization for all Exec mode commands associated with a privilege level, including global configuration commands. Exec authorization attempts authorization when a user attempts to enter Privileged Exec mode.

When exec authorization is configured for a line mode, the use may not be required to use the **enable** command to enter Privileged Exec mode. If the authorization response indicates the user has privileges for Privileged Exec mode, then the switch bypasses User Exec mode entirely.

If multiple authorization methods are listed, the switch will attempt communication with each method in order, until successful communication is established or all methods in the list have been tried. If authorization fails, then the command is denied and no further attempts at authorization are made for the user request.

If no authorization server is available or configured, the function is denied unless the none method is configured in the list. If authorization is configured on the console, this can lead to situations where the console denies administrative access. Therefore, it is recommended that the console authorization only be enabled with due regard to the risks involved. If none is configured as the last method after radius or tacacs, no authorization is performed if the RADIUS/TACACS servers are down.

The various utility commands like **tftp** and **ping** also must pass command authorization. Applying a script is treated as a single command **apply script** which also must pass authorization. Startup-config commands applied on device boot-up are not subject to the authorization process.

Refer to the **Line Commands** section for information on configured an authorization method for a particular type of line access.

Method	Notes
Local	The local method is not supported for command authorization. This method is equivalent to selecting the **none** method when used for Exec authorization.
TACACS	Selects TACACS for command or exec authorization.
None	Selecting the **none** method authorizes all commands. This option is valid for both command and Exec authorization.
RADIUS	The radius method is valid for Exec authorization and Network authorization. Network and Exec authorization with RADIUS will work only if the applied authentication method is radius.

Example

Per command authorization example for telnet access using TACACS:

Configure the Authorization Method list.

```
console(config)#aaa authorization commands telnet-list tacacs
```

Apply the AML to an access line mode (telnet):

```
console(config)#line telnet
console(config-telnet)#authorization commands telnet-list
```

Exec authorization example for SSH using RADIUS with a fallback to the none method:

Configure the Authorization Method list.

```
console(config)#aaa authorization exec exec-list radius none
```

Apply the AML to an access line mode (SSH):

```
console(config)#line ssh
console(config-ssh)#authorization exec exec-list
```

Display the authorization methods:

```
console#show authorization methods
Exec Authorization List       Methods
----------------------------  ------------------------------
dfltExecAuthList              none
exec-list                     radius  none

Command Authorization List    Methods
----------------------------  ------------------------------
dfltCmdAuthList               none
telnet-list                   tacacs

Line       Exec Method Lists      Command Method Lists
---------  ---------------------  ---------------------
Console    dfltExecAuthList       dfltCmdAuthList
Telnet     dfltExecAuthList       telnet-list
SSH        exec-list              dfltCmdAuthList

Network Authorization  Methods
---------------------- -------
Dot1x                  none
```

aaa authorization network default radius

Use the **aaa authorization network default radius** command in Global Configuration mode to enable the switch to authorize VLAN assignment by the RADIUS server.

Syntax

aaa authorization network default radius

no aaa authorization network default radius

Default Configuration

By default, the switch does not accept VLAN assignments by the RADIUS server.

Command Mode

Global Configuration mode

User Guidelines

The RADIUS server can place a port in a particular VLAN based on the result of the authentication. VLAN assignment must be configured on the external RADIUS server using the RADIUS TUNNEL-TYPE attribute and others. See RADIUS Commands and Security Commands for further information.

If the port is configured to use authentication host-mode multi-auth or multi-domain-multi-host and the port is configured as a general mode port, each authenticating data device is placed into the assigned VLAN. Device packets are identified by their source MAC address.

If the port is configured to use 802.1X port control auto mode and the port is configured as an access mode port, the PVID of the port is updated for the first data device authentication. Only the first assignment of the PVID takes effect. All subsequent valid authentications will be placed into the first PVID assigned, regardless of the received VLAN ID.

RADIUS-assigned VLANs may be dynamically created. Use the **authentication dynamic-vlan enable** command to enable dynamic VLAN creation.

Example

The following example enables RADIUS-assigned VLANs.

```
console(config)#aaa authorization network default radius
```

aaa ias-user username

Use the **aaa ias-user username** command in Global Configuration mode to configure IAS users and their attributes. Username and password attributes are supported. The ias-user name is composed of up to 64 alphanumeric characters. This command also changes the mode to a user Configuration mode. Use the **no** form of this command to remove the user from the internal user database.

Syntax

aaa ias-user username *user*

no aaa ias-user username *user*

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Examples

```
console#configure
console(config)#aaa ias-user username client-1
console(config-ias-user)#exit
console(config)#no aaa ias-user username client-1
```

aaa new-model

The **aaa new-model** command in Global Configuration mode is a no-op command. It is present only for compatibility purposes. Dell EMC Networking switches only support the new model command set.

Syntax

aaa new-model

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

The following example configures the switch to use the new model command set.

```
console(config)# aaa new-model
```

aaa server radius dynamic-author

Use this command to enter dynamic RADIUS server configuration mode.

Syntax

aaa server radius dynamic-author

Default Configuration

By default, no dynamic RADIUS servers are configured.

Command Mode

Global Configuration

User Guidelines

Configuring a dynamic RADIUS server causes the system to begin listening on the default port 3799 for RADIUS CoA requests. The switch ensures that a unique session key is sent to the RADIUS server in all Access-Request packets. The Acct-Session-Id, User-Name, and Calling-Station-Id, Framed-

IP-Address, NAS-IP-Address (if configured in switch), NAS-Port identifiers are maintained in the switch for 802.1X session identification. The switch ensures that a unique Acct-Session-ID is sent to the RADIUS server in all Access-Request packets. CoA-Request requests must contain at least one of the Acct-Session-Id, Framed-IP-Address, User-Name, or Calling-Station-Id for presentation to the NAS for CoA requests.

A valid authenticated RFC 3575 Disconnect-Request terminates the session without disabling the port. The termination may cause the host to attempt to reauthenticate on the port. If an ACL was applied for the session, the ACL is removed when the session is terminated.

If a valid authenticated RFC 3575 Disconnect-Request request is received from a configured server and the session cannot be found, the switch returns a Disconnect-NAK message with the 503 Session Context Not Found response code.

Four additional types of CoA requests are supported:

- Re-authenticate Session:

  Upon receipt of a re-authenticate request for a host currently authenticated by 802.1x, the switch sends an EAPOL EAP-Request/EAP-Identity Request to the host without de-authorizing the host.

  If the host is authenticated using MAB, the switch sends a RADIUS Access-Request to the authentication server using the same attributes as were used in the previously successful authentication.

  If session authentication is in progress when the switch receives the re-authenticate session command, the switch restarts the authentication sequence starting with the first configured method.

- Session Termination:

  Upon receipt of a session termination request for a host currently authenticated by 802.1x, the switch terminates the session without disabling the port and denies access to the individual host. The termination may cause the host to attempt to re-authenticate on the port.

  If a valid and authenticated session termination request is received from a configured CoA client and the session cannot be found, the switch returns a CoA-NAK message with the 503 Session Context Not Found response code.

- Disable Host Port:

  The disable host port request may be useful when a port is causing issues on the network. It administratively disables the port by bringing the link down. The administrator may re-enable the port using the no shutdown command.

  If a valid and authenticated disable host port request is received from a configured CoA client and the session cannot be found, the switch returns a CoA-NAK message with the 503 Session Context Not Found response code. If a valid and authenticated request is received from a configured CoA client and the disable host port is administratively disabled, a CoA-NAK response is returned with 501 Administratively Prohibited response code.

- Bounce Port:

  A bounce port request disables the port for 10 seconds (terminating all sessions on the port) and then re-enables the port. The termination disables access to the network for all hosts on the port by disabling the link and may cause the hosts to attempt to re-authenticate when the link is brought up. Therefore, it is recommended that the bounce port request only be used for ports configured in 802.1X auto mode.

  If a valid and authenticated bounce port request is received from a configured CoA client and the session cannot be found, the switch returns a CoA-NAK message with the 503 Session Context Not Found response code. If a valid and authenticated request is received from a configured CoA client and the bounce port capability is administratively disabled, a CoA-NAK response is returned with 501 Administratively Prohibited response code.

If it expected that more than one session will authenticate over a port, use of multi-auth or multi-domain host mode authentication is recommended.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures RADIUS servers at 1.1.1.1, 2.2.2.2, and 3.3.3.3 and CoA clients at 4.4.4.4 and 5.5.5.5. It sets the front panel ports to use multi-auth authentication. CoA is configured for two dynamic RADIUS servers located at 1.1.1.1 and 2.2.2.2 using a global shared secret and a third server using a server specific shared secret. CoA and disconnect requests are accepted from the CoA clients at 4.4.4.4 and 5.5.5.5. Any attribute contained in the Disconnect request is allowed for session identification. In this example, the NAS-IP-Address is optionally configured at the fixed IPv4 address of 3.3.3.3. CoA client 5.5.5.5 uses the global server key while client 4.4.4.4 uses a client-specific server key.

```
console#configure terminal
console(config)# aaa new-model
console(config)# aaa authentication dot1x default radius
console(config)# dot1x system-auth-control
console(config)# interface range gi1/0/1-24
console(config-if)# authentication port-control auto
console(config-if)# authentication host-mode multi-auth
console(config-if)# exit
console(config)# radius server 1.1.1.1
console(Config-radius)#primary
console(Config-radius)#exit
console(config)# radius server 2.2.2.2
console(Config-radius)#exit
console(config)# radius server 3.3.3.3
console(Config-radius)#key “That’s your secret.”
console(Config-radius)#exit
console(config)# radius server key “Keep it. Keep it.”
console(config)# aaa server radius dynamic-author
console(config-radius-da)# client 4.4.4.4 server-key 0 “That’s your secret.”
console(config-radius-da)# client 5.5.5.5
console(config-radius-da)# server-key 0 “Keep it. Keep it.”
console(config-radius-da)# port 3799
console(config-radius-da)# auth-type any
console(config-radius-da)# exit
console(config)#radius server attribute 4 3.3.3.3
console(config)#dot1x system-auth-control
console(config)#exit
console#clear authentication sessions
```

authentication command

Use the **authentication command {bounce-port|disable-port} ignore** to disable processing of RADIUS CoA requests to bounce the host port. The no form of this command honors RADIUS CoA bounce host port requests.

Syntax

authentication command { bounce-port | disable-port } ignore

no authentication command { bounce-port | disable-port } ignore

- **bounce-port**—Ignore CoA requests to disable the port for 10 seconds and then re-enable it.
- **disable-port**—Ignore CoA requests to administratively disable the port.

Default Configuration

By default, RADIUS CoA bounce host port requests are honored.

By default, RADIUS CoA disable host port requests are honored.

Command Mode

Global Configuration mode

User Guidelines

A RADIUS CoA bounce host port command disables the port for 10 seconds by bringing the link down and then re-enables the port. The authentication command bounce-port ignore disables processing of bounce host port CoA requests and effectively prevents a link flap on the requested RADIUS authenticated port. A link flap may cause the connected devices to restart the DHCP address assignment and configuration process.

If a valid and authenticated bounce port request is received from a configured CoA client and the session cannot be found, the switch returns a CoA-NAK message with the 503 Session Context Not Found response code. If a valid and authenticated request is received from a configured CoA client and the bounce port capability is administratively disabled, a CoA-NAK response is returned with 501 Administratively Prohibited response code.

A RADIUS CoA disable host port command administratively disables the port. A RADIUS CoA disabled port requires administrative intervention to re-enable the port using the no shutdown command. The authentication command disable-port ignore disables processing of the CoA disable port request.

If a valid and authenticated disable host port request is received from a configured CoA client and the session cannot be found, the switch returns a CoA-NAK message with the 503 Session Context Not Found response code. If a valid and authenticated request is received from a configured CoA client and the disable host port capability is administratively disabled, a CoA-NAK response is returned with 501 Administratively Prohibited response code.

Command History

Syntax added in version 6.6 firmware.

Example

The following example sets the switch to ignore CoA bounce host port commands.

```
console(config)# authentication command bounce-port ignore
```

The following example sets the switch to ignore CoA disable host port commands.

```
console(config)# authentication command disable-port ignore
```

authentication control-direction

Use this command to control traffic flow for 801.2X unauthenticated interfaces.

Syntax

authentication control-direction { **in** | **both** }

- **in** — Ingress traffic is dropped for unauthenticated hosts.
- **both** — Ingress and egress traffic is blocked for unauthenticated hosts.

Default Configuration

The default control direction is **both**.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

The following traffic is bidirectionally permitted on unauthenticated ports, regardless of the authentication state or control direction: LLDP, BOOTP, DHCP, DNS, and EAPOL.

Example

```
console(config-if-Fi1/0/1)#authentication control-direction in
```

Command History

Command introduced in version 6.7.0 firmware.

authentication critical recovery

Use the **authentication critical recovery** command to control the load placed on RADIUS servers.

Syntax

authentication critical recovery max-reauth *number-of-clients*

no authentication critical recovery max-reauth *number-of-clients*

- *number-of-clients*—The maximum number of 802.1X supplicants that will be re-authenticated per second. Range 1 to 50 clients.

Default Configuration

By default, the maximum number of clients that are processed for reauthentication is 10 per second.

Command Mode

Global Configuration mode

User Guidelines

This command configures the number of supplicants that are re-authenticated per second. This configuration is for the entire system across all the supplicants on all ports. This is used to control the system and network load when the number of supplicants to be re-authenticated is large. These re-authentications can be triggered due to reinitialize dead or alive server actions.

Command History

Syntax added in version 6.6 firmware.

Example

The following example sets the switch to rate limit reauthentication requests to 20 per second.

```
console(config)# authentication critical recovery max-reauth 20
```

authentication dynamic-vlan enable

Use the **authentication dynamic-vlan enable** command to enable the switch to create VLANs dynamically when a RADIUS–assigned VLAN does not exist in the switch. Use the **no** form of the command to disable this capability.

Syntax

authentication dynamic-vlan enable

no authentication dynamic-vlan enable

Default Configuration

The default value is disabled.

Command Mode

Global Configuration

User Guidelines

Dynamic VLANs are not created for multi-auth and multi-host mode configured interfaces.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example enables dynamic VLAN creation using the value provided in the Access-Accept message.

```
console(config)# authentication dynamic-vlan enable
```

authentication enable

Use this command to globally enable the Authentication Manager. Interface configuration set with the **authentication order** command takes effect only if the Authentication Manager is enabled.

Use the **no** form of this command to disable the Authentication Manager.

Syntax

authentication enable

no authentication enable

Default Configuration

The default value is Disabled.

Command Mode

Global Configuration mode

User Guidelines

The administrator must ensure that any methods configured by the Authentication Manager are enabled (e.g. enable IEEE 802.1x using the **dot1x system-auth-control** command). Enable MAB using the **mab** command.

Example

```
console(config)# authentication enable
```

authentication event server dead action

This command configures the actions to take when no authentication server is reachable. Use the **no** form of the command to set the interface configuration to the default.

Syntax

authentication event server dead action [{**reinitialize** | **authorize**}[**vlan** ***vlan-id***]]

no authentication event server dead action

- **reinitialize**—Re-authenticate hosts, potentially into the critical data VLAN.
- **authorize**—Hosts on the data VLAN are switched to the critical data VLAN without re-authentication.
- *vlan-id*—The critical data VLAN identifier.

Default Configuration

By default, critical data VLAN capability is not enabled.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

The command configures the critical data VLAN ID. If the VLAN ID is not specified, the port PVID is used as the critical data VLAN ID.

The critical data VLAN capability allows hosts to authenticate when no RADIUS server is reachable. This allows potentially limited access to the network via VLAN configuration. The dead-server (all RADIUS servers marked dead) actions are configured per interface using this command.

When the dead-server action is configured to **reinitialize**, the switch triggers 802.1X re-authentication of all authenticated hosts on the port. Hosts on the voice VLAN, unauthenticated VLAN (authentication failed hosts) or guest VLAN are not disturbed. During re-authentication, if all the servers are still dead, the hosts are authenticated successfully into the critical data VLAN.

When the dead server action is configured to **authorize**, the switch authorizes the authenticated supplicants into the critical data VLAN. Hosts on a RADIUS assigned VLAN, voice VLAN, unauthenticated VLAN or guest VLAN are not disturbed. Hosts authorized on the port PVID are re-authorized into the critical VLAN.

Command History

Syntax added in version 6.6 firmware.

Example

The following example configures an interface to support a critical data VLAN (100) and to re-authenticate hosts when no RADIUS server is reachable.

```
console(config)#vlan 100
console(config-vlan100)#interface gi1/0/1
console(config-if-Gi1/0/1)#authentication event server dead action
reinitialize vlan 100
```

authentication event server alive action

This command configures the actions to take when at least one authentication server is reachable. Use the **no** form of the command to set the interface configuration to the default.

Syntax

authentication event server alive action reinitialize

no authentication event server alive action reinitialize

Default Configuration

By default, hosts moved to the critical data VLAN are not moved back to the port PVID when a RADIUS server becomes reachable.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

When the alive action is configured to **reinitialize**, the switch triggers 802.1X reauthentication of all authenticated hosts on the port. Hosts on the voice VLAN, unauthenticated VLAN (authentication failed hosts) or guest VLAN are not disturbed. During re-authentication, if all the servers are still dead, the hosts are authenticated successfully into the critical data VLAN.

Command History

Syntax added in version 6.6 firmware.

Example

The following example configures an interface to support a critical data VLAN (100) and to reauthenticate hosts when no RADIUS server is reachable and again when at least one RADIUS server becomes reachable.

```
console(config)#vlan 100
console(config-vlan100)#interface gi1/0/1
console(config-if-Gi1/0/1)#authentication event server dead action
reinitialize vlan 100
console(config-if-Gi1/0/1)#authentication event server alive action
reinitialize
```

authentication open

Use the **authentication open** command to allow unauthenticated devices on 802.1X enabled interfaces access to network resources prior to authorization.

Syntax

authentication open

no authentication open

Default Configuration

By default, unauthenticated devices on 802.1X enabled interfaces may only send and receive DHCP/BOOTP packets.

Command Modes

Interface (Ethernet) Configuration mode

User Guidelines

This command allows devices on 802.1X enabled interfaces to access network resources. An administrator-configured ACL enabled on the interface may be used to restrict network access until the device is authorized.

Command History

Syntax added in version 6.6 firmware.

Example

The following example allows open access to all network resources when no ACL is configured and enabled on the interface.

```
console(config-Gi1/0/1)# authentication open
```

authentication order

This command sets the order of authentication methods used on a port.

Use the **no** form of this command to return the port to the default authentication order.

Syntax

authentication order {dot1x [mab][captive-portal] | mab [dot1x] [captive-portal] | captive-portal}

no authentication order

Default Configuration

The default authentication order is dot1x, MAB, captive portal.

Command Modes

Interface Configuration (Ethernet) mode

User Guidelines

Each method can only be entered once. Ordering is only possible between 802.1x and MAB. Captive portal can be configured either as a stand-alone method or as the last method in the order.

The available authentication methods are dot1x, MAB, and captive portal. Ordering sets the order of authentication methods that the switch attempts when trying to authenticate a new device. If one method is unsuccessful or times out, the next method in the list is attempted.

For a laptop or desktop and phone combination where both devices authenticate using IEEE 802.1X, it is recommended to configure both the order and priority as dot1x.

Example

```
console(config-if-Gi1/0/1)# authentication order dot1x mab captive-portal

console(config-if-Gi1/0/1)# no authentication order
```

authentication priority

Use this command to set the priority for the re-authentication methods used on a port.

Use the **no** form of this command to return the port to the default order of priority for the authentication methods.

Syntax

authentication priority {[dot1x|mab|captive-portal] [mab|dot1x|captive-portal] [mab|dot1x|captive-portal]}

no authentication priority

Default Configuration

The default authentication priority is dot1x, MAB, captive portal.

Command Modes

Interface Configuration (Ethernet) mode.

User Guidelines

The authentication priority selects the methods used when a client is re-authenticated. The available authentication methods are dot1x, MAB, and captive portal. Captive portal is always the last method in the list.

Each method can only be entered once. There are no restrictions on the ordering of priorities.

For a laptop or desktop and phone combination where both devices authenticate using IEEE 802.1X, it is recommended to configure both the authentication priority and order as dot1x.

Example

```
console(config-if-Gi1/0/1)# authentication priority mab dot1x captive-portal
console(config-if-Gi1/0/1)# no authentication priority
```

authentication timer restart

Use this command to set the interval after which reauthentication starts. This timer starts only if all the authentication methods fail.

Use the **no** form of this command to set the authentication restart timer to factory default value.

Syntax

authentication timer restart *time*

no authentication timer restart

- *time*—The time, in seconds, after which reauthentication starts, if all the authentication methods have failed. Range: 300-65535.

Default Configuration

The default timer value is 300 seconds.

Command Modes

Interface Configuration (Ethernet) mode

User Guidelines

None

Command History

Syntax updated in version 6.6 firmware.

Example

```
console(config-if-Gi1/0/1)# authentication timer restart 1800

console(config-if-Gi1/0/1)# no authentication timer restart
```

authentication violation

This command configures the actions to take when more than the AAA-configured number of hosts attempts to authenticate on an interface. Use the **no** form of the command to set the interface configuration to the default.

Syntax

authentication violation { **protect** | **restrict** | **shutdown** }

no authentication violation

- **protect**—Drop incoming packets from the offending host.
- **restrict**—Generate a log when a violation occurs.
- **shutdown**—Error disable the interface.

Default Configuration

The default violation mode is **restrict**.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command should not be confused with the port security capability. These actions occur solely within the authentication framework.

Command History

Syntax added in version 6.6 firmware.

Example

The following example configures an interface error disable when a second data user attempts to authenticate.

```
console(config-vlan100)#interface gi1/0/1
```

```
console(config-if-Gi1/0/1)#authentication port-control auto
console(config-if-Gi1/0/1)#authentication host-mode single-host
console(config-if-Gi1/0/1)#authentication violation shutdown
```

clear (IAS)

Use the **clear aaa ias-users** command to delete all IAS users.

Syntax

clear aaa ias-users

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear aaa ias-users
```

clear authentication statistics

Use this command to clear the authentication statistics.

Syntax

clear authentication statistics {*interface-id* | **all**}

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)# clear authentication statistics Gi1/0/1

Are you sure you want to clear authentication manager port stats? (y/n)
```

clear authentication authentication-history

Use this command to clear all 802.1X and authentication history.

Syntax

clear authentication authentication-history {**all**|*interface-id*}

- **all**—Clear all authentication history.
- *interface-id*—A physical (Ethernet) interface identifier.

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec mode

User Guidelines

The all parameter clears all 802.1X and Authentication Manager history on the switch. Use of the interface parameter clears the history for the specific interface.

Command History

The **clear dot1x authentication-history** syntax was deprecated in favor of the **clear authentication authentication-history** in version 6.6 firmware.

Example

```
console(config)# clear authentication authentication-history Gi1/0/1
```

enable password

Use the **enable password** command in Global Configuration mode to set a local password to control access to the privileged Exec mode. To remove the password requirement, use the **no** form of this command.

Syntax

enable password *password* [**encrypted**]

no enable password

- *password* — Password for this level (Range: 8- 64 characters). The special characters allowed in the password include ! # $ % & ‘ " ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~. User names can contain blanks if the name is surrounded by double quotes. To use the ! character as part of the username or password string, it should be enclosed within quotation marks. For example, username “test!xyz” password “test!xyz”.
- **encrypted** — Encrypted password entered, copied from another switch configuration.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The Dell EMC Networking firmware emulates industry standard behavior for enable mode authentication over SSH and telnet. The default enable authentication method for telnet and SSH uses the enableNetList method, which requires an enable password. If users are unable to enter privileged mode when accessing the switch via telnet or SSH, the administrator will need to either change the enable authentication method, e.g. to enableList, or set an enable password. If the encrypted parameter is specified, the password parameter is stored as entered in the running-config. No attempt is made to decode the encrypted password. To use the ! character as part of the username or password string, it should be enclosed within quotation marks. For example, username “test!xyz” password “test!xyz”.

Example

The following example defines password “xxxyyyzzz” to control access to user and privilege levels.

```
console(config)# enable password xxxyyyzzz
```

ip admission proxy http redirect-url

Use this command to configure a URL to which HTTP or HTTPS requests are directed.

Syntax

ip admission proxy http redirect-url *url*

no ip admission proxy http redirect-url

- *url* — An alphanumeric string (maximum length 255 characters) in HTTP URL format.

Default Configuration

There is no redirect URL configured by default.

Command Mode

Global Configuration

User Guidelines

The switch will redirect HTTP and HTTPS packets for unauthenticated 802.1x clients to the redirect target using the configured URL with HTTP redirect code 302(Found) or 200 (OK).

The `url` parameter consists of an HTTP URL with meta-characters. The meta-characters are substituted by the switch with information from the redirected host.

A redirect URL is used in conjunction with a statically-configured ACL in authentication open mode. The ACL must contain a permit clause for access to the redirect target and any other services provided to unauthenticated hosts, such as DNS or DHCP. Other clauses restricting access to the network may be added as desired. The redirect URL (and the HTTP hijack) is only active if the host is unauthenticated.

When authentication succeeds via 802.1X or MAB, the authentication server *must* send a dynamic ACL allowing access to the network. The dynamic ACL will replace the static ACL described in the preceding paragraph.

The following meta characters may be configured in the URL string. The switch will substitute the listed information in the URL string. The size of the URL string with substitutions may not exceed 384 characters.

- Host MAC address (\M)
- Host IPv4 or IPv6 address (\H)
- Switch port (ifIndex) (\P)
- Switch IPv4 or IPv6 address (\I)
- Original URL (\U)
- Switch Manufacturer or Model (\O)

Only one redirect-url may be configured. Subsequent configurations overwrite the existing configuration.

Example

```
console(config)#ip admission proxy http redirect-url
http://externalcaptiveportal.dell.com?mac=\M
```

Command History

Command introduced in version 6.7.0 firmware.

ip admission proxy http redirect-tgt

Use this command to configure the address to which HTTP or HTTPS requests are redirected.

Syntax

ip admission proxy http redirect-tgt *ip-address*

no ip admission proxy http redirect-tgt

- *ip-address* — An IPv4 or IPv6 address.

Default Configuration

There is no redirect URL configured by default.

Command Mode

Global Configuration

User Guidelines

The switch redirects HTTP/HTTPS packets that are not addressed to the switch to the redirect address using the configured redirect URL with HTTP redirect code 302(Found) or 200 (OK).

The IP address should match the address returned by DNS or the DNS hijack configured using the **ip dns server address** command.

A redirect target is used with a redirect URL and a statically-configured ACL in authentication open mode. The ACL must contain a permit clause for access to the redirect target and any other services provided to unauthenticated hosts, such as DNS or DHCP. Other clauses restricting access to the network may be added as desired.

When authentication succeeds via 802.1X or MAB, the authentication server *must* send a dynamic ACL allowing access to the network. The dynamic ACL will replace the static ACL described in the preceding paragraph.

Example

```
console(config)#ip admission proxy http redirect-tgt 192.168.1.
```

Command History

Command introduced in version 6.7.0 firmware.

ip dns domain-list

Use this command to configure a DNS hijack.

Syntax

ip dns domain-list *fqdn*

no ip dns domain-list *fqdn*

- fqdn — A fully-qualified domain name.

Default Configuration

There is no DNS domain list configured by default.

Command Mode

Global Configuration

User Guidelines

The switch will hijack DNS requests for the configured domain and return the IP addresses configured using the **ip dns server address** command.

Installing a root certificate on the switch for the domain where the CNAME matches the domain parameter may avoid errors during redirection.

Example

```
console(config)#ip dns domain-list fqdn.dell.com
console(config)#ip dns server address 192.168.1.4 192168.1.5
```

Command History

Command introduced in version 6.7.0 firmware.

authentication allow-unauth dhcp

Use this command to configure the switch to allow or block DHCP packet exchange on unauthenticated interfaces.

Syntax

authentication allow-unauth dhcp

Default Configuration

The default is disabled.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

By default DHCP traffic is not permitted on unauthenticated interfaces. Use this command to allow DHCP packet exchange.

Example

```
console(config-if-Fi1/0/1)#authentication allow-unauth dhcp
```

Command History

Command introduced in version 6.7.0 firmware.

ip http authentication

Use the **ip http authentication** command in Global Configuration mode to specify authentication methods for http server users. To return to the default, use the **no** form of this command.

Syntax

ip http authentication {*method1* [*method2*...]}

no ip http authentication

- *method1* [*method2*...] — Specify at least one from the following table:

Keyword	Source or destination
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Default Configuration

The local user database is checked. This action has the same effect as the command **ip http authentication local**.

Command Mode

Global Configuration mode

User Guidelines

The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify **none** as the final method in the command line. For example, if **none** is specified as an authentication method after **radius**, no authentication is used if the RADIUS server is down.

Example

The following example configures the http authentication.

```
console(config)# ip http authentication radius local
```

ip https authentication

Use the **ip https authentication** command in Global Configuration mode to specify authentication methods for users authenticating over HTTPS. To return to the default configuration, use the **no** form of this command.

Syntax

ip https authentication {*method1* [*method2*...]}

no ip https authentication

- *method1* [*method2*...] — Specify at least one from the following table:

Keyword	Source or destination
local	Uses the local username database for authentication.
none	Uses no authentication.
radius	Uses the list of all RADIUS servers for authentication.
tacacs	Uses the list of all TACACS+ servers for authentication.

Default Configuration

The local user database is checked. This action has the same effect as the command **ip https authentication local**.

Command Mode

Global Configuration mode

User Guidelines

The additional methods of authentication are used only if the previous method returns an error, not if it fails. To ensure that the authentication succeeds even if all methods return an error, specify **none** as the final method in the command line. If **none** is specified as an authentication method after **radius**, no authentication is used if the RADIUS server is down.

When using a Cisco ACS with TACACS+ as the authentication method for HTTPS, the Cisco ACS must be configured to allow the **shell** service. In addition, for admin privileges, the **privilege level** attribute must be set to 15.

Example

The following example configures HTTPS authentication.

```
console(config)# ip https authentication radius local
```

mab

Use the **mab** command to configure the switch to enable MAC Authentication Bypass (MAB) authentication for devices connected to the interface. Use the **no** form of this command to disable MAB on an interface.

Syntax

mab [auth-type {pap | eap-md5|chap}]

no mab

- chap—Authenticate MAB clients using Challenge Authentication Protocol (CHAP)
- eap—Authenticate MAB clients using Extensible Authentication Protocol (EAP)
- pap—Authenticate MAB clients using Password Authentication Protocol (PAP)

Default Configuration

By default, MAB clients are authenticated using the EAP method.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command is used to enable MAC Authentication Bypass (MAB) on an interface. MAB is a supplemental authentication mechanism that allows 802.1x unaware clients—such as printers, fax machines, and some IP phones, to authenticate to the network using the client MAC address as an identifier. However, MAB can also be used to authenticate 802.1x aware clients in some configurations. This command also provides options to specify the type of authentication to be used, which can be either EAP-MD5, PAP, CHAP.

Authentication of a user via MAB will not occur until the re-authentication period timer expires.

When using MAB, configure the format of the RADIUS UserName attribute sent in the RADIUS Access-Request using the **mab request format** command.

Command History

Updated syntax in version 6.5 Updated syntax in version 6.6 firmware.

Example

The following example sets MAC Authentication Bypass on interface gigabitethernet 1/0/2:

```
console(config-if-Gi1/0/2)#authentication port-control auto
console(config-if-Gi1/0/2)#mab
```

password (AAA IAS User Configuration)

Use the **password** command in aaa IAS User Configuration mode to configure a password for an IAS user. The password is composed of up to 64 alphanumeric characters. An optional parameter [encrypted] is provided to indicate that the password given to the command is already pre-encrypted. To clear the user's password, use the **no** form of this command.

Syntax

password *password* [**encrypted**]

no password

- *password* — Password for this level. (Range: 1- 64 characters)

- **encrypted** — Encrypted password to be entered, copied from another switch configuration.

Default Configuration

This command has no default configuration.

Command Mode

AAA IAS User Configuration

User Guidelines

IAS user accounts are distinct from user (administrator) accounts. IAS accounts give access to network resources (via 802.1X or MAB), whereas user accounts give administrative access to the switch.

Example

```
console#configure
console(config)#aaa ias-user username client-1
console(config-ias-user)#password client123
console(config-ias-user)#no password
```

The following is an example of adding a MAB Client to the IAS user database with MAC address f81f.3ccc.b157. Be sure to enter the password in upper case letters or authentication will fail with an “MD5 Validation Failure” as the password hash does not match.

```
console#configure
console(config)#aaa ias-user username f81f3cccb157
console(config-ias-user)#password F81F3CCCB157
console(config-ias-user)#exit
console(config)#
```

password (User Exec)

Use the **password** command in User Exec mode to allow a currently logged in user to change the user password without having read/write privileges. This command should be used after the password has aged. The user is prompted to enter the old password and the new password. The special characters allowed in the password include ! # $ % & ‘ ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~. User names can contain blanks if the name is surrounded by double quotes.

NOTE: For commands that configure password properties, see Password Management Commands.

Syntax

password

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec mode

User Guidelines

This command configures the password for a switch administrative user.

Example

The following example shows the prompt sequence for executing the password command.

```
console>password
Enter old password:********
Enter new password:********
Confirm new password:********
```

show aaa ias-users

Use the show aaa ias-users command to display configured IAS users and their attributes. Passwords configured are not shown in the show command output.

Syntax

show aaa ias-users

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

IAS users are distinct from switch administrative users. IAS users are allowed access to network resources.

Example

```
console#show aaa ias-users

UserName
-------------------
Client-1
Client-2
```

show aaa statistics

Use the **show aaa statistics** command to display accounting statistics.

Syntax

show aaa statistics

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

```
console#show aaa statistics

Number of Accounting Notifications sent at beginning of an Exec session: 0
Errors when sending Accounting Notifications beginning of an Exec session: 0
Number of Accounting Notifications sent at end of an Exec session: 0
Errors when sending Accounting Notifications at end of an Exec session: 0
```

```
Number of Accounting Notifications sent at beginning of a command execution: 0
Errors when sending Accounting Notifications at beginning of a command execution: 0
Number of Accounting Notifications sent at end of a command execution: 0
Errors when sending Accounting Notifications at end of a command execution: 0
```

show accounting methods

Use the **show accounting methods** command to display the configured accounting method lists.

Syntax

show accounting methods

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

```
console#show accounting methods
AcctType  MethodName     MethodType    Method1        Method2
-------------------------------------------------------------------
Exec      dfltExecList   start-stop   tacacs
Commands  dfltCmdList    stop-only    tacacs
Dot1x     dfltDot1xList  start-stop
Line      EXEC Method List    Command Method List
-------------------------------------------------
Console   none                none
Telnet    none                none
SSH       none                none
```

Command History

Example updated in the 6.4 release.

show accounting update

Use this command to show the configuration of accounting updates.

Syntax

show accounting update

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show accounting update

aaa accounting  update newinfo  : Disabled
aaa accounting  update periodic : 5 minutes
```

Command History

Introduced in the 6.5.2 release.

show authentication

Use this command to display the authentication status for a specific interface or all interfaces.

Syntax

show authentication [**interface** {*interface-id* | **all**}]

- **interface-id**—Display information for an individual Ethernet (physical) interface.
- **all**—Display information for all interfaces.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The command displays the following information:

Output Parameter	Description
Authentication Manager Status	The administrative status of Authentication on the switch. This is a global configuration value.
Interface	The interface for which authentication configuration information is being displayed.
Port Control Mode	The configured control mode for this port. Possible values are force-unauthorized | auto | unauthorized.
Host Mode	The authentication host mode configured on the interface.
Authentication Restart Time	The time in seconds after which reauthentication starts.
Configured Method Order	The order of authentication methods used on the interface.
Enabled Method Order	The order of authentication methods used on the interface.
Configured Method Priority	The priority for the authentication methods used on the interface.
Enabled Method Priority	The priority for the authentication methods used on the interface.
Reauthentication Period	The period after which all clients on the interface will be reauthenticated.
Reauthentication Enabled	Indicates whether reauthentication is enabled on the interface.

Output Parameter	Description
Maximum Users	The maximum number of clients that can be authenticated on the interface if the interface is configured as multi-auth host mode.
Guest VLAN ID	The VLAN id to be used to authorize clients that time out or fail authentication due to invalid credentials. This is applicable only for 802.1x unaware clients.
Unauthenticated VLAN ID	The VLAN id to be used to authorize clients that that time out or fail authentication due to invalid credentials. This is applicable only for 802.1x clients.
Critical VLAN ID	The VLAN ID to be used to authorize clients that time out due to unreachable RADIUS servers.
Authentication Violation Mode	The action to be taken when a security violation occurs on a port.
Authentication Server Dead Action	The action to be undertaken for data clients when all RADIUS servers are found dead.
Authentication Server Dead Action for Voice	The action to be undertaken for voice clients when all RADIUS servers are found dead.
Authentication Server Alive Action	The action to be undertaken for data clients when a RADIUS server comes alive after all configured RADIUS servers were found dead.

Command History

Output updated in version 6.6 firmware.

Example

The following example shows the output for a single Ethernet interface.

```
console#show authentication interface gigabitethernet 1/0/8

Authentication Manager Status.................. Enabled

Interface...................................... Gi1/0/8
Port Control Mode.............................. auto
Host Mode...................................... multi-domain
Open Authentication............................ Disabled
Authentication Restart timer................... 30
```

```
Configured method order........................ dot1x mab captive-portal
Enabled method order........................... undefined undefined
undefined
Configured method priority..................... dot1x mab captive-portal
Enabled method priority........................ undefined undefined
undefined
Reauthentication Period (secs)................. 300
Reauthentication Enabled....................... TRUE
Reauthentication Session timeout from server .. FALSE
Maximum Users.................................. 32
Guest VLAN ID.................................. 0
Authentication retry attempts.................. 1
Unauthenticated VLAN ID........................ 0
Critical Vlan Id............................... 0
Authentication Violation Mode.................. Restrict
Authentication Server Dead action.............. None
Authentication Server Dead action for Voice.... None
Authentication Server Alive action............. Reinitialize
```

show authentication authentication-history

Use this command to display the historical authentication events for a specific interface.

Syntax

show authentication authentication-history {**all** | *interface-id* [**detail**] | **failed-auth-only** }

- *interface-id*—Display information for a single Ethernet (physical) interface identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following output parameters are displayed:

Output Parameter	Description
Time Stamp	Exact time at which the authentication event occurred.
Interface	Ethernet interface on which the authentication event occurred.
MAC-Address	Supplicant/Client MAC Address.
Auth Status	The final authentication status.
Method	The authentication method used.

Command History

Command syntax **show dot1x authenticated-history** deprecated in favor of **show authentication authentication-history** in version 6.6 firmware.

Example

The following example shows two failed authentications on interface Gi1/0/2 from a single 802.1X client.

```
console#show authentication authentication-history gi1/0/12

Timestamp             Interface  MAC-Address        Auth Status   Method
--------------------  ---------  -----------------  ------------  ------
May 07 2018 13:02:41  Gi1/0/2    58:05:94:1C:00:00  Unauthorized  802.1X
May 07 2018 13:01:33  Gi1/0/2    58:05:94:1C:00:00  Unauthorized  802.1X
```

show authentication methods

Use the **show authentication methods** command to display information about the authentication methods.

Syntax

show authentication methods

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the authentication configuration.

```
console#show authentication methods

Login Authentication Method Lists
---------------------------------
defaultList          : none
networkList          : local

Enable Authentication Method Lists
----------------------------------
enableList           : enable   none
enableNetList        : enable

Line     Login Method List    Enable Method List
-------  -----------------    ------------------
Console  defaultList          enableList
Telnet   networkList          enableNetList
SSH      networkList          enableNetList

HTTPS       :local
HTTP        :local
DOT1X       :
```

show authentication statistics

Use this command to display the Authentication Manager statistics on one or more interfaces.

Syntax

show authentication statistics *interface-id*

- *interface-id*—An Ethernet interface identifier.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
config# show authentication statistics gi1/0/1

Port......................................... Gi1/0/1
802.1x attempts.............................. 1
802.1x failed attempts....................... 0
Mab attempts................................. 0
Mab failed attempts.......................... 0
Captive-portal attempts...................... 0
Captive-Portal failed attempts............... 0
```

show authorization methods

Use the **show authorization methods** command to display the configured authorization method lists.

Syntax

show authorization methods

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Command authorization is supported only for the **line**, **telnet**, and **SSH** access methods.

Example

```
console#show authorization methods

Exec Authorization List        Methods
----------------------------   ------------------------------
dfltExecAuthList               none

Command Authorization List     Methods
----------------------------   ------------------------------
dfltCmdAuthList                none

Line       Exec Method Lists      Command Method Lists
---------  ---------------------  ---------------------
Console    dfltExecAuthList       dfltCmdAuthList
Telnet     dfltExecAuthList       dfltCmdAuthList
SSH        dfltExecAuthList       dfltCmdAuthList

Network Authorization  Methods
---------------------- -------
Dot1x                  radius
```

show mab

Use the **show mab** command to display the authenticated MAB clients.

Syntax

show mab [interface <interface-ID>]

- interface-id—An interface (Ethernet) identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays the configuration and status of MAB authenticated hosts.

Command History

Command introduced in version 6.6 firmware.

Example

The following example displays MAB information.

```
console#show mab

MAB Request Fmt Attr1 Groupsize... 2
MAB Request Fmt Attr1 Separator... legacy(:)
MAB Request Fmt Attr1 Case........ uppercase

Interface    Admin Mode     Auth-type
---------    -----------    ---------
Gi1/0/1        Disabled       N/A
Gi1/0/2        Disabled       N/A
Gi1/0/3        Disabled       N/A


console#show  mab interface gi1/0/10
Interface    Admin Mode     Auth-type
---------    -----------    ---------
Gi1/0/10      Enabled        eap-md5
```

show users accounts

Use the **show users accounts** command to display the local user status with respect to user account lockout and password aging.

Syntax

show users accounts

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

User accounts are distinct from the IAS user accounts. IAS users are allowed access to network resources when authenticating via AAA. User accounts are switch administrators allowed access to the switch administrator console.

The following fields are displayed by this command.

Parameter	Description
UserName	Local user account’s user name.
Privilege	User’s access level (read only-1 or read/write-15). Use level 0 to block a user’s access.
Password Aging	Indicates whether password aging is enabled and the password aging period.
Password Expiry Date	Current password expiration date in date format.
Lockout	Displays the user’s lockout status (**True** or **False**).

Example

The following example displays information about the local user database.

```
console(config)#show users accounts

 UserName                  Privilege  Password  Password              Lockout
                                      Aging     Expiry date
------------------------  ---------  --------  --------------------  --------
 admin                      15         200      Jan 13 1915 00:32:12  False
   Administrative Profile(s):
```

show users login-history

Use the **show users login-history** command in Global Configuration mode to display information about the login history of users.

Syntax

show users login-history [username|**long**]

- *username* — name of user. (Range: 1-64 characters)
- *long* — display only the user login name

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays switch administrative user information.

Example

The following example shows user login history outputs.

```
console#show users login-history
Login Time            Username  Protocol  Location
--------------------  --------- --------- -----------
Jan 19 2005 08:23:48  Bob       Serial
Jan 19 2005 08:29:29  Robert    HTTP      172.16.0.8
Jan 19 2005 08:42:31  John      SSH       172.16.0.1
Jan 19 2005 08:49:52  Betty     Telnet    172.16.1.7
```

Command History

Syntax updated in 6.4 release.

username

Use the **username** command in Global Configuration mode to add a new user to the local user (switch administrator) database. The default privilege level is 1. The command optionally allows the specification of an Administrative Profile for a local user.

Use the **no** form of this command to remove the username from the local user database.

Syntax

username name {**nopassword**|**password** *password*} [**privilege** *level*|**admin-profile** *profile*] [**encrypted**]

no username *name*

- *name*—The name of the user. Range: 1-64 printable characters. The special characters allowed in the username include ! # $ % & ‘ ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~. Question marks are disallowed.User names can contain blanks if the name is surrounded by double quotes.
- *password*—The authentication password for the user. Range: 8-64 characters. This value can be 0 [zero] if the **no passwords min-length** command has been executed. The special characters allowed in the password include ! # $ % & ‘ ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~. Question marks are disallowed.
- *level*—The user’s privilege level. Level 0 can be assigned by a level 15 user to another user to restrict that user’s access to the switch. Supported access levels are 0, 1, or 15. Enter access level 0 to disallow login, 1 for Read Access, or 15 for Read/Write Access.
- **nopassword**—Configure a switch administrator with no password. Note that the SSH is configured to require a password to access the switch. Use of a password for administrative access is highly recommended.
- *profile*—The name of the administrative profile(s) to apply to this user. An administrative profile is mutually exclusive with a privilege level.
- **encrypted**—Encrypted password entered, copied from another switch configuration. Password strength checking is not applied to the encrypted string.

Default Configuration

The default privilege level is 1.

Command Mode

Global Configuration mode

User Guidelines

The following rules and restrictions apply:

- User accounts have an associated privilege level, a user name, and a user password.
- The password is saved internally in hashed format and never appears in clear text anywhere in the UI.
- An administrator (privilege level 15) may create additional administrator accounts and unlock locked accounts.
- An administrator may delete or modify any or all accounts, including other administrator accounts or his own account.

To use the ! character as part of the username or password string, it should be enclosed within quotation marks. For example, username “test!xyz” password “test!xyz” includes an exclamation point in both the username and password.

Up to 8 users may be created. If the password strength feature is enabled, it checks for password strength and returns an appropriate error if it fails to meet the password strength criteria. If the encrypted keyword is entered, no password strength checking is performed as the password is encrypted and the system does not have the capability of decrypting the password. Privilege level 0 cannot log into the switch. There is effectively no difference between Privilege level 1 and 15.

The following table lists the completion messages.

Message Type	Message Description
Successful Completion Message	No message is displayed.
Error Completion Message	Could not set user password!

Message Type	Message Description
Reason behind the failure	**1** Exceeds Minimum Length of a Password. Password should be in the range of 8-64 characters in length. Set minimum password length to 0 by using the **passwords min-length 0** command. **2** Password should contain Minimum <number> uppercase-letters, <number> lowercase-letters, <number> numeric numbers, <number> special characters and <number> character classes and Maximum limit of <number> consecutive alphabetic and numeric characters. Maximum repetition of <number> alphabetic and number characters. **3** Password should not contain the keywords <keyword1>, <keyword2> and <keyword3> in any form (reversed, substring or case-insensitive).

Example

The following example configures user **bob** with password **xxxyymmmm** and user level 15.

```
console(config)# username bob password ?
<password>    Enter the password. The special characters allowed in the
password include ~ ` ! @ # $ % ^ & * ( ) _ - + = [ ] { } \ | : ; ' < > . , /.

console(config)# username bob password xxxyyymmm privilege 15
```

username unlock

Use the **username unlock** command in Global Configuration mode to unlock a locked user account. Only a user with read/write access can reactivate a locked user account.

Syntax

username *username* **unlock**

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command applies to switch administrator (privilege level 15) accounts.

Privilege level 0 cannot log into the switch. There is effectively no difference between privilege level 1 and 15.

Administrative Profiles Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The administrative profiles capability provides the network administrator control over which commands a user (switch administrator) is allowed to execute. The administrator is able to group commands into a “profile” and assign a profile to a user upon authentication. This provides more granularity than simply allowing read-only and read-write users. It may be, for example, that a particular user is only allowed to manage the Captive Portal feature but not allowed to manage any other of the switch features.

This capability is similar to the industry standard “User Roles” feature. The main difference is that the Administrative Profile is obtained via authentication rather than via authorization. This was necessary because Dell EMC Networking does not support AAA authorization of users.

Functionally, the Administrative Profiles feature allows the network administrator to define a list of rules which control the commands which may be executed by a user. These rules are collected in a “profile.” A rule defines a set of commands to which a user is permitted or denied access. Alternatively, a rule may define a CLI command mode to which the user is permitted or denied access. The rule numbers determine the order in which the rules are applied: Rules are applied in descending numerical order until there is a match. Rules may use regular expressions for command matching. All profiles have an implicit “deny all” rule such that any command which does not match any rules in the profile is considered to have been denied by that profile.

It is possible to assign a user more than one profile. If there are conflicting rules in profiles, the “permit” rule always takes precedence over the “deny” rule, i.e., if any profile assigned to a user permits a command, then the user is permitted access to that command. A user may be assigned up to 16 profiles.

A number of profiles are provided by default. These profiles may not be altered by the switch administrator.

If the successful authentication method does not provide an Administrative Profile for a user, then the user is permitted access based upon the user’s privilege level (as in previous releases). This means that if a user successfully passes enable authentication, the user is permitted access to all commands. This is also true if none of the Administrative Profiles provided are configured on the switch.

RADIUS and TACACS+

The network administrator may configure a custom attribute to be provided by the server during authentication. The RADIUS and TACACS+ applications process this custom attribute and provide this data to the User Manager for configuring the user profile.

The custom attribute is defined as:

cisco-av-pair=shell:roles=”roleA roleB …”

admin-profile

Use the **admin-profile** command in Global Configuration mode to create an administrative profile. The system-defined administrative profiles cannot be deleted. When creating a profile, the user is placed into Administrative Profile Configuration mode.

Use the **no** form of the command to delete an administrative profile and all its rules.

Syntax

admin-profile *profile-name*

no admin-profile *profile-name*

- *profile-name*—The name of the profile to create or delete. Range: 1 to 16 alphanumeric characters – may also include a hyphen.

Default Configuration

The administrative profiles are defined by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)#admin-profile qos
console(admin-profile)#
```

description (Administrative Profile Configuration)

Use the **description** command in Administrative Profile Configuration mode to add a description to an administrative profile.

Use the **no** form of this command to delete the description.

Syntax

description *text*

no description

- *text*—A description of, or comment about, the administrative profile. To include white space, enclose the description in quotes. Range: 1 to 128 printable characters.

Default Configuration

This command has no default configuration.

Command Mode

Administrative Profile Configuration mode

User Guidelines

The description string is required to be enclosed in quotes if it contains embedded white space. Question marks are disallowed.

Example

```
console(admin-profile)#description "This profile allows access to QoS
commands."
```

rule

Use the **rule** command to add a rule to an administrative profile.

Use the no form of this command to delete a rule.

Syntax

rule *number* {**deny**|**permit**} {**command** *command-string*|**mode** *mode-name*}

no rule *number*

- *number*—The sequence number of the rule. Rules are applied from the highest sequence number to the lowest. Range: 1 to 256.
- *command-string*—Specifies which commands to permit or deny. The command-string may contain spaces and regular expressions. The command string is required to be enclosed in quotes if it contains embedded white space. Range: 1 to 128 characters). Regular expressions should conform to Henry Spencer's implementation of the POSIX 1003.2 specification.

  NOTE: Note: In this usage, the beginning and end of line meta-characters have no meaning.

- *mode-name*—The name of the CLI mode to which the profile will permit or deny access.

Default Configuration

This command has no default configuration.

Command Mode

Administrative Profile Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(admin-profile)#rule 1 permit command "access-list *"
console(admin-profile)#
```

show admin-profiles

Use the **show admin-profiles** command to show the administrative profiles. If the optional profile name parameter is used, only that profile will be shown.

Syntax

show admin-profiles [**name** *profile-name*]

- *profile-name*—The name of the administrative profile to display.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following admin profiles are predefined and may not be deleted or changed by the administrator:

- Profile: network-admin
- Profile: network-security
- Profile: router-admin
- Profile: multicast-admin
- Profile: dhcp-admin
- Profile: CP-admin
- Profile: network-operator.

Example

```
console#show admin-profiles name qos

Profile: qos
Description: This profile allows access to QoS commands.
Rule Perm    Type        Entity
---- ------ ------- ----------------------------------------
1     permit command     access-list *
2     permit command     access-group *
```

```
3    permit mode        class-map
```

show admin-profiles brief

Use the **show admin-profiles brief** command to list the names of the administrative profiles defined on the switch.

Syntax

show admin-profiles brief

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show admin-profiles brief

Profile: network-admin
Profile: network-security
Profile: router-admin
Profile: multicast-admin
Profile: dhcp-admin
Profile: CP-admin
Profile: network-operator
```

show cli modes

Use the **show cli modes** command to list the names of all the CLI modes.

Syntax

show cli modes

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

These are the generic mode names to be used in the rule command above. These are not the same as the prompt which is displayed in a particular mode.

Example

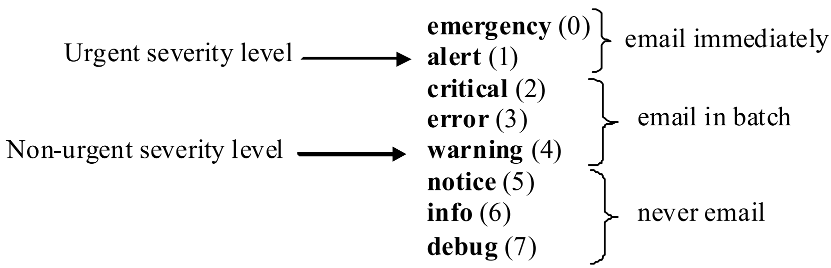
```
console#show cli modes

user-exec
privileged-exec
global-config
ethernet-config
port-channel-config
```

E-mail Alerting Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

E-mail Alerting is an extension of the logging system. The Dell EMC Networking logging system allows the user to configure a variety of destinations for log messages. This feature adds e-mail configuration capabilities, by which the log messages are sent to a configured SMTP server such that an operator may receive the log in an e-mail account of their choice.

Figure 1: Log Messages Severity Level



The network operator can adjust the urgent and non-urgent severity levels. These levels are global and apply to all destination e-mail addresses. Log messages in the urgent group are sent immediately to SMTP server with each log message in a separate mail. Log messages in the non-urgent group are batched into a single e-mail message and after a configurable delay.

Only the minimum part (MUA functionality of RFC 4409) required by the switch or router to send the messages to the SMTP server is supported. Some SMTP servers insist on authentication before the messages may be received by them. The minimum part (MUA functionality of RFC 4954) required by the switch or router to become authenticated by the SMTP server is supported. Only plain text authentication is supported.

logging email

Use the **logging email** command in Global Configuration mode to enable e-mail alerting and set the lowest severity level for which log messages are e-mailed. Use the **no** form of the command to disable e-mail alerting.

Syntax

logging email [*severity*]

no logging email

- *severity*—If you specify a severity level, log messages at or above the severity level are e-mailed. The severity level may either be specified by keyword or as an integer from 0 to 7. The accepted keywords, and the numeric severity level each represents, are as follows.
  - emergency (0)
  - alert (1)
  - critical (2)
  - error (3)
  - warning (4)
  - notice (5)
  - info (6)
  - debug (7)

Default Configuration

E-mail alerting is disabled by default. When e-mail alerting is enabled, log messages at or above severity Warning are e-mailed.

Command Mode

Global Configuration mode

User Guidelines

The **logging email** command with no arguments enables e-mail alerting. Specify a severity to set the severity level of log messages that are e-mailed in a non-urgent manner. Log messages at or above this severity level, but below the urgent severity level, are collected together until the log time expires (the time specified in the logging email logtime command) and then e-mailed in a single e-mail message. If you set the non-urgent severity level to the same value as the urgent severity level, then no log messages are e-mailed non-urgently. See the logging email urgent command to specify the urgent severity level. The command **no logging email** disables all e-mail alerting.

logging email urgent

Use the **logging email urgent** command in Global Configuration mode to set the lowest severity level at which log messages are e-mailed in an urgent manner. To revert the urgent severity level to its default value, use the **no** form of this command.

Syntax

logging email urgent {*severity* | **none**}

no logging email urgent

- *severity*—If you specify a severity level, log messages at or above the severity level are e-mailed. The severity level may either be specified by keyword or as an integer from 0 to 7. The accepted keywords, and the numeric severity level each represents, are as follows.
  - emergency (0)
  - alert (1)
  - critical (2)
  - error (3)
  - warning (4)
  - notice (5)
  - info (6)
  - debug (7)
- **none**—If you specify this keyword, no log messages are e-mailed urgently. All log messages at or above the non-urgent level (configured with the **logging email** command) are e-mailed in batch.

Default Configuration

The default severity level is alert.

Command Mode

Global Configuration mode

User Guidelines

Log messages at or above this severity level are considered urgent. By default, Emergency and Alert log messages are considered urgent. Urgent log messages are e-mailed immediately, one log message per e-mail message, and do not wait for the log time to expire. Urgent log messages are not e-mailed unless you enable e-mail alerting with the **logging email** command.

logging email message-type to-addr

Use the **logging email message-type to-addr** command in Global Configuration mode to configure the **To** address field of the e-mail. The message types supported are **urgent**, **non-urgent**, and **both**. For each supported severity level, multiple e-mail addresses can be configured. For example, for urgent type of messages, there could be multiple addresses configured.

Syntax

logging email message-type {urgent | non-urgent | both} to-addr *to-email-addr*

no logging email to-addr *to-addr* **message-type**

no logging email message-type {urgent | non-urgent | both} to-addr *to-email-addr*

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The to-email-addr is the address to which the email is sent.

Urgent | non-urgent | both—The priority with which the email is queued. Urgent email is sent immediately. Non-urgent email is queued and sent periodically.

Example

```
console(config)#logging email message-type urgent to-addr admin123@dell.com
```

Command History

Example added in the 6.4 release.

logging email from-addr

Use the **logging email from-addr** command in Global Configuration mode to configure the **From** address of the e-mail. Use the **no** form of this command to remove the e-mail source address.

Syntax

logging email from-addr *from-email-addr*

no logging email from-addr

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The from-addr in this command is the email address of the email sender. Many mail servers will validate the from address of an email to ensure that abuse of the email server does not occur.

Example

```
console(config)#logging email from-addr dell@gmail.com
```

Command History

Example added in the 6.4 release.

logging email message-type subject

Use the **logging email message-type subject** command in Global Configuration mode to configures subject of the e-mail. Use the **no** form of this command to remove the existing subject and return to the default subject.

Syntax

logging email message-type *message-type* **subject** *subject*

no logging email message-type *message-type* **subject**

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The user must enter the message-type parameter manually as tab and space bar completion do not work for this parameter.

Example

```
console(config)#logging email message-type urgent subject UrgentLog
```

Command History

Example added in the 6.4 release.

logging email logtime

Use the **logging email logtime** command in Global Configuration mode to configure the value of how frequently the queued messages are sent.

Syntax

logging email logtime *time duration*

no logging email logtime

- *time duration*—Time in minutes. Range: 30 – 1440.

Default Configuration

The default value is 30 minutes.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#logging email logtime 50
```

Command History

Example added in the 6.4 release.

logging email test message-type

Use the **logging email test message-type** command in Global Configuration mode to test whether or not an e-mail is being sent to an SMTP server.

Syntax

logging email test message-type *message-type* **message-body** *message-body*

- *message-type*—Urgent, non-urgent, or both
- *message-body*—The message to log. Enclose the message in double quotes if it contains any spaces.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#logging email test message-type urgent message-body
urgentlog
```

Command History

Example added in the 6.4 release.

show logging email statistics

Use the **show logging email statistics** command to show the statistics about the e-mails. The command displays information on how many e-mails are sent, how many e-mails failed, how long it has been since the last e-mail was sent.

Syntax

show logging email statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

Example

```
console#show logging email statistics

No of email Failures so far.................... 0
No of email sent so far........................ 0
Time since last email Sent.................... 00 days 00 hours 00 mins 00
secs
```

clear logging email statistics

Use the **clear logging email statistics** command to clear the e-mail alerting statistics.

Syntax

clear logging email statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

Example

```
console#clear logging email statistics
```

Command History

Example added in the 6.4 release.

security

Use the **security** command in Mail Server Configuration mode to set the e-mail alerting security protocol. This enables and disables the switch to use TLS authentication with the SMTP Server. If the administrator sets the TLS mode and, if the SMTP sever does not support TLS mode, then no e-mail goes to the SMTP server.

Syntax

security {**tlsv1** | **none**}

Default Configuration

The default value is disabled.

Command Mode

Mail Server Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#mail-server 10.131.1.11
console(mail-server)#security tlsv1
```

Command History

Example added in the 6.4 release.

mail-server ip-address | hostname

Use the **mail-server ip-address | hostname** command in Global Configuration mode to configure the SMTP server IP address and change the mode to Mail Server Configuration mode. Use the **no** form of this command to remove the configured SMTP server address.

Syntax

mail-server {*ip-address* | *hostname*}

no mail-server {*ip-address* | *hostname*}

- *ip-address*—An IPv4 or IPv6 address.
- *hostname*—The DNS name of an SMTP server.

Default Configuration

The default configuration for a mail server is shown in the table below.

Field	Default
Email Alert Mail Server Port	25

Field	Default
Email Alert Security Protocol	none
Email Alert Username	admin
Email Alert Password	admin

Command Mode

Global Configuration

User Guidelines

The server address can be in the IPv4, IPv6, or DNS FQDN name format.

port (Mail Server Configuration Mode)

Use the **port** command in Mail Server Configuration mode to configure the TCP port to use for communication with the SMTP server. The default for no security is 25 (SMTP). The port for TLSv1 is port 465. The range is 1025 to 65535. Use the **no** form of the command to revert the SMTP port to the default port.

Syntax

port *port*

no port

Default Configuration

The default value is 25 (SMTP).

Command Mode

Mail Server Configuration

User Guidelines

Port 25 is the standard SMTP port for cleartext messages. Port 465 is the standard port for messages sent using TLSv1.

Example

```
console(config)#mail-server 10.131.1.11
```

```
console(mail-server)#port 1024
```

Command History

Example added in the 6.4 release.

Description updated in the 6.4 release.

username (Mail Server Configuration Mode)

Use the **username** command in Mail Server Configuration mode to configure the username required by the authentication. Use the **no** form of the command to revert the username to the default value.

Syntax

username *username*

no username

Default Configuration

The default value for username is **admin**.

Command Mode

Mail Server Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#mail-server 10.131.1.11
console(mail-server)#username admin
```

Command History

Example added in the 6.4 release.

password (Mail Server Configuration Mode)

Use the **password** command in Mail Server Configuration mode to configure the password required to authenticate to the e-mail server. Use the **no** form of the command to revert the password to the default value.

Syntax

password *password*

no password

Default Configuration

The default value for password is **admin**.

Command Mode

Mail Server Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#mail-server 10.131.1.11
console(mail-server)#password admin123
```

Command History

Example added in the 6.4 release.

show mail-server

Use the **show mail-server** command to display the configuration of all the mail servers or a particular mail server.

Syntax

show mail-server {*ip-address* | *hostname* | **all**}

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show mail-server all
Mail Servers Configuration:

No of mail servers configured.....................1

Email Alert Mail Server Address................. 10.131.1.11
Email Alert Mail Server Port....................... 465
Email Alert SecurityProtocol....................... tlsv1
Email Alert Username............................... admin
Email Alert Password............................... password

console#show mail-server all
Mail Servers Configuration:

No of mail servers configured.....................1

Email Alert Mail Server Address................. 10.131.1.11
Email Alert Mail Server Port....................... 465
Email Alert SecurityProtocol....................... tlsv1
Email Alert Username............................... admin
Email Alert Password............................... password

console#show mail-server 10.131.1.11
Email Alert Mail Server Address................ 10.131.1.11
Email Alert Mail Server Port.................. 465
Email Alert SecurityProtocol.................. tlsv1
Email Alert Username.......................... admin
Email Alert Password.......................... password
```

Command History

Example added in the 6.4 release.

RADIUS Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Authentication of users in a large network can be significantly simplified by making use of a single database of accessible information supplied by an Authentication Server. These servers commonly use the Remote Authentication Dial In User Service (RADIUS) protocol as defined by RFC 2865.

RADIUS permits access to a user's authentication and configuration information contained on the server only when requests are received from a client that shares an encrypted secret with the server. This **secret** is never transmitted over the network in an attempt to maintain a secure environment. Any requests from clients that are not appropriately configured with the secret or access from unauthorized devices are silently discarded by the server.

RADIUS conforms to a client/server model with secure communications using UDP as a transport protocol. It is extremely flexible, supporting a variety of methods to authenticate and statistically track users. It is very extensible allowing for new methods of authentication to be added without disrupting existing network functionality.

Dell EMC Networking supports a RADIUS client in conformance with RFC 2865 and accounting functions in conformance with RFC2866 and RFC6911 for attribute 168. The RADIUS client will apply user policies under control of the RADIUS server, e.g. password lockout or login time of day restrictions. The RADIUS client supports up to 32 named authentication and accounting servers.

For the N1100-ON and N1500 Series switches, the number of supported authentication and accounting servers is 8.

RADIUS-based Dynamic VLAN Assignment

If a VLAN assignment is enabled in the RADIUS server, then as part of the response message, the RADIUS server sends the VLAN ID that the client is requested to use in the 802.1x tunnel attributes. If dynamic VLAN creation is enabled on the switch (**dot1x dynamic-vlan enable**) and the RADIUS assigned VLAN does not exist on the supplicant connected interface, the assigned VLAN is dynamically created. See the **aaa authorization network default radius** command for further information. This implies that the client can connect from any port and be assigned to the appropriate VLAN, which may be already configured on an uplink interface. This gives flexibility for clients to move around the network with out requiring the operator to perform additional provisioning for each network interface. Dynamic VLAN assignment uses the following RADIUS attributes from the received Access-Accept:

IETF 64 (Tunnel Type)—Set this to VLAN.

IETF 65 (Tunnel Medium Type)—Set this to 802.

IETF 81 (Tunnel Private Group ID)—Set this to VLAN ID or VLAN name.

RADIUS Change of Authorization

Dell EMC Networking supports the Change of Authorization Disconnect - Request per RFC 3575. The Dell EMC Networking switch listens for the Disconnect-Request on UDP port 3799. The Disconnect-Request identifies the user session to be terminated using the following attributes:

- User-Name (IETF attribute #1)
- Acct-Session-Id (IETF attribute #44)
- Calling-Station-Id (IETF attribute #31, which contains the host MAC address)

The following messages from RFC 3575 are supported:

- 40 - Disconnect-Request
- 41 - Disconnect-ACK
- 42 - Disconnect-NAK

A CoA Disconnect-Request terminates the session without disabling the switch port. Instead, CoA Disconnect-Request termination causes re-initialization of the authenticator state machine for the specified host. MAC-based port control can be enabled for 802.1x sessions. In this case, if the RADIUS server issues a disconnect request and subsequently does not authorize the MAC address to access network resources, the host is effectively denied network access. Dell EMC Networking switches also support the proprietary VSA subscriber commands **bounce-host-port**, **disable-host-port**, and **reauthenticate**.

If the session cannot be located, the device returns a Disconnect-NAK message with the “Session Context Not Found” error-code attribute. If the session is located, the device terminates the session. After the session has been completely removed, the device returns a Disconnect-ACK message. The attributes returned within a CoA ACK can vary based on the CoA Request.

The administrator can configure whether all or any of the session attributes are used to identify a client session. If all is configured, all session identification attributes included in the CoA Disconnect-Request must match a session or the device returns a Disconnect-NAK or CoA-NAK with the “Invalid Attribute Value” error-code attribute.

Dell EMC Networking supports the following attributes in responses:

- User-Name (IETF attribute #1)
- State (IETF attribute #24)
- Calling-Station-ID (IETF attribute #31)
- Acct-Session-ID (IETF attribute #44)
- Message-Authenticator (IETF attribute #80)
- Error-Cause (IETF attribute #101)

A CoA NAK message is not sent for all CoA requests with a key mismatch. The message is sent only for the first three requests for a client. After that, all the packets from that client are dropped. When there is a key mismatch, the response authenticator sent with the CoA NAK message is calculated from a dummy key value.

The Dell EMC Networking switch starts listening to the client again based on reauthentication timer.

Refer to the RADIUS Change of Authorization section in the Users Configuration Guide for examples of configuring RADIUS CoA.

acct-port

Use the **acct-port** command to set the port on which the RADIUS accounting server listens for connections. Use the **no** form of this command to reset the port to the default.

Syntax

acct-port *port*

no acct-port

- *port* — The layer 4 port number of the accounting server (Range: 1 - 65535).

Default Configuration

The default value of the port number is 1813.

Command Mode

RADIUS Server Accounting mode

User Guidelines

There are no user guidelines for this command.

Example

The following example sets port number 56 for accounting requests.

```
console(config)#radius server acct 3.2.3.2
console(Config-acct-radius)#acct-port 56
```

attribute 6

Use the **attribute 6** command to configure processing of the RADIUS Service-Type attribute.

Syntax

attribute 6 [on-for-login-auth|mandatory]

no attribute 6 [on-for-login-auth|mandatory]

Default Configuration

By default, the Service-Type is not included in the Access-Request message sent to the authentication server.

Command Mode

RADIUS Server Configuration

User Guidelines

on-for-login—If the **on-for-login** parameter is enabled, the Service-Type TLV is send in the Access-Request message.

mandatory—If the mandatory parameter is enabled, the Service-Type attribute is required and validated in the Access-Accept packet received from the RADIUS server. Dell EMC Networking N-Series switches accept the Login-User (1) and Administrative-User (6) values in the Access-Accept message returned from the RADIUS server. If the **mandatory** parameter is not configured, the Service-Type TLV received in an Access-Accept packet is ignored.

Command History

Introduced in version 6.3.0.1 firmware. Updated in 6.3.5.0 firmware.

Example

This example configures the switch to send the Service-Type attribute to the RADIUS server in the Access-Request message.

```
console#conf
console(config)#radius server auth 4.3.2.1
console(config-auth-radius)#attribute 6 on-for-login-auth
```

This example configures the switch to process and validate the Service-Type received in the Access-Accept message from the RADIUS server.

```
console#conf
console(config)#radius server auth 4.3.2.1
console(config-auth-radius)#attribute 6 mandatory
```

attribute 8

Use the **attribute** 8 command to configure the switch to send the RADIUS Framed-IP-Address attribute in the Access-Request message sent to a specific RADIUS authentication server. The switch sends the IP address of the host attempting to authenticate in the Framed-IP-Address attribute in the Access-Request sent to the authentication server.

Syntax

attribute 8 **include-in-access-req**

no attribute 8 **include-in-access-req**

Default Configuration

By default, the Framed-IP-Address is not included in the Access-Request message sent to the authentication server.

Command Mode

RADIUS Server Configuration

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#radius server auth 4.3.2.1
console(config-auth-radius)#attribute 8 include-in-access-req
```

attribute 25

Use the **attribute 25** command to enable the switch to send the RADIUS Class attribute as supplied by the RADIUS server in accounting messages sent to the specific accounting server.

Syntax

attribute 25 include-in-access-req

no attribute 25 include-in-access-req

Default Configuration

By default, the Class attribute is included in the accounting messages sent to the accounting server if received in the Access-Accept from the RADIUS authentication server.

Command Mode

RADIUS Server Configuration

User Guidelines

The switch sends the Class attribute value supplied by the RADIUS server in the Access-Accept message if enabled. If disabled, the Class attribute received from the RADIUS server is ignored. The Class attribute may be up to 16 octets in length

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#radius server auth 4.3.2.1
console(config-auth-radius)#attribute 25 include-in-access-req
```

attribute mac format

Use the **attribute mac format** command to configure the format of the Original-Called-Number (30), Calling-Station-ID (31), NAS-Identifier (32) attributes sent to the RADIUS server in Access-Request and Acct-Request messages for a RADIUS server. Use the **no** form of the command to return the MAC address format to the default.

Syntax

attribute { 30 | 31 | 32 } mac format { ietf | unformatted | legacy } [lower-case | upper-case]

no attribute { 30 | 31 | 32 } mac format

- **ietf**—Format the MAC address as 18-DB-F2-25-B2-D4. The default is upper case.
- **unformatted**—Format the MAC address as 18dbf225b2d4. The default is lower case.
- **legacy**—Format the MAC address as 18:db:f2:25:b2:d4. The default is lower case.
- **lower**-case—Format hexadecimal characters using the character set [0-9a-f].
- **upper**-case—Format hexadecimal characters using the character set [0-9A-F].

Default Configuration

By default, the switch sends the Original-Called-Number (30), Calling-Station-Id (31), and NAS-Identifier (32) attribute MAC address in unformatted upper-case.

Command Mode

RADIUS Server Configuration

User Guidelines

Use this command to override the format of MAC addresses sent in the Original-Called-Number (30), Calling-Station-Id (31), or NAS-Identifier (32) attributes for a RADIUS server.

This command is only supported for 802.1X or MAB authentication . Local authentication formats remain unchanged.

The Calling-Station-Id attribute is sent when authenticating using authentication host mode single-host, multi-auth, multi-domain or when using MAB authentication for an interface.

This command overrides the global configuration for attribute 30, 31, or 32. Use the mab request format attribute 1 command to configure formatting the User-Name attribute. Use the radius server attribute mac format command to globally configure MAC address formatting.

Command History

Introduced in version 6.3.0.1 firmware. Updated in release 6.5.0 to remove formatting of the User-Name attribute. Updated in release 6.6.0 to add formatting of attributes 30 and 31.

Example

```
console#conf
console(config)#radius server auth 4.3.2.1
console(config-auth-radius)#attribute 30 mac format unformatted lower-case
```

attribute 32

Use this command to configure the format of the NAS-Identifier sent to the RADIUS server in Access-Request and Acct-Request messages. Use the **no** form of the command to return the MAC address format to the default.

Syntax

attribute 32 include-in-access-request [**format**]

no attribute 32 include-in-access-request

- format—A text string of 2 to 128 characters and may include the following format specifiers:

%m : NAS MAC address

%i : NAS IP address

%h : NAS host name

%d : NAS domain name

Default Configuration

By default, the format specifier is %m.

Command Mode

RADIUS Server Configuration mode

User Guidelines

The format parameter is a text string. Use quotes to include embedded spaces.

Command History

Command introduced in version 6.6.0.1 firmware.

attribute 44

Use the **attribute 44** command to enable sending the Acct-Session-ID in Access-Request messages. Use the **no** form of the command to cease sending the Acct-Session-ID in Access-Request messages.

Syntax

attribute 44 include-in-access-request

no attribute 44 include-in-access-request

Default Configuration

By default, the Acct-Session-ID is not sent in Access-Request messages.

Command Mode

RADIUS Server Configuration mode

User Guidelines

The Acct-Session-ID is the same as the session identifier used in accounting messages.

Command History

Command introduced in version 6.6.0.1 firmware.

attribute 168

Use the **attribute 168 include-in-access-req** command to enable the switch to send the RADIUS Framed-IPv6-Address attribute in Access-Request messages sent to the RADIUS authentication server.

Syntax

attribute 168 include-in-access-req

no attribute 168 include-in-access-req

Default Configuration

By default, RADIUS attribute 168 is not sent.

Command Mode

RADIUS Server Configuration mode.

User Guidelines

The switch sends the IPv6 address of the host attempting to access the network in the Framed-IPv6-Address attribute if it is available to the switch. If accounting is enabled and the address is available to the switch, the switch will send the IPv6 address in the Access-Request, Acct-Start/Acct-Interim/Acct-Stop messages sent to the accounting server.

The switch discovers the client IPv6 address via its inclusion in the RADIUS Access-Accept, or via DHCPv6 snooping. DHCPv6 snooping must be enabled for the switch to discover a host IPv6 address via DHCPv6.

After an Access-Accept has been received by the switch and the switch grants the host access to the network, it may take a few seconds before the DHCPv6 transaction completes. Use the **aaa accounting delay-start** command to delay the sending of the Acct-Start packet to the accounting server.

Use the **show authentication clients** command to display the RADIUS server supplied IPv6 address, if any.

RADIUS attribute 168 Framed-IPv6-Address is defined in RFC 6911.

Command History

Command introduced in firmware release 6.5.2.

authentication event fail retry

Use the **authentication event fail retry** command to select the number of times authentication is reattempted by the user for an IEEE 802.1X supplicant. Use the **no** form of the command to return the number of maximum attempts to the default value.

Syntax

authentication event fail retry *max-attempts*

no authentication event fail retry

- *max-attempts* — The number of times RADIUS authentication is allowed to fail before failing the authentication and moving to the next authentication method. Default 1. Range 1–5.

Default Configuration

By default, the number of failed authentication attempts is 1. An authentication failure is declared failed after a single authentication attempt.

Command Mode

Interface Configuration mode, Interface Range mode

User Guidelines

This command is only applicable to IEEE 802.1X authentication with a RADIUS server. It has no effect on any other authentication method.

This parameter is independent of, and does not control, the number of times the authenticator will attempt to contact the RADIUS servers. For example, if the max-retries for a single configured RADIUS server is set to 3 and the max-attempts is set to 2, on a supplicant login attempt, the authenticator will send up to three access requests to the RADIUS server before returning failure. The authenticator will then re-invoke supplicant authentication method which allows the RADIUS back end to again send up to three requests to the RADIUS server before the authenticator allows IEEE 802.1x to stop supplicant authentication and to invoke the quiet period for the supplicant.

This command sets the limit for retring failed authentications for RADIUS. The switch attempts authentication based on the selected method and if authentication returns an error (as opposed to a failure), the next authentication method is attempted regardless of this setting.

For example, if one or multiple RADIUS servers are configured and no RADIUS server responds to the authentication message, RADIUS returns an error and the next authentication method is attempted even when the retry parameter is configured to a value larger than 1.

Example

The following example configures the switch to allow IEEE 802.1X supplicants to fail authentication (e.g., enter incorrect passwords) three times before invoking the quiet timer on the interface.

```
console#conf
console(config)#authentication enable
console(config)#interface gi1/0/3
console(config-if-Gi1/0/3)#authentication order dot1x
console(config-if-Gi1/0/3)#authentication event fail retry 3
```

Command History

Introduced in version 6.3.0.1 firmware.

auth-port

Use the **auth-port** command in RADIUS Server Configuration mode to set the port number on which the RADIUS server listens for authentication requests.

Syntax

auth-port *auth-port-number*

- *auth-port-number* — Port number for authentication requests. (Range: 1 - 65535)

Default Configuration

The default value of the port number is 1812.

Command Mode

RADIUS Server Configuration mode

User Guidelines

User must enter the mode corresponding to a specific RADIUS Server Configuration before executing this command.

Example

The following example sets the port number 2412 for authentication requests.

```
console(config)#radius server auth 192.143.120.123
console(config-auth-radius)#auth-port 2412
```

automate-tester

Use the **automate-tester** command to configure liveness checking. Use the **no** form of the command to disable liveness checking.

Syntax

automate-tester username *user-name* [**idle-time** *minutes*]

no automate-tester username

- **username** *user-name*—Configure the user name to use to test the RADIUS server for liveness. The user-name should **not** be configured on the RADIUS server.
- idle-time minutes—Configure the idle time (in minutes) after which the server is quarantined and sending of test packets commences. The range is 1 to 35791 minutes.

Default Configuration

There is no default user name.

The default idle time is 60 minutes.

Command Mode

RADIUS Authentication Server Configuration mode

RADIUS Accounting Server Configuration mode

User Guidelines

RADIUS servers configured with a test username and a non-zero deadtime are tested periodically for liveness. Liveness of a server is determined by sending an Access-Request to the server using a configurable dummy login. If an Access-Reject is returned, the server is marked alive and is available for use for authentication. The radius deadtime configured retries and timeouts are applied. It is suggested that the configured values be the same as the normal RADIUS values. If a RADIUS server fails to respond, it is marked dead. Setting the deadtime to 0 disables liveness checks and configures the switch to never mark the server dead.

Configuring the *user-name* parameter as a valid login on the RADIUS server will induce state on the server as the server will wait for further packets from the switch. The switch will not send any further RADIUS packets to remove the state from the RADIUS server. Therefore, Dell EMC strongly recommends that the user name **not** be configured on the RADIUS server.

The *user-name* parameter accepts any printable character. Enclose the parameter in double quotes to configure embedded blanks in the user name.

Successive invocations of the automate-tester command overwrite the previous values.

Command History

Command introduced in version 6.5 firmware.

Example

The following example configures an IPv4 RADIUS accounting server with the following characteristics:

Server IP address—192.168.10.1

Login—DummyLogin

Idle Time—30 minutes

deadtime

Use the **deadtime** command in RADIUS Server Configuration mode to configure the minimum amount of time to wait before attempting to recontact an unresponsive RADIUS server after it has been declared dead.

Syntax

deadtime *deadtime*

- *deadtime* — The amount of time that the unavailable server is skipped over. (Range: 0-2000 minutes)

Default Configuration

The default deadtime interval is 0 minutes, that is, the server will never be marked dead.

Command Mode

RADIUS Server Configuration mode

User Guidelines

If only one RADIUS server is configured, it is recommended to use a deadtime interval of 0.

Setting the deadtime to 0 indicates to the switch that the server should never be marked dead. This effectively disables features such as critical Voice VLAN.

If a RADIUS server is currently active and responsive, that server will be used until it no longer responds. RADIUS servers whose deadtime interval has not expired are skipped when searching for a new RADIUS server to contact.

Example

The following example specifies a deadtime interval of 60 minutes.

```
console(config)#radius server auth 192.143.120.123
console(config-auth-radius)#deadtime 60
```

key

Use the **key** command to specify the encryption key which is shared with the RADIUS server. Use the **no** form of this command to remove the key.

Syntax

key [0|7] *key-string*

no key

- 0—The key string that follows is the unencrypted shared secret. The length is 1–128 characters.
- 7—The key string that follows is the encrypted shared secret. The length is exactly 256 characters.
- *key-string* — The key string in encrypted or unencrypted form. In encrypted form, it must be 256 characters in length. In unencrypted form, it may be up to 128 characters in length.

Default Configuration

There is no key configured by default.

Command Mode

RADIUS Server Configuration mode

User Guidelines

There are no user guidelines for this command.

In an Access-Request, encrypted passwords are sent using the RSA Message Digest algorithm (MD5).

If no encryption parameter (7) is present, the key string is interpreted as an unencrypted shared secret.

Keys are always displayed in their encrypted form in the running configuration.

The encryption algorithm is the same across switches. Encrypted passwords may be copied from one switch and pasted into another switch.

Command History

Updated in version 6.3.0.1 firmware.

Example

The following two examples globally configure the RADIUS server key for all configured servers. The two examples are identical in effect.

```
console(config)#radius server auth 1.2.3.4
console(config-auth-radius)#key "This is a key string"
console(config-auth-radius)#key 0 "This is a key string"
```

msgauth

Use the **msgauth** command to enable the message authenticator attribute to be used for the RADIUS Authenticating server being configured. Use the "no" form of this command to disable the message authenticator attribute.

Syntax

msgauth

no msgauth

Default Configuration

The message authenticator attribute is enabled by default.

Command Mode

RADIUS Server Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-auth-radius)#msgauth
```

name (RADIUS Server)

Use the name command to assign a RADIUS server to a group. Use the no form of the command to return the name to the default (Default-RADIUS-Server). The **no** form of the command does not require the user to enter the configured name.

Syntax

name groupname

no name

- groupname—The name of the group for a RADIUS server (Range: 1 to 32 characters).

Default Configuration

The default RADIUS server group name is Default-RADIUS-Server.

Command Mode

RADIUS Server Configuration mode

User Guidelines

Assigning a name to multiple RADIUS servers associates the servers into a list. Server groups may be used to control which authentication servers are prioritized for traffic.

Names may consist of alphanumeric characters and the underscore, dash and blanks. Embed the name in double quotes to use a name with blanks.

NOTE: When multiple RADIUS servers are configured with different list names, e.g. ServerName is name1 and address is 1.1.1.1 ServerName is name2 and address is 1.1.1.2 the RADIUS request is always sent to the first lexicographically ordered server list, i.e. communication with the name1 server list is attempted before moving on to the name2 server list. Even if the priority value of servers in the name2 list is lower (lower value indicates higher priority) the request is sent to the name1 servers. If no servers respond in the name1 list, the request is sent to the second name list in lexicographic order, et. seq.

A server group may consist of multiple primary server and multiple secondary servers. Within a server group, communication the primary servers is attempted first in priority order. From the multiple secondary servers, the server with the lowest priority value is tried after the primary fails. For a server group where all priorities are equal, communication is attempted based on the server name lexicographic order. For example, if name9, name1, name6 are configured in a server group, communication is attempted in the order name1, then name6, then name9.

Use the **show aaa servers name** command to display the server groups.

Command History

Name command supported for accounting servers added in version 6.6 firmware.

Example

```
console(config)#radius server  44.44.44.44
console(config-auth-radius)#name NAME
```

```
console(config-auth-radius)#no name
```

primary

Use the **primary** command to specify that a configured server should be the primary server in a server group.

Syntax

primary

Default Configuration

There is no primary authentication server by default.

Command Mode

RADIUS Server Configuration mode

User Guidelines

Multiple primary servers can be configured for each server group. When the RADIUS client has to perform transactions with an authenticating RADIUS server of the specified group, it uses the primary server(s) first. If it fails to communicate with the primary server(s) for any reason, it uses the secondary servers configured within the group.

Example

```
console(Config-auth-radius)#primary
```

priority

Use the **priority** command in RADIUS Server Configuration mode to specify the order in which the servers are to be used, with 0 being the highest priority.

Syntax

priority *priority*

- *priority* — Sets server priority level. (Range 0-65535)

Default Configuration

The default priority is 0.

Command Mode

RADIUS Server Configuration mode

User Guidelines

User must enter the mode corresponding to a specific RADIUS server before executing this command. The highest priority is 0, with higher values indicating progressively lower priorities.

Example

The following example specifies a priority of 10 for the designated server.

```
console(config)#radius server auth 192.143.120.123
console(config-auth-radius)#priority 10
```

radius server attribute 4

Use the **radius server attribute 4** command to set the network access server (NAS) IPv4 address for the RADIUS server. The NAS-IP-Address is RADIUS attribute number 4. Use the **no** version of the command to set the value to the default.

Syntax

radius server attribute 4 *ip-address*

no radius server attribute 4

- *ip-address* — Specifies the IPv4 address to be used as the RADIUS attribute 4, the NAS-IP-Address.

Default Configuration

If a RADIUS server has been configured on the switch, the default NAS-IP-Address sent to the RADIUS server is the address of the switch or the address of the interface over which the Access-Request is sent.

Command Mode

Global Configuration mode

User Guidelines

This command does not alter the address in the IP header in Access-Requests transmitted to the RADIUS server. It only configures the NAS-IP-Address attribute sent to the RADIUS server inside the RADIUS Access-Request packet. This capability is useful when configuring multiple RADIUS clients (switches) to simulate a single RADIUS client for scalability. The RADIUS Acct-Session-Id may overlap if multiple switches are configured with the same NAS-IP-Address.

The configured NAS-IP-Address need not be the same as the IPv4 source address transmitted in the IP header. Use the **radius server source-ip** command to configure the IPv4 source address transmitted in the IP header.

Example

The following example sets the NAS IP address RADIUS attribute 4 to 192.168.10.22.

```
console(config)#radius server attribute 4 192.168.10.22
```

radius server attribute 6

Use the **radius server attribute 6** command to configure the use of the RADIUS Service-Type attribute.

Syntax

radius server attribute 6 {on-for-login-auth|mandatory}

no radius server attribute 6 {on-for-login-auth|mandatory}

Default Configuration

By default, the switch does not send the Service-Type attribute to the RADIUS server in the Access-Request packets. By default, the switch ignores the Service-Type received in Access-Accept packets.

Command Mode

Global Configuration

User Guidelines

on-for-login—This parameter globally configures the switch to send the RADIUS Service-Type attribute in the Access-Request message sent to all RADIUS authentication servers. The switch sends the Service-Type value Administrative (6) for administrators attempting to access the switch console and sends Service-Type value Login (1) for users attempting to access the network.

mandatory—This parameter enables processing and validation of the Service-Type parameter received from the RADIUS server in Access-Accept messages. Dell EMC Networking N-Series switches accept the Login-User (1) or Administrative-User (6) values in the Access-Accept message returned from the RADIUS server. Access-Accept messages without one of those values are treated as if an Access-Reject message has been received.

Command History

Introduced in version 6.3.0.1 firmware. Updated in 6.3.0.5 firmware.

Example

This command configures the switch to send the Service-Type attribute in the Access-Request message sent to the RADIUS server.

```
console#conf
console(config)#radius server attribute 6 on-for-login-auth
```

radius server attribute 8

Use the **radius server attribute** 8 **include-in-access-req** command to enable the switch to send the RADIUS Framed-IP-Address attribute in Access-Request messages sent to the authentication server.

Syntax

radius server attribute 8 **include-in-access-req**

no radius server attribute 8 **include-in-access-req**

Default Configuration

By default, RADIUS attribute 8 is not sent.

Command Mode

Global Configuration

User Guidelines

If accounting is enabled and the address is available to the switch, the switch will send the IPv4 address in the Access-Request, Acct-Start/Acct-Interim/Acct-Stop messages sent to the RADIUS server.

The switch discovers the client IPv4 address via its inclusion in the RADIUS Access-Accept, via DHCPv4 snooping. DHCPv4 snooping must be enabled for the switch to discover a host IPv4 prefix via DHCP.

After an Access-Accept has been received by the switch and the switch grants the host access to the network, it may take a few seconds before the DHCP transaction completes. Use the **aaa accounting delay-start** command to delay the sending of the Acct-Start packet to the accounting server. Accounting packets are not sent for ports placed in the Guest VLAN. Multiple hosts are allowed access on a port configured in 802.1x multi-domain-multi-host mode which is placed in the Guest VLAN.

Use the **show authentication clients** command to display the RADIUS discovered IPv4 address, if any.

Command History

Introduced in version 6.3.0.1 firmware. Command updated in firmware release 6.5.2.

Example

```
console#conf
console(config)#radius server attribute 8 include-in-access-req
```

radius server attribute 25

Use the **radius server attribute 25** command to globally enable the switch to send the RADIUS Class attribute as supplied by the RADIUS server in accounting messages sent to the accounting server.

Syntax

radius server attribute 25 include-in-access-req

no radius server attribute 25 include-in-access-req

Default Configuration

By default, the switch sends the Class attribute to the accounting server if received in the Access-Accept from the RADIUS authentication server.

Command Mode

Global Configuration

User Guidelines

The switch sends the Class attribute value supplied by the RADIUS server in the RADIUS Access-Accept message if enabled. If disabled, the Class attribute received in the RADIUS Access-Accept message is ignored. The Class attribute may be up to 16 octets in length

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#radius server attribute 25 include-in-access-req
```

radius server attribute 32

Use the **radius server attribute 32** command to configure the content of the NAS-Identifier sent to the RADIUS server in Access-Request and Acct-Request messages. Use the **no** form of the command to return the content to the default.

Syntax

radius server attribute 32 include-in-access-req [format]

no radius server attribute 32 include-in-access-req

The format parameter is a text string of 2-128 characters and may include the following format specifiers:

%m : NAS MAC address

%i : NAS IP address

%h : NAS host name

%d : NAS domain name

Default Configuration

By default, the format specifier is %m.

Command Mode

Global Configuration

User Guidelines

The format parameter is a text string. Use quotes to include embedded spaces.

The MAC address format may be altered by configuration of the **radius server attribute 32 mac format** command. See radius server attribute mac format.

Command History

Command introduced in version 6.6.0.1 firmware.

Example

This example globally configures the format of the NAS-Identifier to be the IP address and host name.

```
console(config)#radius server attribute 32 include-in-access-request “%i %h”
```

radius server attribute 44

Use the **radius server attribute 44** command to enable sending the Acct-Session-ID in Access-Request messages. Use the **no** form of the command to cease sending the Acct-Session-ID in Access-Request messages.

Syntax

radius server attribute 44 include-in-access-request

no radius server attribute 44 include-in-access-request

Default Configuration

By default, the Acct-Session-ID is not sent in Access-Request messages.

Command Mode

Global Configuration mode

User Guidelines

The Acct-Session-ID is the same as the session identifier used in accounting messages.

Command History

Command introduced in version 6.6.0.1 firmware.

Example

This example globally enables sending the Acct-Session-ID in Access-Request messages.

```
console(config)#radius server attribute 44 include-in-access-request
```

radius server attribute mac format

Use the **radius server attribute mac format** command to globally configure the format of the Original-Called-Number (30), Calling-Station-ID (31), NAS-Identifier (32) attributes sent to the RADIUS server in Access-Request and Acct-Request messages. Use the **no** form of the command to return the MAC address format to the default.

Syntax

radius server attribute { 30 | 31 | 32 } mac format { ietf | unformatted | legacy } [lower-case | upper-case]

no radius server attribute { 30 | 31 | 32 } mac format

- **ietf**—Format the MAC address as 18-DB-F2-25-B2-D4. The default is upper case.
- **unformatted**—Format the MAC address as 18dbf225b2d4. The default is lower case.
- **legacy**—Format the MAC address as 18:db:f2:25:b2:d4. The default is lower case.
- **lower**-case—Format hexadecimal characters using the character set [0-9a-f].
- **upper**-case—Format hexadecimal characters using the character set [0-9A-F].

Default Configuration

By default, the switch sends the Original-Called-Number (30), Calling-Station-Id (31), and MAS-Identifier (32) attribute MAC addresses in unformatted upper-case format.

Command Mode

Global Configuration

User Guidelines

Use this command to globally configure the format of MAC addresses sent in the Original-Called-Number (30), Calling-Station-Id (31), or NAS-Identifier (32) attributes for ports configured for 802.1x authentication or MAB.

This command is only supported for 802.1X and MAB authentication. Local authentication formats are not configurable.

This command does not override the per RADIUS server configuration. Use the **mab request format** command to configure formatting the User-Name attribute.

Use the attribute mac format command in RADIUS Server Configuration mode to configure the MAC format for an individual RADIUS server.

Command History

Introduced in version 6.3.0.1 firmware. Updated in release 6.5.0 to remove formatting of the User-Name attribute. Updated in release 6.6.0 to add formatting of attributes 30 and 31.

Example

This example globally configures the format of the MAC address sent in the Calling-Station-Id attribute to IETF lower case. It also configures interface Gi1/0/1 to use MAB. For this command to have any affect, MAB must be configured on the switch in an active authentication list, IEEE 802.1X must be configured, and a RADIUS server must also be configured.

```
console(config)#radius server attribute 31 mac format ietf lower-case
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#authentication host-mode multi-auth
console(config-if-Gi1/0/1)#mab
```

radius server attribute 168

Use the **radius server attribute 168 include-in-access-req** command to enable the switch to send the RADIUS Framed-IPv6-Address attribute in Access-Request messages sent to the RADIUS authentication server.

Syntax

radius server attribute 168 include-in-access-req

no radius server attribute 168 include-in-access-req

Default Configuration

By default, RADIUS attribute 168 is not sent.

Command Mode

Global Configuration mode.

User Guidelines

The switch sends the IPv6 address of the host attempting to access the network in the Framed-IPv6-Address attribute if it is available to the switch. If accounting is enabled and the address is available to the switch, the switch will send the IPv6 address in the Access-Request, Acct-Start/Acct-Interim/Acct-Stop messages sent to the accounting server.

The switch discovers the client IPv6 address via its inclusion in the RADIUS Access-Accept, or via DHCPv6 snooping. DHCPv6 snooping must be enabled for the switch to discover a host IPv6 address.

After an Access-Accept has been received by the switch and the switch grants the host access to the network, it may take a few seconds before the DHCPv6 transaction completes. Use the **aaa accounting delay-start** command to delay the sending of the Acct-Start packet to the accounting server. Accounting messages are not sent for hosts placed in the Guest VLAN.

Use the **show authentication clients** command to display the RADIUS Server supplied IPv6 address, if any.

RADIUS attribute 168 Framed-IPv6-Address is defined in RFC 6911.

Command History

Command introduced in firmware release 6.5.2.

radius server dead-criteria

Use this command to configure the condition upon which a RADIUS server is considered unreachable (dead). Use the **no** form of the command to return the dead criteria to the default.

Syntax

radius server dead criteria time *seconds* **tries** *tries*

no radius server dead criteria

- *seconds*—The number of seconds in which a response from the RADIUS server is not received. Range is 1 to 120 seconds.
- tries—The number of attempts to make before marking the RADIUS server unavailable. Range is 1 to 100 tries.

Default Configuration

By default, a RADIUS server must fail to respond to four tests requests with a twenty second timeout each before being marked as dead.

Command Mode

Global Configuration mode

User Guidelines

Use this command in conjunction with the automate-tester command to enable testing of RADIUS servers. When all RADIUS servers have been declared dead, 802.1x authenticated clients may be migrated to the critical data VLAN or critical voice VLAN. Newly authenticating clients will be authenticated to the critical data or voice VLAN.

Command History

Command introduced in version 6.6.0.1 firmware.

Example

This example globally sets the dead criteria to two attempts with a 10 second timeout.

```
console(config)#radius server dead criteria time 10 tries 2
console(config-auth-radius)#radius-server dead-criteria time 10 tries 2
```

radius server deadtime

Use the **radius server deadtime** command to configure the minimum amount of time to wait before attempting to recontact an unresponsive RADIUS server. To set the deadtime to 0, use the **no** form of this command.

Syntax

radius server deadtime *deadtime*

no radius server deadtime

- *deadtime* — Length of time in minutes, for which a RADIUS server is skipped over by transaction requests. (Range: 0–2000 minutes). **Deadtime** is used to mark an unavailable RADIUS server as dead until this user-configured time expires. **Deadtime** is configurable on a RADIUS server basis.

Default Configuration

The default dead time is 0 minutes.

Command Mode

Global Configuration mode

User Guidelines

If only one RADIUS server is configured, it is recommended that the deadtime interval be left at 0. Setting the deadtime to 0 will cause the switch to always send a RADIUS request to the RADIUS server if the server is selected. If a RADIUS server is currently active and responsive, that server will be used until it no longer responds. RADIUS servers whose deadtime interval has not expired are skipped when searching for a new RADIUS server to contact.

Example

The following example sets the minimum interval for a RADIUS server will not be contacted after becoming unresponsive.

```
console(config)#radius server deadtime 10
```

radius server

Use the **radius server** command to specify a RADIUS server, and enter RADIUS Server Configuration mode. To delete the specified RADIUS server, use the **no** form of this command.

Syntax

radius server [**acct** | **auth**] {*ip–address* | *hostname*}

no radius server {*ip–address* | *hostname*}

- **acct** | **auth**—The type of server (accounting or authentication).
- *ip–address*—The RADIUS server IP address.
- *hostname* —Host name of the RADIUS server host. (Range: 1–255 characters).

Default Configuration

The default server type is authentication. The default server name is **Default-RADIUS-Server**. The default port number is 1812 for an authentication server and 1813 for an accounting server.

Command Mode

Global Configuration mode

User Guidelines

RADIUS servers are keyed by the host name/IP address, therefore it is advisable to use unique server host names. Use the **show aaa servers {accounting|authentication}** command to display the hostname/IP address to list name mapping.

Multiple authentication servers may be configured with the same name using the **name** command.

Dell EMC Networking implements a two-level hierarchy for RADIUS servers. The top level is a list of servers which is alphabetically ordered by name. Each server within the top level may be associated with the multiple server hostnames/IP addresses. When multiple RADIUS servers are configured with different names (for example, one server is name1 with address 1.1.1.1 and the second server is name2 with address 1.1.1.2):

- The RADIUS request is always sent to the first server in the alphabetically ordered list of servers, for example, server name1 is attempted before moving on to the server name 2 server. Even if the priority value of hosts/IP addresses in server name 2 is lower (a lower value indicates a higher priority), the request would be sent to server name 1. If, for the server name 1, all the configured hostnames/IP addresses fail to respond, the request is sent to the second configured server.
- Within a server, the primary server is always tried first. Use the **primary** command in RADIUS Server configuration mode to designate a primary server. One can have multiple secondary hostnames/IP addresses in the same server list. From the multiple secondary hostnames/IP addresses, the one with the lowest priority value is tried first. In a server with multiple hostnames/IP addresses with the same priority, the order of attempts is based on lexicographic order. For example, if hostnames name9, name1, name6 are configured as secondary hosts, the hostnames are attempted in the order name1, name6, name9 when the primary host fails to respond.

Command History

Updated syntax in version 6.5 firmware.

Example

The following example specifies a RADIUS authentication server with the following characteristics:

Server IP address — 192.168.10.1

Server Name — name1

Type — primary

```
console(config)#radius server 192.168.10.1
console(config-auth-radius)#name name1
console(config-auth-radius)#primary
```

The following shows an example configuration with two servers (list1 and list2), each of which has a Primary and Secondary IP addresses:

```
console(config)#show aaa servers authentication

  *  Host Address    Server Name   Port         Type
---- ------------    -----------   ---------    -------
      1.2.3.1        list1         1812         Primary
      4.3.2.2        list2         1812         Secondary
      4.3.2.1        list2         1812         Primary
      1.2.3.5        list1         1812         Secondary
      1.2.3.4        list1         1812         Secondary

 * currently selected server
```

radius server key

Use the **radius server key** command to set the authentication and encryption key for all RADIUS communications between the switch and the RADIUS server. Use the **no** form of the command to disable the key.

Syntax

radius server key [0 **|** 7]*key-string*

no radius server key

- 0—The key string that follows is the unencrypted shared secret. The length is 1–128 characters.
- 7—The key string that follows is the encrypted shared secret. The length is exactly 256 characters.
- *key-string* — The key string in encrypted or unencrypted form. In encrypted form, it must be 256 characters in length. In unencrypted form, it may be up to 128 characters in length.

Default Configuration

The default is an empty string.

Command Mode

Global Configuration

User Guidelines

In an Access-Request, encrypted passwords are sent using the RSA Message Digest algorithm (MD5).

If no encryption parameter (7) is present, the key string is interpreted as an unencrypted shared secret.

Keys are always displayed in their encrypted form in the running configuration.

The encryption algorithm is the same across switches. Encrypted passwords may be copied from one switch and pasted into another switch configuration.

Command History

Updated in version 6.3.0.1 firmware.

Example

The following two examples globally configure the RADIUS server key for all configured servers. The two examples are identical in effect.

```
console(config)#radius server key "This is a key string"
console(config)#radius server key 0 "This is a key string"
```

radius server load-balance

Use this command to enable load balancing within RADIUS server lists. Use the **no** form of the command to disable load balancing.

Syntax

radius server load-balance [auth | acct] {radius |name <*servername*>} method least-outstanding [batch-size <*value*>] }

no radius server load-balance [auth | acct] {radius | name <*servername*>}

- **auth**—Configure load balancing for authentication servers.

- **acct**—Configure load balancing for accounting servers.
- **radius**—Configure load balancing for the default RADIUS server list.
- **name**—Configure load balancing for the named server list.
- **least-outstanding**—Configure least outstanding request load balancing.
- **batch-size**—Configure the number of outstanding requests to send to a server.

Default Configuration

By default, all RADIUS servers are part of the Default-RADIUS-Server list.

The default batch size is 25 requests.

By default, load balancing is configured for authentication servers.

Command Mode

Global Configuration mode

User Guidelines

This command configures load balancing requests among the RADIUS lists for either authentication or accounting servers.

Configure a RADIUS server as part of a list using the name (RADIUS Server) command in Radius Server Configuration mode. All servers configured with the same list name are considered to be part of the same list.

The load balancing algorithm is based upon the number of pending requests. If the number of pending requests to a group (or to a server in the default group) exceeds the batch size, the switch will send new requests to the group (server) with the least number of pending requests.

The batch size is the number of requests sent to a server before sending requests to another server in the server list.

Command History

Command introduced in version 6.6.0.1 firmware.

Example

This example globally sets load balancing for the default RADIUS list using a batch size of 5. Probes are sent to the RADIUS server after two minutes with no activity to that server.

```
console(config)#radius server auth 4.3.2.4
console(config-auth-radius)#radius-server dead-criteria time 10 tries 2
console(config-auth-radius)#automate-tester username dummy idle-time 2
console(config-auth-radius)#exit
console(config)#radius server auth 4.3.2.2
console(config-auth-radius)#radius-server dead-criteria time 10 tries 2
console(config-auth-radius)#automate-tester username dummy idle-time 2
console(config-auth-radius)#exit
console(config)#radius-server load-balance auth radius method least-
outstanding batch-size 5
```

radius server retransmit

Use the **radius server retransmit** command to specify the number of times the RADIUS client will retransmit requests to the RADIUS server. To reset the default configuration, use the **no** form of this command.

Syntax

radius server retransmit *retries*

no radius server retransmit

- *retries* — Specifies the retransmit value. (Range: 1–10)

Default Configuration

The default is 1 retry.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the number of times the RADIUS client attempts to retransmit requests to the RADIUS server to five attempts.

```
console(config)#radius server retransmit 5
```

radius server source-ip

Use the **radius server source-ip** command to specify the source IPv4 address used in the IP header for communication with RADIUS servers. To return to the default, use the **no** form of this command. 0.0.0.0 is interpreted as a request to use the IPv4 address of the outgoing IP interface.

Syntax

radius server source-ip *source*

no radius server source-ip

- *source* — Specifies the source IPv4 address.

Default Configuration

The default IPv4 address is the outgoing interface IPv4 address.

Command Mode

Global Configuration mode

User Guidelines

The command configures the source IP address present in the IPv4 header. It is not the optional NAS-IP-Address in the RADIUS message. Use the **radius server attribute 4** command to configure the NAS-IP-Address attribute sent in the RADIUS Access-Request message.

Example

The following example configures the source IP address used for communication with RADIUS servers to 10.1.1.1.

```
console(config)#radius server source-ip 10.1.1.1
```

radius server source-interface

Use the **radius server source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted RADIUS packets. Use the **no** form of the command to revert to the default IP address.

Syntax

radius server source-interface {**loopback** *loopback-id* | **vlan** *vlan-id*}

no radius server source-interface

- *loopback-id* — A loopback interface identifier.
- *vlan-id*—A VLAN identifier.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for RADIUS packets. This is either the IP address assigned to the VLAN from which the RADIUS packet originates or the out-of-band interface IP address.

Command Mode

Global Configuration

User Guidelines

The source IP address of RADIUS packets sent to a server should match the NAS IP address configured on the RADIUS server. A mismatch may lead to a RADIUS packet timeout.

Loopback interfaces are not supported on the Dell EMC N1100-ON Series switches.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
```

```
console(config-if-vlan1)#exit
console(config)#radius server source-interface vlan 1
```

radius server timeout

Use the **radius server timeout** command in Global Configuration mode to set the interval for which a switch waits for a server to reply. To restore the default, use the **no** form of this command.

Syntax

radius server timeout *timeout*

no radius server timeout

- *timeout* — Specifies the timeout value in seconds. (Range: 1–30)

Default Configuration

The default value is 15 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the interval for which a switch waits for a server to reply to 5 seconds.

```
console(config)#radius server timeout 5
```

radius server vsa send authentication

Use the **radius server vsa send authentication** command to enable the switch to process vendor-specific attributes during authentication.

Syntax

radius server vsa send authentication

no radius server vsa send authentication

Default Configuration

By default, VSA Attribute 26, Vendor ID 9, and Sub-type 1 are not processed by the switch.

Command Mode

Global Configuration mode

User Guidelines

This command does not affect processing of any VSA's other than VSA Attribute :q1 26, Vendor ID 9, Sub-type 1. It does not affect processing of Voice VLAN or Admin/Login.

Predefined ACL Selection using VSA Attribute 26

This method selects an ACL that is already configured on the switch. The extended-access-control-list-name is the name of an existing ACL pre-configured on the switch. The ACL need not be statically pre-configured on the port prior to RADIUS configuring the ACL on the port prior to authorizing the port (it would be removed in any case as statically configured ACLs on a port are removed prior to configuring a dynamic ACL).

```
ip:inacl={ extended-access-control-list-name }
ipv6:inacl={ extended-access-control-list-name }
```

- The ip token indicates an IPv4 ACL name follows the equals sign.
- The IPv6 token indicates an IPv6 ACL name follows the equals sign.
- The extended-access-control-list-name token identifies an IP/IPv6 Extended ACL Name of an existing ACL. The name is case sensitive.
- The tokens ip:inacl and ipv6:inacl are in lower case and are followed by an equals sign with no intervening white space.

Different authentication sessions, as in the case of the data and voice VLAN authenticating independently, may both have Dynamic ACLs. It is recommended that the DACLs be carefully designed so that they work in harmony, such as, at a minimum, no ACL numbers are duplicated across the DACLs. DACLs are applied at the port level and are capable of affecting any traffic ingressing the port.

Predefined ACL Examples

```
ip:inacl=Named_ACL
```

```
ipv6:inacl=Named_IPv6_ACL
```

Dynamic ACL Definition

This method uses ACL syntax to create a new ingress ACL on the switch:

```
ip:inacl[#number]={extended-access-control-list}
ipv6:inacl[#number]={ extended-access-control-list}
```

- The ip token indicates an IPv4 ACL definition follows the equals sign.
- The ipv6 token indicates an IPv6 ACL definition follows the equals sign.
- #number is the ACL sequence number in decimal format. Range 1–2147483647.
- The tokens ip:inacl and ipv6:inacl are in lower case and are followed by an equals sign with no intervening white space.
- extended-access-control-list means an extended IPv4/IPv6 Extended ACL CLI rule definition beginning with the {permit|deny} tokens followed by the protocol {every | eigrp | gre | icmp | igmp | ip | ipinip | ospf | pim | tcp | udp | 0-55} for IPv4 and { every icmpv6| ipv6 | sctp | tcp | udp} for IPv6.

The switch also accepts the proprietary ACS:CiscoSecure-Defined-ACL AVP. If the ACL does not exist on the switch, the switch attempts to download the ACL from the RADIUS server prior to completing authentication. The ACL name or number in the AVP use the following syntax: `#ACL#-IP-name-number` or `#ACSACL#<<ACL-Name>>`.

Dynamic ACL Example (Extended syntax, that is, ip access-list extended ...)

```
ip:inacl#100=permit ip any 209.165.0.0 0.0.255.255
ip:inacl#110=permit ip any 209.166.0.0 0.0.255.255
ip:inacl#120=permit ip any 209.167.0.0 0.0.255.255
```

Multiple ip:inacl /ipv6:inacl av-pairs may be present in the RADIUS message. However, only the first definition will be applied for the authentication session. Different sessions, as in the case of the data and voice VLAN authenticating independently, may both have Dynamic ACLs. It is recommended that the DACLs be carefully designed so that they work in harmony, such as, at a minimum, no ACL numbers are duplicated across the DACLs. DACLs are applied at the port level and are capable of affecting any traffic ingressing the port. If there are syntax errors in the received ACLs (other than duplicate rules), the ACL rules are not applied, the RADIUS Access-Accept is treated as an Access-Reject, and a WARN log message or

"Interface X/X/X not authorized. Application of downloaded ACL did not complete due to invalid syntax XXXXX" is issued indicating that a received RADIUS rule is misconfigured with invalid syntax or configured with both ip:traffic-class and inacl rules and identifying the affected interface. If Accounting is enabled, the Acct-Start packet is not sent. An EAP-Failure is sent to the 802.1X client.

Command History

Command introduced in firmware version 6.5.2.

retransmit

Use the **retransmit** command in RADIUS Server Configuration mode to specify the number of times the RADIUS client retransmits requests to the RADIUS server.

Syntax

retransmit *retries*

- *retries* — Specifies the retransmit value. (Range: 1-10 attempts)

Default Configuration

The default number for attempts is 3.

Command Mode

RADIUS mode

User Guidelines

The administrator must enter the mode corresponding to a specific RADIUS server before executing this command. This command overrides the global configuration.

Example

The following example of the retransmit command specifies five retries.

```
console(config)#radius server 192.143.120.123
console(config-auth-radius)#retransmit 5
```

show aaa servers

Use the **show aaa servers** command to display the list of configured RADIUS servers and the values configured for the global parameters of the RADIUS servers.

Syntax

show aaa servers [**accounting | authentication**] [**name** [*servername*]]

- **accounting**—This optional parameter will cause accounting servers to be displayed.
- **authentication**—This optional parameter will cause authentication servers to be displayed.
- **name**—This optional parameter will cause the server names to be displayed instead of the server configuration parameters.
- *servername*—Will cause only the server(s) with *server-name* name to be displayed. There are no global parameters displayed when this parameter is specified.

Default Configuration

All authentication servers are displayed by default.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Field	Description
Configured Authentication Servers	The number of RADIUS Authentication servers that have been configured.
Configured Accounting Servers	The number of RADIUS accounting servers that have been configured.
Named Authentication Server Groups	The number of configured named authentication RADIUS server groups.

Field	Description
Named Accounting Server Groups	The number of configured named accounting RADIUS server groups.
Timeout	The configured timeout value, in seconds, for request retransmissions.
Retransmit	The configured value of the maximum number of times a request packet is retransmitted.
Dead Time	The configured length of time an unavailable RADIUS server is skipped.
RADIUS Accounting Mode	A global parameter to indicate whether the accounting mode for all the servers is enabled or not.
RADIUS Attribute 4 Mode	A global parameter to indicate whether the NAS-IP-Address attribute has been enabled to use in RADIUS requests.
RADIUS Attribute 4 Value	A global parameter that specifies the IP address to be used in NAS-IP-Address attribute to be used in RADIUS requests.
Source Interface	The source interface from which the source IP address is obtained.
RADIUS Attribute 6	A global parameter that specifies if the Service-Type is sent to the RADIUS server.
RADIUS Attribute 8	A global parameter that indicates if the Authenticate-Only attribute is sent to the RADIUS server.
RADIUS Attribute 25	A global parameter that indicates if the Class attribute is sent to the RADIUS server.
RADIUS Attribute 31	A global parameter that indicates if the Calling-Station-ID is sent to the RADIUS server.
RADIUS Attribute 31 format	A global parameter that indicates the format of the Calling-Station-ID attribute.

Command History

Introduced in version 6.2.0.1 firmware. Command updated in version 6.5.2 firmware. Output updated in version 6.6 firmware.

Example

```
console#show aaa servers

IP address       Type  Port  TimeOut Retran. DeadTime Source IP     Prio.
Usage
---------------- ----- ----- ------- ------- -------- ------------- ----- --
----
10.130.50.107    Auth  1812  Global  Global  Global   Global        0     all
10.130.50.107    Acct  1813  N/A     N/A     N/A      N/A           N/A   N/A

Global values
--------------------------------------------
Number of Configured Authentication Servers.... 1
Number of Configured Accounting Servers........ 1
Number of Named Authentication Server Groups... 1
Number of Named Accounting Server Groups....... 1
Number of Retransmits.......................... 3
Timeout Duration............................... 15
Deadtime....................................... 0
Source IP...................................... 0.0.0.0
Source Interface............................... Default
RADIUS Accounting Mode......................... Enable
RADIUS Attribute 4 Mode........................ Disable
RADIUS Attribute 4 Value....................... 0.0.0.0
RADIUS Attribute 6 Mode........................ Disable
RADIUS Attribute 8 Mode........................ Enable
RADIUS Attribute 168 Mode...................... Enable
RADIUS Attribute 25 Mode....................... Enable
RADIUS Attribute 31 MAC Format Value........... Unformatted upper-case
RADIUS Accounting Interim Update............... Enable
RADIUS Accounting delayed start Mode........... Enable
RADIUS Accounting extended delay Value......... 60

console#show aaa servers authentication name Default-RADIUS-Server

RADIUS Server Name............................. CoA-Server-1
Current Server IP Address...................... 1.1.1.1
Number of Retransmits.......................... 3
Timeout Duration............................... 15
Deadtime....................................... 0
Port........................................... 3799
Source IP...................................... 10.27.9.99
RADIUS Accounting Mode......................... Disabled
Secret Configured.............................. Yes
Message Authenticator.......................... Enable
Number of CoA Requests Received...................... 203
```

```
Number of CoA ACK Responses Sent..................... 111
Number of CoA NAK Responses Sent..................... 37
Number of Coa Requests Ignored....................... 55
Number of CoA Missing/Unsupported Attribute Requests.  18
Number of CoA Session Context Not Found Requests.....  5
Number of CoA Invalid Attribute Value Requests........ 11
Number of Administratively Prohibited Requests........ 3
Radius Server VSA Authentication:..................... Disable
```

show radius statistics

Use the **show radius statistics** command to show the statistics for an authentication or accounting server.

Syntax

show radius statistics [**accounting | authentication**] [{*ipaddress* **|** *hostname* **| name** *servername*}]

- **accounting | authentication**—The type of server (accounting or authentication).
- *ipaddress*—The RADIUS server host IP address.
- *hostname*—Host name of the RADIUS server host. (Range: 1–256 characters). The command allows spaces in the host name when specified in double quotes. For example, console(config)#snmp-server host “host name”
- *servername*—The alias used to identify the server.

Default Configuration

By default, the command displays authentication server statistics.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

The following fields are displayed for accounting servers:

Field	Description
RADIUS Accounting Server Name	Name of the accounting server.
Server Host Address	IP address of the host.
Round Trip Time	The time interval, in hundredths of a second, between the most recent Accounting Response and the Accounting Request that matched it from this RADIUS accounting server.
Requests	The number of RADIUS Accounting Request packets sent to this server not including the retransmissions.
Retransmissions	The number of RADIUS Accounting Request packets retransmitted to this RADIUS accounting server.
Responses	The number of RADIUS packets received on the accounting port from this server.
Malformed Responses	The number of malformed RADIUS Accounting Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed accounting responses.
Bad Authenticators	The number of RADIUS Accounting Response packets containing invalid authenticators received from this accounting server.
Pending Requests	The number of RADIUS Accounting Request packets destined for this server that have not yet timed out or received a response.
Timeouts	The number of accounting timeouts on this server.

Field	Description
Unknown Types	The number of packets unknown type which were received from this server on accounting port.
Packets Dropped	The number of RADIUS packets received from this server on accounting port and dropped for some other reason.

The following fields are displayed for authentication servers:

Field	Description
RADIUS Server Name	Name of the authenticating server.
Server Host Address	IP address of the host.
Access Requests	The number of RADIUS Access Request packets sent to this server. This number does not include retransmissions.
Access Retransmissions	The number of RADIUS Access Request packets retransmitted to this RADIUS authentication server.
Access Accepts	The number of RADIUS Access Accept packets, including both valid and invalid packets, that were received from this server.
Access Rejects	The number of RADIUS Access Reject packets, including both valid and invalid packets, that were received from this server.
Access Challenges	The number of RADIUS Access Challenge packets, including both valid and invalid packets, that were received from this server.
Malformed Access Responses	The number of malformed RADIUS Access Response packets received from this server. Malformed packets include packets with an invalid length. Bad authenticators or signature attributes or unknown types are not included as malformed access responses.
Bad Authenticators	The number of RADIUS Access Response packets containing invalid authenticators or signature attributes received from this server.
Pending Requests	The number of RADIUS Access Request packets destined for this server that have not yet timed out or received a response.
Timeouts	The number of authentication timeouts to this server.

Field	Description
Unknown Types	The number of packets unknown type which were received from this server on the authentication port.
Packets Dropped	The number of RADIUS packets received from this server on authentication port and dropped for some other reason.

Example

```
console#show radius statistics accounting 192.168.37.200

RADIUS Accounting Server Name................. Default_RADIUS_Server
Host Address.................................. 192.168.37.200
Round Trip Time............................... 0.00
Requests...................................... 0
Retransmissions............................... 0
Responses..................................... 0
Malformed Responses........................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
Timeouts...................................... 0
Unknown Types................................. 0
Packets Dropped............................... 0

console#show radius statistics name Default_RADIUS_Server

RADIUS Server Name............................ Default_RADIUS_Server
Server Host Address........................... 192.168.37.200
Access Requests............................... 0.00
Access Retransmissions........................ 0
Access Accepts................................ 0
Access Rejects................................ 0
Access Challenges............................. 0
Malformed Access Responses.................... 0
Bad Authenticators............................ 0
Pending Requests.............................. 0
Timeouts...................................... 0
Unknown Types................................. 0
Packets Dropped............................... 0
```

source-ip

Use the **source-ip** command in RADIUS Server Configuration mode to specify the source IP address to be used for communication with RADIUS servers. 0.0.0.0 is interpreted as a request to use the IP address of the outgoing IP interface.

Syntax

source-ip *source*

- *source* — A valid source IP address.

Default Configuration

The IP address is of the outgoing IP interface.

Command Mode

RADIUS Server Configuration mode

User Guidelines

The administrator must enter the mode corresponding to a specific RADIUS server before executing this command. This command overrides the global configuration for the selected server.

Example

The following example specifies 10.240.1.23 as the source IP address.

```
console(config)#radius server host 192.143.120.123
console(config-auth-radius)#source-ip 10.240.1.23
```

timeout

Use the timeout command in RADIUS mode to set the timeout value in seconds for the designated RADIUS server.

Syntax

timeout *timeout*

- *timeout* — Timeout value in seconds for the specified server. (Range: 1-30 seconds.)

Default Configuration

The default value is 15 seconds.

Command Mode

RADIUS Server Configuration mode

User Guidelines

The administrator must enter the mode corresponding to a specific RADIUS server before executing this command. This command overrides the global configuration for the selected server.

Example

The following example specifies the timeout setting for the designated RADIUS Server.

```
console(config)#radius server host 192.143.120.123
console(config-radius)#timeout 20
```

usage authmgr

Use the **usage authmgr** command in RADIUS mode to specify the usage type of the server.

Syntax

usage authmgr *type*

- *type* — The type can be one of the following values: *login*, *authmgr*, or *all*.

Default Configuration

The default variable setting is *all*.

Command Mode

RADIUS Server Configuration mode

User Guidelines

The administrator must enter the auth or acct mode corresponding to a specific RADIUS server before executing this command. This command has no effect on accounting servers.

Use this command to restrict the types of authentication sent to a particular RADIUS server. The login selection restricts authentication requests to switch administrator logins. The authmgr setting restricts authentication requests to 802.1x and MAB authentications.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example specifies usage type *login*, i.e. switch administrator login authentications.

```
console(config)#radius server host 192.143.120.123
console(config-auth-radius)#usage login
```

TACACS+ Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

TACACS+ provides access control for networked devices via one or more centralized servers, similar to RADIUS this protocol simplifies authentication by making use of a single database that can be shared by many clients on a large network. TACACS+ is based on the TACACS protocol (described in RFC1492) but additionally provides for separate authentication, authorization and accounting services. The original protocol was UDP based with messages passed in clear text over the network; TACACS+ uses TCP to ensure reliable delivery and a shared key configured on the client and daemon server to encrypt all messages.

Dell EMC Networking supports authentication of a user using a TACACS+ server. When TACACS+ is configured as the authentication method for a user login type (CLI/HTTP/HTTPS), the NAS will prompt for the user login credentials and request services from the TACACS+ client; the client will then use the configured list of servers for authentication and provide results back to the NAS. The TACACS+ server list is configured with one or more hosts defined via their network IP address; each can be assigned a priority to determine the order in which the TACACS+ client will contact them, a server is contacted when a connection attempt fails or times out for a higher priority server. Each server host can be separately configured with a specific connection type, port, time-out, and shared key, or the global configuration may be used for the key and time-out. Like RADIUS, the TACACS+ server may do the authentication itself, or redirect the request to another back-end device, all sensitive information is encrypted and the shared secret is never passed over the network.

key

Use the **key** command in TACACS Configuration mode to specify the authentication and encryption key for all TACACS communications between the device and the TACACS server. This key must match the key used on the TACACS daemon.

Syntax

key [0|7] *key-string*

no key

- 0—The key string that follows is the unencrypted shared secret. The length is 1–128 characters.
- 7—The key string that follows is the encrypted shared secret. The length is 256 characters.
- *key-string* — Specifies the key string in encrypted or unencrypted form. It may be up to 128 characters in length in unencrypted format and 256 characters in length in encrypted format.

Default Configuration

If left unspecified, the key-string parameter defaults to the global value.

Command Mode

TACACS Configuration mode

User Guidelines

The key command accepts any printable characters for the key except a question mark. Enclose the string in double quotes to include spaces within the key. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

If no encryption parameter is present, the key string is interpreted as an un-encrypted shared secret.

Keys are always displayed in their encrypted form in the running configuration.

In an Access-Request, encrypted passwords are sent using the RSA Message Digest algorithm (MD5).

The encryption algorithm is the same across switches. Encrypted passwords may be copied from one switch and pasted into another switch configuration.

Command History

Updated in version 6.3.0.1 firmware.

Example

The following example sets the authentication encryption key.

```
console(config-tacacs)#key "This is a key string"
console(config-tacacs)#key 0 "This is a key string"
```

port

Use the **port** command in TACACS Configuration mode to specify a port number on which a TACACS server listens for connections.

Syntax

port [port-number]

- *port-number* — The server port number. If left unspecified, the default port number is 49. (Range: 0–65535)

Default Configuration

The default port number is 49.

Command Mode

TACACS Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays how to specify TACACS server port number 1200.

```
console(config-tacacs)#port 1200
```

priority

Use the **priority** command in TACACS Configuration mode to specify the order in which servers are used, where 0 (zero) is the highest priority.

Syntax

priority [*priority*]

- *priority* — Specifies the priority for servers. 0 (zero) is the highest priority. (Range: 0–65535).

Default Configuration

If left unspecified, this parameter defaults to 0 (zero).

Command Mode

TACACS Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example shows how to specify a server priority of 10000.

```
console(config-tacacs)#priority 10000
```

show tacacs

Use the **show tacacs** command to display the configuration and statistics of a TACACS+ server.

Syntax

show tacacs [*ip-address*]

- *ip-address* — The name or IP address of the host.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following example displays TACACS+ server settings.

```
console#show tacacs

Global Timeout: 5

Server Address        Port    Timeout   Priority  Source Interface
---------------       -----   -------   --------  -----------------
10.254.24.162         49       Global   0         Loopback 0
```

tacacs-server host

Use the **tacacs-server host** command in Global Configuration mode to configure a TACACS+ server. This command enters into the TACACS+ configuration mode. To delete the specified hostname or IP address, use the **no** form of this command.

Syntax

tacacs-server host {*ip-address* | *hostname*}

no tacacs-server host {*ip-address* | *hostname*}

- *ip-address* — The IP address of the TACACS+ server.
- *hostname* — The hostname of the TACACS+ server. (Range: 1-255 characters).

Default Configuration

No TACACS+ host is specified.

Command Mode

Global Configuration mode

User Guidelines

To specify multiple hosts, multiple **tacacs-server host** commands can be used. TACACS servers are keyed by the host name, therefore it is advisable to use unique host names.

Example

The following example specifies a TACACS+ host.

```
console(config)#tacacs-server host 172.16.1.1
console(config-tacacs)#
```

tacacs-server key

Use the **tacacs-server key** command in Global Configuration mode to set the authentication and encryption key for all TACACS+ communications between the switch and the TACACS+ daemon. To disable the key, use the **no** form of this command.

Syntax

tacacs-server key [0 **|** 7] [*key-string*]

no tacacs-server key

- 0—The key string that follows is the unencrypted shared secret. The length is 1–128 characters.
- 7—The key string that follows is the encrypted shared secret. The length is fixed at 256 characters.
- *key-string* — Specifies the key string in encrypted or unencrypted form. It may be up to 128 characters in length in unencrypted format and is exactly 256 characters in length in encrypted format.

Default Configuration

The default is an empty string.

Command Mode

Global Configuration mode

User Guidelines

The tacacs-server key command accepts any printable characters for the key except a question mark. Enclose the string in double quotes to include spaces within the key. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

If no encryption parameter is present, the key string is interpreted as an un-encrypted shared secret.

Keys are always displayed in their encrypted form in the running configuration.

In an Access-Request, encrypted passwords are sent using the RSA Message Digest algorithm (MD5).

The encryption algorithm is the same across switches. Encrypted passwords may be copied from one switch and pasted into another switch.

Command History

Updated in version 6.3.0.1 firmware.

Example

The following example sets the authentication encryption key.

```
console(config)#tacacs-server key "This is a key string"
console(config)#tacacs-server key 0 "This is a key string"
```

tacacs-server source-interface

Use the **tacacs-server source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted TACACS packets. Use the **no** form of the command to revert to the default IP address.

Syntax

tacacs-server source-interface { **loopback** *loopback-id* | **vlan** *vlan-id* }

no tacacs-server source-interface

- *loopback-id* — Identifies the loopback interface.
- *vlan-id* — Identifies the VLAN.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for TACACS packets. This is either the IP address assigned to the VLAN from which the TACACS packet originates or a loopback interface IP address.

Command Mode

Global Configuration

User Guidelines

The source interface must have an assigned IP address (either manually or via another method such as DHCP). Loopback interfaces are not supported on the Dell EMC N1100-ON Series switches.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#tacacs-server source-interface vlan 1
```

tacacs-server timeout

Use the **tacacs-server timeout** command in Global Configuration mode to set the interval during which a switch waits for a server host to reply. To restore the default, use the **no** form of this command.

Syntax

tacacs-server timeout [*timeout*]

no tacacs-server timeout

- *timeout* — The timeout value in seconds. (Range: 1–30)

Default Configuration

The default value is 5 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the timeout value as 30.

```
console(config)#tacacs-server timeout 30
```

timeout

Use the **timeout** command in TACACS Configuration mode to specify the timeout value in seconds. If no timeout value is specified, the global value is used.

Syntax

timeout [*timeout*]

- *timeout* — The timeout value in seconds. (Range: 1–30)

Default Configuration

If left unspecified, the timeout defaults to the global value.

Command Mode

TACACS Configuration mode

User Guidelines

This command has no user guidelines.

Example

This example shows how to specify the timeout value.

```
console(config-tacacs)#timeout 23
```

802.1x NAS Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Local Area Networks (LANs) are often deployed in environments that permit the attachment of unauthorized devices. The networks also permit unauthorized users to attempt to access the LAN through existing equipment. In such environments, the administrator may desire to restrict access to the services offered by the LAN.

Port-based network access control makes use of the physical characteristics of LAN infrastructures to provide a means of authenticating and authorizing devices attached to a LAN port. Port-based network access control prevents access to the port in cases in which the authentication and authorization process fails. A port is defined as a single point of attachment to the LAN.

The Dell EMC Networking switches support an 802.1x Authenticator service with a local authentication server or authentication using remote RADIUS or TACACS servers. Refer to "AAA Commands " on page 944 for information on configuring connectivity to a RADIUS or TACACS authentication server or to configure the local authentication service.

Dell EMC Networking switches also support 802.1X accounting to RADIUS servers. Refer to the “AAA Commands” section to configure RADIUS accounting.

MD5 or none is the supported authentication method for communication with an authentication server. Dell EMC Networking does not support encryption of switch initiated authenticator/authentication server communication. However, Dell EMC Networking switches are capable of transporting end-to-end encrypted traffic such as EAP-TLS between a supplicant and an authenticator.

802.1x Monitor Mode

Monitor mode is a special mode that can be enabled in conjunction with 802.1X authentication. It allows network access even in case where there is a failure to authenticate but logs the results of the authentication process for diagnostic purposes. The exact details are described in the below sections. The main aim of the monitor mode is to provide a mechanism to the operator to be able to identify the short-comings in the configuration of a 802.1x authentication on the switch without affecting the network access to the users of the switch.

There are three important aspects to this feature after activation:

1 To allow successful authentications using the returned information from authentication server.
2 To provide a mechanism to report unsuccessful authentications without negative repercussions to the user due to operator errors or failure cases from the Authentication server or supplicants.
3 To accurately report the data received from the successful and unsuccessful operations so that the operator can make the appropriate changes or learn where the problem areas are.

The monitor mode can be configured globally on a switch. If the switch fails to authenticate the user for any reason (say RADIUS access reject from RADIUS server, RADIUS time-out, or the client itself is 802.1x unaware), the client is authenticated and is undisturbed by the failure condition(s). The reasons for failure are logged and buffered into the local logging database such that the operator can track the failure conditions. Clients authenticated when monitor mode is enabled are always assigned to the default port PVID if no VLAN is supplied from the RADIUS server, and clients are assigned to RADIUS VLAN if filter-ID is a mismatch.

dot1x eapolflood

This command enables the flooding of received IEEE 802.1x frames in the VLAN. Use the **no** form of the command to return the processing of EAPOL frames to the default.

Syntax

dot1x eapolflood

no dot1x eapolflood

Default Configuration

By default, the switch does not forward received IEEE 802.1x frames, even if 802.1x is not enabled on the switch. This is the default behavior required by IEEE 802.1x-2010.

Command Mode

Global Configuration mode

User Guidelines

Local processing of IEEE 802.1x frames must be disabled (**no dot1x system-auth-control**) for this capability to be enabled. This capability is useful in situations where the authenticator device is placed one or more hops away from the authenticating host. The intervening switch will flood all received IEEE 802.1x frames in the VLAN.

Flooding of IEEE 802.1x frames makes end stations vulnerable to a denial of service attack should another end station record and play back certain flooded EAPOL frames at a high rate.

clear authentication sessions

Use this command to clear all or some authentication sessions. Authenticated clients must authenticate to the switch to gain access to network resources.

Syntax

clear authentication sessions [**interface** interface-id]

- *interface-id*—An optional physical (Ethernet) interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

When used with no parameters, this command clears all 802.1X sessions on the switch by removing the authentication information, reseting the 802.1X state machine and denying network access to the authenticated device. Use with caution.

When used with an interface parameter, this command clears all 802.1X sessions on the interface by removing the authentication information, reseting the 802.1X state machine, and denying network access to the authenticated device. Use with caution.

Command History

Syntax updated in version 6.6 firmware.

default mab

Use the **default mab** command to configure the switch to transmit EAP or CHAP or PAP credentials to the RADIUS server for MAB-authenticated devices connected to the interface. Use the **no** form of the command to set the protocol to the default.

Syntax

default mab [eap|chap|pap]

no default mab

- eap—Use EAP Message Digest 5 authentication.
- chap—Use Challenge Handshake Authentication Protocol.
- pap—Use Password Authentication Protocol.

Default Configuration

The default protocol is EAP-MD5.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command configures the RADIUS authentication protocol used for MAB devices connected to the interface.

CHAP and PAP are not supported for TACACS authentication.

The switch sends the following information to the RADIUS server for CHAP Access-Requests:

1–User-Name—MAC address of MAB device.

3–CHAP-Password = Encrypted User Name.

4–NAS-IP-Address—IP address of the switch.

5–NAS-Port—Our internal port number.

6–Service-Type is set to 10 (Call-Check).

12–Framed-MTU—Port/switch MTU—header length (for example, 1500).

30–Called Station ID—MAC address of device (in xx:xx:xx:xx:xx:xx format).

31–Calling-Station ID—Switch MAC address.

60–CHAP-Challenge (if auth type is CHAP).

61–NAS-Port-Type (Ethernet 15).

87–NAS-Port-Id (e.g., Gigabitethernet 1/0/15)

The switch sends the following information to the RADIUS server for CHAP Access-Requests:

1–User-Name—MAC address of MAB device.

2-User-Password—MAC Address of the MAB device (encrypted).

4–NAS-IP-Address—IP address of the switch.

5–NAS-Port—Our internal port number.

6–Service—Type is set to 10 (Call-Check).

12–Framed-MTU—Port/switch MTU—header length (for example, 1500).

30–Called Station ID—MAC address of device (in xx:xx:xx:xx:xx:xx format).

31–Calling-Station ID—Switch MAC address.

61–NAS-Port-Type (Ethernet 15).

87–NAS-Port-Id (e.g., Gigabitethernet 1/0/15)

The switch sends the following information to the RADIUS server for EAP Access-Requests:

1–User-Name—MAC address of device.

4–NAS-IP-Address—IP address of the switch.

5–NAS-Port—Our internal port number.

12–Framed-MTU—Port/switch MTU—header length (for example, 1500).

30–Called Station ID—MAC address of device (in xx:xx:xx:xx:xx:xx format).

31–Calling-Station ID—Switch MAC address.

61–NAS-Port-Type (Ethernet 15).

The Calling Station ID is formatted per the attribute 31 command.

The User-Name attribute is formatted per the attribute 1 command.

The Access-Request attribute is formatted for PAP authentication.

Command History

Command introduced in version 6.5 firmware.

mab request format attribute 1

Use the **mab request format attribute 1** command to configure the format of the MAC address sent in the User-Name attribute. Use the **no** form of the command to return the configuration to the default.

Syntax

mab request format attribute 1 groupsize {1 | 2 | 4 | 12} **separator** {**-** | : | .} [**lowercase** | **uppercase**]

no mab request format attribute 1

- groupsize—The number of digits in a group.
- separator—The separator between groups of digits.
- uppercase—Use uppercase formatting for the digits.
- lowercase—Use lowercase formatting for the digits.

Default Configuration

The default format is a group size of 2, a colon separator and upper case characters, for example,18:DB:F2:25:B2:D4.

Command Mode

Global Configuration mode

User Guidelines

A MAC address consists of 12 hexadecimal digits. The MAC address of the authentication station is sent in the User-Name attribute in a RADIUS Access-Request for MAC Authentication Bypass configured stations.

The following table shows some example formats:

MAC Address	Group Size	Separator	Case	Formatted Address
18DBF225B2D4	1	.	Lower	1.8.d.b.f.2.2.5.b.2.d.4
18DBF225B2D4	2	:	Lower	18:db:f2:25:b2:d4
18DBF225B2D4	4	-	Upper	18DB-F225-B2D4

Command History

Command introduced in version 6.5 firmware.

mab request format attribute 2

Use this command to override the password sent in MAB Access Requests.

Syntax

mab request format attribute 2 [0 | 7] *password*

- 0 — The password entered is in unencrypted format.
- 7 — The password entered is in encrypted format.
- *password* — A configurable password up to 32 alphanumeric characters in length.

Default Configuration

The default password format is unencrypted, however, passwords are always stored in the running config and saved config as encrypted. Passwords are always displayed as encrypted.

The default password (attribute 2) sent in the Access-Request for MAB hosts is the host MAC address.

Command Mode

Global Configuration mode

User Guidelines

Some authentication servers will not authenticate hosts where the username (attribute 1) information is the same as the password (attribute 2) information. This command globally configures MAB users to send the configured password in the password (2) attributes. The configured password is sent for all MAB authenticating hosts.

Enclose the password in quotes to embed a blank in the password.

This command overrides the **default mab** command settings.

Example

```
console(config)#mab request format attribute 2 MyPassword
```

Command History

Command introduced in version 6.7.0 firmware.

dot1x max-reauth-req

Use the **dot1x max-reauth-req** command in Interface Configuration mode to set the maximum number of times that the switch sends Extensible Authentication Protocol EAP-Request/Identity frames to which no response is received before restarting the authentication process. To return to the default setting, use the **no** form of the command.

Syntax

dot1x max-reauth-req *count*

no dot1x max-reauth-req

- *count* — Number of times that the switch sends an EAP-Request/Identity frame before restarting the authentication process. (Range: 1–20)

Default Configuration

The default value for the *count* parameter is 2.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command limits the number of EAP Request/Identity messages. EAP Request/Identity messages are sent to identify if the connected host is 802.1X capable. This setting controls how long the switch will wait to identify non-802.1X capable hosts on ports configured to authenticate with a method other than 802.1X. Use the dot1x max-req command to limit the number of EAP Request messages other than EAP Request/Identity.

Command History

Command introduced in version 6.5 firmware.

dot1x max-req

Use the **dot1x max-req** command to set the maximum number of times that the switch sends an Extensible Authentication Protocol EAP-Request frame to which no response is received, before restarting the authentication process. To return to the default setting, use the **no** form of this command.

Syntax

dot1x max-req *count*

no dot1x max-req

- *count* — Number of times that the switch sends an EAP-Request frame before restarting the authentication process. (Range: 1–10)

Default Configuration

The default value for the *count* parameter is 2.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Change the default value of this command only to adjust for unusual circumstances, such as unreliable links or specific behavioral problems with certain hosts and authentication servers.

This command limits the number of times an EAP-Request is sent without receiving an EAP-Response. EAP-Requests are sent during the 802.1X authentication process to 802.1X aware hosts. Use the **dot1x max-reauth-req** command to limit the number of repeated EAP Request/Identity messages.

Example

The following example sets the number of times that the switch sends an EAP-request frame for which no EAP-Response is received to 6.

```
console(config)# interface gigabitethernet 1/0/16
console(config-if-Gi1/0/16)# dot1x max-req 6
```

dot1x max-start

Use this command to configure the number of EAPOL start frames that the switch supplicant sends to initiate authentication before it concludes that there is no authenticator connected. Use the **no** form of the command to set the count to the default.

Syntax

dot1x max-start *count*

no dot1x max-start

- *count* — The number of EAPOL-Start frames to send. The range is 1 to 10.

Default Configuration

The default count is 3.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

The supplicant state machine sends an EAPOL-Start packet every **dot1x start-period** seconds.

If the max-start count is exceeded, the supplicant state machine waits for the expiry of the held period before attempting to re-authenticate.

Command History

Command introduced in version 6.7.0 firmware.

dot1x pae

Use this command to enable 802.1X on an interface and set the interface role.

Syntax

dot1x pae authenticator

- authenticator—Set the port role as an 802.1X authenticator.

Default Configuration

The default role is **authenticator**.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Example

This command sets the 802.1X port role to authenticator on interface Gi1/0/3.

```
console(config-if-Gi1/0/3)#dot1x pae authenticator
```

authentication host-mode

Use the **authentication host-mode** command to configure the host mode of an interface. Use the **no** form of the command to set the interface configuration to the default.

Syntax

authentication host-mode { multi-auth | multi-domain | multi-host | single-host | multi-domain-multi-host }

no authentication host-mode

- **multi-auth**—Allow multiple hosts to authenticate individually on the interface.
- **multi-domain**—Allow one data device and one voice device to authenticate.
- **multi-host**—Allow multiple hosts access to the network on an authenticated interface. One host must authenticate on the interface to allow access to other hosts.
- **multi-domain-multi-host**—Allow one data device and one voice device to authenticate. Once the data device is authenticated, unrestricted access to the data VLAN for any host is allowed.
- **single-host**—Allow a single authenticated device access to the network.

Default Configuration

By default, the interface port-control mode is **multi-domain-multi-host**.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

Changing the host mode on an interface causes any currently authenticated client sessions on the interface to be terminated.

The host modes are implemented as follows:

- **multi-auth**—Allow multiple hosts to authenticate individually on the interface. Hosts may authenticate to the data VLAN or the voice VLAN.

  Port access is enforced by examining the source MAC address of the incoming packets.

  A typical use case is a wireless access point which is connected to an access-controlled port of a NAS, the wireless clients connected to the access point also authenticate using the switch resources. The access point must be configured to transparently pass EAPOL traffic.

Use switchport mode general to support RADIUS VLAN assignment for hosts.

- **multi-domain**—In this mode, exactly one data client and one voice client may be authenticated. The switch enforces this restriction by examining the source MAC address of incoming packets.

  The typical use case is an IP phone connected to a NAS port and a laptop connected to the hub port of the IP phone. Both the devices must authenticate to access the network. The voice and data domains are typically separated by VLANs. The RADIUS server attribute “Cisco-AVPair = "device-traffic-class=voice" is used to identify a voice client. Use switchport mode general to support RADIUS VLAN assignment for hosts.

- **multi-host**—Allow multiple hosts access to the network on an authenticated interface. A host must authenticate on the interface before network access is granted. However once authentication succeeds, access is granted to all hosts connected to the port.

  The typical use case for multi-host mode is a wireless access point (AP) connected to an access controlled port of a NAS. Once the access point is authenticated by the NAS, the port is authorized for traffic from the access point and all the wireless clients connected to the access point. Essentially, the AP is a trusted device.

  If it is desired that the AP connected hosts be authenticated in this mode, the AP must implement a NAS capability and authenticate the clients to a RADIUS server.

- **multi-domain-multi-host**—In this mode, one voice client and one data client may authenticate on a port and be granted network access. However, once a data client is authenticated, access over the data VLAN is unrestricted and any device may utilize the data VLAN. Authentication to the voice VLAN is supported and is restricted to the authenticating voice device.

  The typical use case is an IP phone connected to a NAS port and a Virtual Machine Controller connected to the hub port of the IP phone. The Virtual Machine Controller hosts multiple Virtual Machines. Both the VM Controller and the IP phone need to be authenticated to access the network services behind the NAS. The voice and data domains are separated. Once the VM Controller is authenticated, it allows traffic from all the VMs hosted by the VM Controller.

- **single-host**—Only allow a single authenticated device access to the network. No other hosts are allowed access to the network. Access is enforced via the MAC address of the authenticating host. The authenticated host must de-authenticate to allow a different host to authenticate. Shutting down the port de-authenticates any authenticated hosts.

  Use switchport mode general to support RADIUS VLAN assignment for the authenticating host.

Command History

Syntax added in version 6.6 firmware.

Example

The following example globally configures an interface to allow a single host to authenticate.

```
console(config)# authentication host-mode single-host
```

authentication max-users

Use the **authentication max-users** command in Interface Configuration mode to set the maximum number of clients supported on the port when multi-auth host mode is enabled on the port. Use the **no** version of the command to reset the maximum number of clients supported on the port to the default.

Syntax

authentication max-users *users*

no authentication max-users

- *users* — The number of users the port supports for multi-auth authentication (Range: 1–64)

Default Configuration

By default, the maximum number of clients supported by the switch are allowed to authenticate on a port. For the N1100-ON and N1500 Series switches, the range is 1–32.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The maximum number of clients that can authenticate on a port is 64. For the N1100-ON and N1500 Series switches, the maximum number of clients is to 32.

When configuring an interface for both a data and voice device, set the max-users limit to 3 if the voice device first authenticates or otherwise uses the data VLAN prior to switching over to the voice VLAN.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example configures an interface for a data and voice device. The voice device is a typical IP phone that utilizes the data VLAN to obtain configuration via HTTP prior to authenticating onto the voice VLAN.

```
console(config)#authentication max-users 3
```

authentication port-control

Use the **authentication port-control** command in Interface Configuration mode to configure the 802.1x mode of authentication on the port. Use the **no** form of the command to return the mode to the default.

Syntax

authentication port-control {force-authorized | force-unauthorized | auto}

no authentication port-control

- **auto** — Enables 802.1x authentication on the interface and causes the port to transition to the authorized or unauthorized state based on the 802.1x authentication exchange between the switch and the client. Once the first data client is authenticated, any other clients on the interface have access to the data VLAN. This is equivalent to IEEE 802.1X port-based mode. VLAN assignment is allowed on the port if it is not configured in trunk mode. This is the default port-control authentication method.
- **force-authorized** — Disables 802.1x authentication on the interface and causes the port to transition to the authorized state without any authentication exchange required. The port sends and receives normal traffic without 802.1x-based authentication of the client. VLAN assignment is not supported in this mode.
- **force-unauthorized** — Denies all access through this interface by forcing the port to transition to the unauthorized state, ignoring all attempts by the client to authenticate. The switch cannot provide authentication services to the client through the interface. VLAN assignment is not supported in this mode.

Default Configuration

The default port-control mode is **auto** (N1100, N1500, N2000, N2100, N3000E, N3100 switch models). The default port-control mode is force-authorized (N2200, N3200 switch models).

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Interface configuration takes precedence over the global port-control setting.

It is recommended that you disable spanning tree or enable spanning-tree portfast mode on 802.1x edge ports (ports in **auto** state that are connected to end stations) in order to go immediately to the forwarding state after successful authentication. Edge ports are ports connected to end stations that do not forward traffic to other stations and do not participate in spanning-tree.

Command History

Syntax added in version 6.6 firmware.

Example

The following command disables authentication on port 1/0/2

```
console(config)# interface gigabitethernet 1/0/2
console(config-if-Gi1/0/2)# authentication port-control force-unauthorized
```

The following example configures an interface to ignore 802.1x authentication messages and allow access to the network.

```
console(config-if-Gi1/0/1)# authentication port-control force-authorized
```

authentication periodic

Use the **authentication periodic** command in Interface Configuration mode to enable periodic re-authentication of the client. To return to the default setting, use the **no** form of this command.

Syntax

authentication periodic

no authentication periodic

Default Configuration

Periodic reauthentication is disabled.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

It is possible to configure the periodic re-authentication timer by sending the IETF Session-Timeout attribute in the RADIUS Access-Accept. If periodic re-authentication is not enabled, the session will be terminated and the 802.1X client will need to authenticate again to access the network.

If re-authentication is enabled, the switch will initiate re-authentication and terminate the session only if the client fails re-authentication.

Command History

Command updated in version 6.6 firmware.

Example

The following example enables periodic reauthentication of the client.

```
console(config)# interface gigabitethernet 1/0/16
console(config-if-Gi1/0/16)# authentication periodic
```

clear dot1x statistics

Use the **clear dot1x statistics** command to clear the statistics for a specified interface or all interfaces.

Syntax

clear dot1x statistics [interface ID]

- interface ID—An Ethernet (physical) interface identifier.

Default Configuration

This command has no default configuration

Command Mode

Privileged Exec mode

User Guidelines

This command clears all 802.1X statistics for an interface or for all interfaces on the switch.

Command History

Command introduced in version 6.6 firmware.

dot1x supplicant user

Use this command to configure the shared secret used by the supplicant to authenticate.

Syntax

dot1x supplicant user *username*

no dot1x supplicant user

- *username* — The name of the user with the required credential (password). Range: 1 to 64 printable characters. The special characters allowed in the username include ! # $ % & ' ( ) * +, - . / : ; < = > @ [\ ] ^ _ ` { | } ~. Question marks are disallowed.User names can contain blanks if the name is surrounded by double quotes.

Default Configuration

There is no supplicant username configured by default.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

The username must be configured using the **username** command. To avoid granting access to the switch console using the supplicant credentials, configure the user with privilege level 0.

Example

The following example configures an administrative user *dot1x-supplicant* with no login access. Interface Gi1/0/1 is configured as an 802.1X supplicant using the *dot1x-supplicant* credentials to authenticate to the 802.1X authenticator.

```
console(config)#username dot1x-supplicant password XYZZYPLUGH privilege 0
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#dot1x pae supplicant
console(config-if-Gi1/0/1)#dot1x supplicant user dot1x-supplicant
```

Command History

Command introduced in version 6.7.0 firmware.

dot1x system-auth-control

Use the **dot1x system-auth-control** command in Global Configuration mode to enable 802.1x globally. To disable 802.1x globally, use the **no** form of this command.

Syntax

dot1x system-auth-control

no dot1x system-auth-control

Default Configuration

The default for this command is disabled.

Command Mode

Global Configuration mode

User Guidelines

Devices connected to interfaces on which IEEE 802.1X authentication is enabled will be required to authenticate before accessing network resources. This command enables 802.1X authentication globally. IEEE 802.1x must also be enabled on an interface in order for authentication to be enabled.

It is possible to configure IEEE 802.1x while not enabled globally. Use the **dot1x system-auth-control** command to activate the configuration.

This command enables local processing of IEEE 802.1x frames on the switch. Dot1x eapolflood mode must be disabled for local processing to occur.

If 802.1x is used in combination with the authentication manager, be sure to enable the authentication manager with the **authentication enable** command.

Example

The following example enables 802.1x globally.

```
console(config)# dot1x system-auth-control
```

authentication monitor

Use the **authentication monitor** command in Global Configuration mode to enable 801.1x monitor mode globally. To disable 802.1x monitor mode globally, use the **no** form of this command.

Syntax

authentication monitor

no authentication monitor

Default Configuration

Authentication monitor mode is disabled.

Command Mode

Global Configuration mode

User Guidelines

Monitor mode is intended to test network access controls in a test environment. Monitor mode always allows access to network resources, even if authentication fails, and therefore should never be used in a production network with real end users.

Command History

Command updated in version 6.6 firmware.

Example

The following command enables 802.1x monitor mode globally. Clients are always authenticated in monitor mode. Use of monitor mode in a production network should be restricted to test user accounts. Never use monitor mode for real user accounts.

```
console(config)# authentication monitor
```

dot1x timeout

Use the **dot1x timeout** command in Interface Configuration mode to set the values of the various 802.1x state machine timers. To return to the default setting, use the **no** form of this command.

Syntax

dot1x timeout { quiet-period | tx-period | server-timeout | supp-timeout } {seconds}

no dot1x timeout

- **quiet-period**—The time, in seconds, during which the authenticator state machine will not attempt to acquire a supplicant. This is the period for which the authenticator state machine stays in the HELD state.
- **tx-period**—The time, in seconds, between successive EAPOL EAP Request/Identity frames are sent to the supplicant.
- **server-timeout**—The time, in seconds, the authenticator will wait for a response before timing out a RADIUS server.
- **supp-timeout**—The time, in seconds, the authenticator will wait for a response before timing out a supplicant.
- *seconds* — Time in seconds that the switch remains in the quiet state following a failed authentication exchange with the client. (Range: 0–65535 seconds)

Default Configuration

Each timer has a default as follows:

- **quiet-period**: 60 seconds
- **tx-period**: 30 seconds
- **supp-timeout**: 30 seconds
- **server-timeout**: 30 seconds

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Change the default value of the 802.1X/AAA timers only to adjust for unusual circumstances, such as unreliable links or specific behavioral problems with certain clients or authentication servers. Changing these values may result in RADIUS server timeouts, failed authentications or switch behavior that is not responsive to 802.1X clients, potentially including denial of network access.

It is strongly recommended that the authentication server be present within the local site to ensure access to the network. Configuring the switch to use a remote Active Directory or other authentication server operating over a congested or unreliable link will not give local 802.1X clients a responsive experience and may deny 802.1X clients access to the network.

The RADIUS server relies on the DNS service to resolve RADIUS host names. A slow to respond DNS server will cause delays in processing of 802.1X client authentications. An unresponsive DNS server will deny network access to 802.1X clients. It is strongly recommended that a local DNS server be used whenever possible. Configuring the switch to use a remote Active Directory or other DNS server operating over a congested or unreliable link will not give local 802.1X clients a responsive experience and may deny 802.1X client access.

Quiet-period:

During the quiet period, the switch does not accept or initiate any authentication requests.

To provide a faster response time to the 802.1X clients, enter a smaller number than the default.

Supp-timeout:

The default timeout value is set per IEEE 802.1x. This value is used in conjunction with the dot1x timeout server-timeout command to limit the amount of time a supplicant can remain in a pending authentication state.

Server-timeout:

The actual timeout value used by the switch is this parameter or the product of the RADIUS transmission times the RADIUS timeout, whichever is smaller.

Command History

Syntax updated in version 6.6 firmware.

Example

The following command sets the number of seconds that the switch waits for a response to an EAP-request/identity frame to 60 seconds. A side effect of this setting is that a MAB device might take several minutes to be authenticated.

```
console(config)# interface gigabitethernet 1/0/16
console(config-if-Gi1/0/16)# dot1x timeout tx-period 60
```

The following example sets the time for the retransmission to the authentication server to 90 seconds. A side effect of this setting is that an authentication over an unreliable link to the authentication server might take as long as six or seven minutes.

```
console(config-if-gi1/0/1)# dot1x timeout server-timeout 90
```

authentication timer reauthenticate

Use the **authentication timer reauthenticate** command in Interface Configuration mode to set the number of seconds between reauthentication attempts. To return to the default setting, use the **no** form of this command.

Syntax

authentication timer reauthenticate {*seconds*|**server**}

no authentication timer reauthenticate

- *seconds* — Number of seconds between re-authentication attempts. (Range: 300–4294967295)
- server— Utilize the Session-Timeout (RADIUS attribute 27) value received from the RADIUS server.

Default Configuration

The default re-authentication period is 3600 seconds. By default, the switch will utilize the value sent by the authentication server, if any.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The re-authentication process sends an authentication message (EAP-Request/Identity)to authenticated supplicants asking them to re-authenticate themselves. If a supplicant fails re-authentication, it is denied access to switch resources. Re-authentication must be enabled for this setting to have any effect.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example sets the number of seconds between re-authentication attempts to 300.

```
console(config)# interface gigabitethernet 1/0/16
console(config-if-Gi1/0/16)# authentication timer reauthenticate 300
```

The following example enables periodic reauthentication of the client every two hours.

```
console(config)# interface gigabitethernet 1/0/16
console(config-if-Gi1/0/16)# authentication periodic
console(config-if-Gi1/0/16)# authentication timer reauthenticate 7200
```

auth-type

Use this command to set the accepted authorization types for RADIUS CoA clients. Use the **no** form of the command to set the authorization type to the default (all).

Syntax

auth-type { **all** | **any** |**session-key**}

no auth-type

- **all**—Selects all CoA client authentication types. All session identification attributes must match for the authentication to succeed.
- **any**—Selects any CoA client authentication type. Any session identification attribute may match for the authentication to succeed.
- **session-key**—Indicates that the session-key (Acct-Session-ID) must match for authentication to succeed.

Default Configuration

The default is to authenticate with all received session identification parameters.

Command Modes

Dynamic RADIUS Configuration

User Guidelines

This command specifies the session identification attributes to validate before acting on a CoA disconnect request. The any/all parameter only applies to the received attributes. It does not mandate which attributes must be contained in the received message. If **session-key** is specified and the received session ID (Acct-Session-ID) is valid, authentication succeeds even if the session-key does not match. If authentication succeeds and the session-key does not match, a response (Disconnect-NAK) will be sent. If authentication does not succeed, no response is sent.

This command works in concert with the **ignore** command. The **ignore** command refines the **all** parameter to limit the attribute matching.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-radius-da)# auth-type all
```

client

Use this command to enter the CoA client parameters.

Syntax

client {*ip-address* | *hostname* } [**server-key** [0 | 7] *key-string*]

no client {*ip-address* | *hostname* }

- *ip-address*—The IPv4 address of a CoA client. The IPv4 address is entered in dotted-quad notation.

- *hostname*—The fully qualified domain name (FQDN) of a CoA client. Maximum length of a host FQDN is 255 characters.
- server-key —Sets the shared secret to verify client COA requests for this server.
- 0—An unencrypted key is to be entered.
- 7—An encrypted key is to be entered.
- *key-string*—The key string in encrypted or unencrypted form. In encrypted form, it must be 256 characters in length. In unencrypted form, it may be up to 128 characters in length. Enclose in key string in quotes to use special characters or embedded blanks.

Default Configuration

By default, no RADIUS CoA clients are configured.

Command Modes

Dynamic RADIUS Configuration

User Guidelines

Up to 10 dynamic CoA clients can be configured.

The server-key, if configured, overrides the global shared secret for this client only.

Messages received from a RADIUS CoA client are validated against the configured servers. Messages received from unconfigured RADIUS CoA clients are silently discarded.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures RADIUS servers at 1.1.1.1, 2.2.2.2, and 3.3.3.3 and CoA clients at 3.3.3.3, 4.4.4.4, and 5.5.5.5. It sets the front panel ports to use multi-auth authentication. CoA is configured for two RADIUS servers located at 1.1.1.1 and 2.2.2.2 using a global shared secret and a third server using a server specific shared secret. CoA disconnect requests are accepted from these servers. Any session identification attribute is allowed for CoA disconnect requests.

```
console#configure terminal
console(config)# aaa new-model
console(config)# aaa authentication dot1x default radius
console(config)# dot1x system-auth-control
console(config)# interface range gi1/0/1-24
console(config-if)# authentication port-control auto
console(config-if)# authentication host-mode multi-auth
console(config-if)# exit
console(config)# radius server auth 1.1.1.1
console(config-auth-radius)#primary
console(config-auth-radius)#exit
console(config)# server auth 2.2.2.2
console(config-auth-radius)#exit
console(config)# server auth 3.3.3.3
console(config-auth-radius)#key “That’s your secret.”
console(config-auth-radius)#exit
console(config)# radius server key “Keep it. Keep it.”
console(config)# aaa server radius dynamic-author
console(config-radius-da)# client 3.3.3.3 server-key 0 “That’s your secret.”
console(config-radius-da)# client 4.4.4.4
console(config-radius-da)# client 5.5.5.5
console(config-radius-da)# server-key 0 “Keep it. Keep it.”
console(config-radius-da)# port 3799
console(config-radius-da)# auth-type any
console(config-radius-da)# exit
console(config)#dot1x system-auth-control
console(config)#clear authentication sessions
```

ignore

Use this command to set the switch to ignore certain authentication/session identification parameters from RADIUS CoA clients. Use the **no** form of the command to restore checking of the specific authentication parameters as configured by the **auth-type** command.

Syntax

ignore {**session-key** | **server-key**}

no ignore {**session-key** | **server-key**}

- Session-key—Do not attempt to authenticate with the session key.

- Server-key—Do not attempt to authenticate with the server key.

Default Configuration

The default is to authenticate using all parameters present in the received message as specified by the configured auth-type.

Command Modes

Dynamic RADIUS Configuration

User Guidelines

This command specifies the attributes to validate before acting on a CoA or disconnect request. If **session-key** is specified and the session ID is valid, authentication succeeds even if the session-key does not match. If the session-key (Acct-Session-ID) does not match, a Disconnect-ACK is sent.

The **ignore** command refines the **all** parameter to limit the attribute matching.

Setting the **auth-type** to **session-key** in conjunction with setting the **ignore session-key** is invalid and causes all configured servers to authenticate with no warnings.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-radius-da)# ignore session-key
```

port

Use this command to set the port on which to listen for CoA and disconnect requests from authorized RADIUS CoA clients.

Syntax

port *port–number*

no port

- *port-number*—An integer in the range of 1025–65535

Default Configuration

The default is port 3799.

Command Modes

Dynamic RADIUS Configuration

User Guidelines

Only one port may be defined and it is used by all RADIUS CoA clients. Do not use a port number reserved for use by the switch. UDP, TCP and RAW Ports reserved by the switch and unavailable for use or configuration are:

Ports 1, 17, 58, 255, 546, 547, 2222, 4567, 6343, 49160

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-radius-da)# port 1700
```

server-key

Use this command to configure a global shared secret that is used for all dynamic RADIUS clients that do not have an individual shared secret configured. Use the **no** form of the command to remove the global shared secret configuration.

Syntax

server-key [0 | 7] *key-string*

no server-key

- 0—An unencrypted key is to be entered.
- 7—An encrypted key is to be entered.
- *key-string*—The key string in encrypted or unencrypted form. In encrypted form, it must be 256 characters in length. In unencrypted form, it may be up to 128 characters in length. Enclose the key string in quotes to use special characters or embedded blanks.

Default Configuration

By default, no global server key is configured.

Command Modes

Dynamic RADIUS Configuration

User Guidelines

Only one global server key may be defined. Use the server-key parameter in the **client** command to configure a unique server key for each client.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures RADIUS servers at 1.1.1.1, 2.2.2.2, and 3.3.3.3. It sets the front panel ports to use multi-auth authentication. CoA is configured for two RADIUS servers located at 1.1.1.1 and 2.2.2.2 using a global shared secret and a third server 3.3.3.3 using a server specific shared secret. CoA disconnect requests are accepted from these servers. Any authentication type is allowed for CoA disconnect requests.

```
console#configure terminal
console(config)# aaa new-model
console(config)# aaa authentication dot1x default radius
console(config)# dot1x system-auth-control
console(config)# interface range gi1/0/1-24
console(config-if)# authentication port-control auto
console(config-if)# authentication host-mode multi-auth
console(config-if)# exit
console(config)# radius server auth 1.1.1.1
console(config-auth-radius)#primary
console(config-auth-radius)#exit
console(config)# radius server auth 2.2.2.2
console(config-auth-radius)#exit
console(config)# radius server auth 3.3.3.3
console(config-auth-radius)#key "That's your secret."
console(config-auth-radius)#exit
console(config)# radius server key "Keep it. Keep it."
console(config)# aaa server radius dynamic-author
console(config-radius-da)# client 3.3.3.3 server-key 0 "That's your secret."
console(config-radius-da)# client 1.1.1.1
```

```
console(config-radius-da)# client 2.2.2.2
console(config-radius-da)# server-key 0 "Keep it. Keep it."
console(config-radius-da)# port 3799
console(config-radius-da)# auth-type any
console(config-radius-da)# exit
console(config)#dot1x system-auth-control
console(config)#clear authentication sessions
```

dot1x user

Use this command to add an IAS or administrator user ID to the list of users allowed to authenticate on an interface.

Syntax

dot1x user { *user-id* [*interface-id* | **all**]}

no dot1x user { user-id }

- *ias-user-id*—The user name of a configured IAS user or switch administrator.
- *interface-id* —An interface (Ethernet) identifier.
- **all**—All interfaces (Ethernet).

Default Configuration

By default, newly configured users are authorized to authenticate on all interfaces. Use the **no dot1x user** *username* **all** command to remove the user from all ports and then use the dot1x user **username** <*interface-id*> to add the user to specific ports.

Command Mode

Global Configuration mode

User Guidelines

Use this command to restrict authentication to a subset of interfaces. The list is maintained per interface. Use the command once for each interface on which the user is allowed to authenticate.

Command History

Command introduced in version 6.6 firmware.

Example

This command creates IAS user Philip and allows authentication for Philip on Gi1/0/1 and Gi1/0/2 when using the IAS database for authentication.

```
console(config)#aaa ias-user  username Philip
console(config-ias-user)#exit
console(config)#authentication dot1x default ias
console(config)#no dot1x user Philip all
console(config)#dot1x user Philip Gi1/0/1
console(config)#dot1x user Philip Gi1/0/2
```

show dot1x

Use the **show dot1x** command to display the global or interface configuration or the statistics for an interface.

Syntax

show dot1x [detail ***interface-id*** statistics ***interface-id***]

- **detail**—Display detailed information for an interface.
- statistics—Display message tx/rx counts
- *interface-id*—An interface (Ethernet) identifier. See Interface Naming Conventions for interface representation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Use this command with no parameters to display the global 802.1X configuration. Use the statistics parameter to display statistics information for a port.

The following configuration information is displayed for the detail parameter:

Field	Description
Port	The interface whose configuration is displayed.
Protocol Version	The protocol version associated with this port. The only possible value is 1, corresponding to the first version of the 802.1x specification.
PAE Capabilities	The port access entity (PAE) functionality of this port. Possible value is Authenticator.
Quiet Period	The timer used by the authenticator state machine on this port to define periods of time in which it will not attempt to acquire a supplicant. The value is expressed in seconds and will be in the range 0 and 65535. This is the period for which the authenticator state machine stays in the HELD state.
Transmit Period	The timer used by the authenticator state machine on the specified port to determine when to send an EAPOL EAP Request/Identity frame to the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Supplicant Timeout	The timer used by the authenticator state machine on this port to timeout the supplicant. The value is expressed in seconds and will be in the range of 1 and 65535.
Server Timeout	The timer used by the authenticator on this port to timeout the authentication server. The value is expressed in seconds and will be in the range of 1 and 65535.
Maximum Request-Identities	The maximum number of times (attempts), the authenticator state machine on this port will retransmit an EAPOL EAP Request-Identity frames before timing out the supplicant.
Maximum Requests	The maximum number of times the authenticator state machine on this port will retransmit an EAPOL EAP Request/Identity before restarting the authentication process.
Key Transmission Enabled	Indicates if the key is transmitted to the supplicant for the specified port. Possible values are True or False.

Command History

Syntax updated in version 6.6 firmware.

Example

The following shows example CLI display output for the global configuration.

```
console#show dot1x

Administrative Mode............... Enabled
EAPOL Flood Mode.................. Disabled
Software Version.................. 1
```

The following shows example CLI display output for the detail parameter.

```
console #show dot1x detail gi1/0/3
Port........................................... Gi1/0/3
Protocol Version............................... 1
PAE Capabilities............................... Authenticator
Quiet Period (secs)............................ 60
Transmit Period (secs)......................... 30
Supplicant Timeout (secs)...................... 30
Server Timeout (secs).......................... 30
Maximum Request-Identities..................... 2
Maximum Requests............................... 2
Key Transmission Enabled....................... False
```

The following shows example CLI display output for the statistics.

```
console #show dot1x statistics gi1/0/1
Port........................................... Gi1/0/1
EAPOL Frames Received.......................... 0
EAPOL Frames Transmitted....................... 0
EAPOL Start Frames Transmitted................. 3
EAPOL Logoff Frames Received................... 0
EAP Resp/Id frames transmitted................. 0
EAP Response frames transmitted................ 0
EAP Req/Id frames transmitted.................. 0
EAP Req frames transmitted..................... 0
Invalid EAPOL frames received.................. 0
EAP length error frames received............... 0
Last EAPOL Frame Version....................... 0
Last EAPOL Frame Source........................ 00:00:00:00:02:01
```

show authentication authentication-history

Use the **show authentication authentication-history** command to display the dot1x authentication events and information during successful and unsuccessful dot1x authentication processes. The command is available to display all events, or events per interface, or only failure authentication events in summary or in detail.

Syntax

show authentication authentication-history {*interface-id* **|** **all**} [**failed-auth-only**] [**detail**]

- interface-id— Any valid interface. See Interface Naming Conventions for interface representation.
- all—All interfaces.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table explains the output parameters.

Parameter	**Description**
Time Stamp	Exact time at which the event occurs.
Interface	Ethernet interface on which the event occurs.
MAC-Address	Supplicant/Client MAC Address
VLAN assigned	VLAN assigned to the client/port on authentication.
VLAN assigned Reason	Type of VLAN ID assigned i.e Guest VLAN, Unauth, Default, RADIUS Assigned or Monitor Mode VLAN ID.
Auth Status	Authentication Status

Parameter	Description
Reason	Actual reason behind the successful or failure authentication.
Result Age	Time since last result.
Filter Name	The name of the assigned filter (policy map).

Example

```
console#show authentication authentication-history all detail

Time Stamp......................... Mar 22 2010 01:16:31
Result Age......................... 0 days, 1 hours, 17 minutes, 38 seconds
Interface.......................... Gi1/0/2
MAC-Address........................ 00:01:02:03:04:05
VLAN Assigned...................... 111
VLAN Assigned Reason............... Guest VLAN
Filter Name........................
Auth Status........................ Authorized
Reason............................. Dot1x Authentication due to Guest VLAN
                                         Timer Expiry.

......
......

console#show authentication authentication-history all
Time Stamp            Interface MAC-Address       VLANID Auth Status
--------------------- --------- ----------------- ------ ----------
Mar 22 2010 01:16:31  Gi1/0/2   00:01:02:03:04:05 111    Authorized
Mar 22 2010 01:20:33  Gi1/0/7   00:00:0D:00:00:00 222    Authorized

console#show authentication authentication-history gi1/0/1
Time Stamp            Interface MAC-Address       VLANID Auth Status
--------------------- --------- ----------------- ------ ----------
Mar 22 2010 01:16:31  Gi1/0/1   00:01:02:03:04:05 111    Authorized
Mar 22 2010 01:18:22  Gi1/0/1   00:00:00:03:04:05 0      Unauthorized
console#show authentication authentication-history gi1/0/1 failed-auth-only
Time Stamp            Interface MAC-Address       VLANID Auth Status
--------------------- --------- ----------------- ------ ----------
Mar 22 2010 01:18:22  Gi1/0/2   00:00:00:03:04:05 0      Unauthorized
```

show authentication clients

Use the **show authentication clients** command to display details regarding authenticated clients.

Syntax

show authentication clients {**all**|**interface** *interface–id* }

- all—Display information for all interfaces on which an authenticated client is present.
- *interface–id*—Display information for a single Ethernet (physical) interface identifier. See Interface Naming Conventions for interface representation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed.

Field	Description
Interface	The interface for which authentication configuration information is being displayed.
MAC Address	The MAC address of the client.
Username	The username associated with the client.

Field	Description
VLAN Assigned Reason	This can take one of the following values: • Default VLAN—The client has been authenticated on the port default VLAN and the authentication server is not RADIUS. • RADIUS—RADIUS is used for authenticating the client. • Voice VLAN—The client is identified as a Voice device. • Critical VLAN—The client has been authenticated on the Critical VLAN. • Unauthenticated VLAN—The client has been authenticated on the unauthenticated VLAN. • Guest VLAN—The client has been authenticated on the Guest VLAN. • Monitor Mode—The client has been authenticated by Monitor Mode
Host Mode	The authentication host mode configured on the interface. The possible values are multi-auth, multi-domain, multi-host, single-host, and multi-domain-multi-host.
Method	The method used to authenticate the client on the interface. The possible values are 802.1x, MAB, Captive Portal, and None.
Control Mode	The configured control mode for this port. Possible values are force-unauthorized, auto and unauthorized.
Session Time	The amount of time the client session has been active.
Session Timeout	This value indicates the time for which the given session is valid. The time period in seconds is returned by the RADIUS server on authentication of the port.
Session Termination Action	This value indicates the action to be taken once the session timeout expires. Possible values are Default and Radius-Request. If the value is Default, the session is terminated and client details are cleared. If the value is Radius-Request, then a reauthentication of the client is performed.

Field	Description
Filter ID	Identifies the Filter ID returned by the RADIUS server when the client was authenticated. This is a configured DiffServ policy name on the switch.
DACL	Identifies the Downloadable ACL returned by the RADIUS server when the client was authenticated.
Acct Session ID	The Accounting Session ID associated with the client session.
Linksec Policy	Displays the MACSEC-related Operational Linksec policy.

Example

The following shows example output for the command.

```
console#show authentication clients Te1/0/23

Interface..................................... Te1/0/23
Mac Address................................... 00:1B:21:96:10:2E
User Name..................................... testUser
VLAN Assigned Reason.......................... RADIUS Assigned VLAN (100)
Host Mode..................................... multi-domain-multi-host
Method........................................ 802.1X
Control Mode.................................. auto
Session time.................................. 95
Session timeout .............................. 0
Session Termination Action.................... Default
Filter ID.....................................
RADIUS Framed IPv4/IPv6 address...............
DACL..........................................
Redirect ACL..................................
Redirect URL..................................
Acct SessionId................................ testUser:1700000003
Linksec policy................................ must-secure
```

The following shows example output for the command.

```
console#show authentication clients gigabitethernet 1/0/1

Interface..................................... Gi1/0/10
Mac Address................................... 0E:87:CC:D3:00:00
User Name..................................... testUser
VLAN Assigned Reason.......................... RADIUS Assigned VLAN (193)
Host Mode..................................... multi-auth
```

```
Method......................................... 802.1X
Control Mode................................... auto
Session time................................... 139
Session timeout ............................... 0
Session Termination Action..................... Default
Filter ID......................................
RADIUS Framed IPv4/IPv6 address................
DACL........................................... IP-DACL-IN-00000018
Redirect ACL...................................
Redirect URL...................................
Acct SessionId................................. testUser:a00000018
Linksec policy................................. should-secure
```

The following shows example output for the command.

```
console#show authentication clients all

Interface  MAC-Address       Method  Host Mode    Control Mode    VLAN
Assigned Reason
---------   -----------------    -------    ------------------------   ----
Gi2/0/24  04:EB:40:B9:D1:57  none    multi-domain auto       Voice VLAN 172)
Te3/0/1   0E:96:B0:CD:00:00  802.1X  multi-auth   auto       RADIUS Assigned
VLAN (193)
Te3/0/1   72:75:6F:9C:00:00  802.1X  multi-auth   auto       RADIUS Assigned
VLAN (130)
Te11/0/1  5E:A6:AC:6A:00:00  none    multi-auth   auto       Default VLAN
(193)
Gi12/0/21 A0:93:51:0F:DF:CF  mab     multi-domain-multi-host auto Voice VLAN
(182)
```

Command History

Command syntax **show dot1x clients** deprecated in favor of **show authentication clients** in version 6.6 firmware. Command output updated in version 6.7.0 firmware.

show dot1x interface

This command shows the status and configuration of an IEEE 802.1x configured interface.

Syntax

show dot1x interface *interface-id*

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The command accepts Ethernet interface identifiers.

The following describes the fields in the output. All times are in seconds:

- Transmit Period —The time period between two successive EAP RequestId packets if the Supplicant does not respond 1 – 65535 sec 30 sec
- Supplicant Timeout—The timeout period when waiting for a response from the Supplicant1 – 65535 sec 30 sec
- Server Timeout —The timeout period when waiting for a response from the RADIUS Server1 – 65535 sec 30 sec
- Maximum Requests —The maximum number of EAP packet retransmissions to a Supplicant other than RequestId packets 1 – 20 sec 2
- Maximum Request-Identities —The maximum number of EAP RequestId retransmissions to a Supplicant 1 – 20 sec 2
- Quiet Period —The time the authenticator waits after timing out a supplicant before restarting authentication 60 sec
- Max Users —The maximum number of authenticated supplicants on the port 1-64 64

Example

```
console#show dot1x interface gigabitethernet 1/0/10

Administrative Mode............... Disabled
Dynamic VLAN Creation Mode........ Disabled
Monitor Mode...................... Disabled

Port     Admin              Oper          Reauth      Reauth
         Mode               Mode          Control     Period
-------  ------------------ ------------  --------  ----------
Gi1/0/10 auto               N/A           FALSE     3600
```

```
Quiet Period.................................. 60
Transmit Period............................... 30
Maximum Request-Identities.................... 2
Maximum Requests.............................. 2
Max Users..................................... 64
VLAN Assigned.................................
Supplicant Timeout............................ 30
Guest-vlan Timeout............................ 90
Server Timeout (secs)......................... 30
MAB mode (configured)......................... Disabled
MAB mode (operational)........................ Disabled
MAB Protocol.................................. EAP
Authentication Server Dead action for Voice.... None
Authentication Server Alive action............ None

Authenticator PAE State....................... Initialize
Backend Authentication State.................. Idle
```

show dot1x interface statistics

Use the **show dot1x interface statistics** command to display 802.1x statistics for the specified interface.

Syntax

show dot1x interface {**gigabitethernet** unit/slot/port| **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port} **statistics**

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display.

Field	Description
Port	The interface for which counters are displayed.
EAPOL Frames Received	The number of valid EAPOL frames of any type that have been received by this Authenticator.
EAPOL Frames Transmitted	The number of EAPOL frames of any type that have been transmitted by this Authenticator.
EAPOL Start Frames Received	The number of EAPOL Start frames that have been received by this Authenticator.
EAPOL Logoff Frames Received	The number of EAPOL Logoff frames that have been received by this Authenticator.
EAP Response/ID Frames Received	The number of EAP Resp/Id frames that have been received by this Authenticator.
EAP Response Frames Received	The number of valid EAP Response frames (other than Resp/Id frames) that have been received by this Authenticator.
EAP Request/ID Frames Transmitted	The number of EAP Req/Id frames that have been transmitted by this Authenticator.
EAP Request Frames Transmitted	The number of EAP Request frames (other than Rq/Id frames) that have been transmitted by this Authenticator.
Invalid EAPOL Frames Received	The number of EAPOL frames that have been received by this Authenticator in which the frame type is not recognized.
EAPOL Length Error Frames Received	The number of EAPOL frames that have been received by this Authenticator in which the Packet Body Length field is invalid.
Last EAPOL Frame Version	The protocol version number carried in the most recently received EAPOL frame.
Last EAPOL Frame Source	The source MAC address carried in the most recently received EAPOL frame.

Example

The following example displays 802.1x statistics for the specified interface.

```
console#show dot1x interface gigabitethernet 1/0/2 statistics
```

```
Port....................................... Gi1/0/2
EAPOL Frames Received......................... 0
EAPOL Frames Transmitted...................... 0
EAPOL Start Frames Received................... 0
EAPOL Logoff Frames Received.................. 0
Last EAPOL Frame Version...................... 0
Last EAPOL Frame Source....................... 0000.0000.0000
EAP Response/Id Frames Received............... 0
EAP Response Frames Received.................. 0
EAP Request/Id Frames Transmitted............. 0
EAP Request Frames Transmitted................ 0
Invalid EAPOL Frames Received................. 0
EAPOL Length Error Frames Received............ 0
```

clear authentication authentication–history

Use the **clear authentication authentication–history** command to clear all 802.1x and authentication manager history in the authentication history table captured during successful and unsuccessful authentication.

Syntax

clear authentication authentication–history

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command clears all 802.1x and authentication manager history on the switch.

Command History

The clear dot1x authentication–history syntax was deprecated in favor of the clear authentication authentication-history in version 6.6 firmware.

Example

This examples clears all entries from the authentication log.

```
console#clear authentication authentication-history
```

802.1x Advanced Features

authentication event no-response

Use the **authentication event no-response** command in Interface Configuration mode to set the guest VLAN on a port. The VLAN must be defined prior to use. The **no** form of this command sets the guest VLAN ID to zero, which disables the guest VLAN capability on the port.

Syntax

authentication event no-response action authorize vlan *vlan-id*

no authentication event no-response action authorize vlan

- *vlan-id* — The ID of a valid VLAN to use as the guest VLAN (Range: 1-4093).

Default Configuration

The guest VLAN is disabled on the interface by default.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

If configured, the guest VLAN is the VLAN to which 802.1X unaware clients are assigned. Configure the guest VLAN before using this command.

By default, the switch retries authentication one time before assigning a supplicant to the guest VLAN.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example sets the guest VLAN on Gigabit Ethernet 1/0/2 to VLAN 10.

```
console(config-if-Gi1/0/2)#authentication event no-response action authorize
vlan 10
```

authentication event fail

Use the **authentication event fail** command in Interface Configuration mode to specify the unauthenticated VLAN on a port. The VLAN must be defined prior to use. The no form of the command sets the unauthenticated VLAN ID to zero, which disables the authenticated VLAN on a port.

Syntax

authentication event fail action authorize vlan *vlan-id*

no authentication event fail action authorize vlan

- *vlan-id* — The ID of a valid VLAN to use for unauthenticated clients (Range: 1-4093).

Default Configuration

The unauthenticated VLAN is disabled on the interface by default.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

The unauthenticated VLAN is the VLAN to which supplicants that fail 802.1x authentication are assigned. By default, the switch will retry authentication one time before assigning a user to the unauthenticated VLAN. Configure the unauthenticated VLAN before using this command.

Command History

Syntax updated in version 6.6 firmware.

Example

The following example sets the unauthenticated VLAN on Gi1/0/21/0/2 to VLAN 20.

console(config-if-Gi1/0/2)# authentication event fail action authorize vlan 20

show dot1x advanced

Use the **show dot1x advanced** command to display 802.1x advanced features for the switch or for the specified interface.

Syntax

show dot1x advanced [{**gigabitethernet** unit/slot/port**|** **tengigabitethernet** unit/slot/port **|** **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The output of this command has been updated in release 2.1 to remove the Multiple Hosts column and add an Unauthenticated VLAN column, which indicates whether an unauthenticated VLAN is configured on a port. The command has also been updated to show the Guest VLAN ID (instead of the status) since it is now configurable per port.

Example

The following example displays 802.1x advanced features for the switch.

```
console#show dot1x advanced
Port        Guest       Unauthenticated
             VLAN           Vlan
---------   ---------   ---------------
Gi1/0/1        Disabled    Disabled
Gi1/0/2        10          20
Gi1/0/3        Disabled    Disabled
```

```
Gi1/0/4        Disabled    Disabled
Gi1/0/5        Disabled    Disabled
Gi1/0/6        Disabled    Disabled

console#show dot1x advanced gigabitethernet 1/0/2

Port         Guest       Unauthenticated
             VLAN             Vlan
---------   ---------   ---------------
Gi1/0/2      10           20
```

Captive Portal Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The Captive Portal feature is a software implementation that blocks both wired and wireless clients from accessing the network until user verification has been established. Verification can be configured to allow access for both guest and authenticated users. Authenticated users must be validated against a database of authorized Captive Portal users before access is granted.

The Authentication server supports both HTTP and HTTPS web connections. In addition, Captive Portal can be configured to use an optional HTTP port (in support of HTTP Proxy networks) or an optional HTTPS port. If configured, this additional port or ports are then used exclusively by Captive Portal.

NOTE: This optional HTTP port is in addition to the standard HTTP port 80 which is currently being used for all other web traffic, and the optional HTTPS port is in addition to the standard HTTPS port 443 used for secure web traffic.

Captive Portal Administrative Profile Commands

authentication timeout

Use the **authentication timeout** command to configure the time within which the user must enter their credentials. Use the “no” form of this command to reset the authentication timeout to the default.

Syntax

authentication timeout *timeout*

no authentication timeout

- *timeout*—The authentication timeout (Range: 60–600 seconds).

Default Configuration

The default authentication timeout is 300 seconds.

Command Mode

Captive Portal Configuration mode.

User Guidelines

If the user does not enter their credentials within the configured timeout, the user must initiate authentication again by sending another HTTP/HTTPS request.

Example

```
console(config-cp)#authentication timeout 600
console(config-cp)#no authentication timeout
```

captive-portal

Use the **captive-portal** command to enter the captive portal configuration mode.

Syntax

captive-portal

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#captive-portal
console(config-cp)#
```

enable

Use the **enable** command to globally enable captive portal. Use the “no” form of this command to globally disable captive portal.

Syntax

enable

no enable

Default Configuration

Captive Portal is disabled by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#enable
```

http port

Use the **http port** command to configure an additional HTTP port for captive portal to listen for connections. Use the “no” form of this command to remove the additional HTTP port from monitoring.

Syntax

http port *port-num*

no http port

- *port-num*—The port number on which the HTTP server listens for connections (Range: 1025–65535).

Default Configuration

Captive portal only monitors port 80 by default.

Command Mode

Captive Portal Configuration mode

User Guidelines

The port number should not be set to a value that might conflict with other well-known protocol port numbers used on this switch. Do not configure HTTP captive portal on an interface for which front panel switch management is enabled using the default HTTP port number.

Example

```
console(config-cp)#http port 32768
console(config-cp)#no http port
```

https port

Use the **https port** command to configure an additional HTTPS port for captive portal to monitor. Use the “no” form of this command to remove the additional HTTPS port.

Syntax

https port *port-num*

no https port

- *port-num*—The port number on which the HTTPS server listens for connections (Range: 1025–65535).

Default Configuration

Captive portal listens on port 443 by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

The port number should not be set to a value that might conflict with other well-known protocol port numbers used on this switch. Do not configure HTTPS captive portal on an interface for which front panel switch management is enabled using the default HTTPS port number.

Example

```
console(config-cp)#https port 1443
```

```
console(config-cp)#no https port
```

show captive-portal

Use the **show captive-portal** command to display the status of the captive portal feature.

Syntax

show captive-portal

Default Configuration

There is no default configuration for this command

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal
Administrative Mode....................... Disabled
Operational Status........................ Disabled
Disable Reason............................ Administrator Disabled
CP IP Address............................. 1.2.3.4
```

show captive-portal status

Use the **show captive-portal status** command to report the status of all captive portal instances in the system.

Syntax

show captive-portal status

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal status

Additional HTTP Port.......................... 81
Additional HTTP Secure Port................... 1443
Authentication Timeout........................ 300
Supported Captive Portals..................... 10
Configured Captive Portals.................... 1
Active Captive Portals........................ 0
Local Supported Users......................... 128
Configured Local Users........................ 3
System Supported Users........................ 1024
Authenticated Users........................... 0
```

Captive Portal Configuration Commands

The commands in this section are related to captive portal configurations.

block

Use the **block** command to block all traffic for a captive portal configuration. Use the “no” form of this command to unblock traffic.

Syntax

block

no block

Default Configuration

Traffic is not blocked by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#block
```

configuration

Use the **configuration** command to enter the captive portal instance mode. The captive portal configuration identified by CP ID 1 is the default CP configuration. The system supports a total of ten CP configurations. Use the "no" form of this command to delete a configuration. The default configuration (1) cannot be deleted.

Syntax

configuration *cp-id*

no configuration *cp-id*

- *cp-id*—Captive Portal ID (Range: 1–10).

Default Configuration

Configuration 1 is enabled by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#configuration 2
console(config-cp 2)#
```

enable

Use the **enable** command to enable a captive portal configuration. Use the **no** form of this command to disable a configuration.

Syntax

enable

no enable

Default Configuration

Configurations are enabled by default

Command Mode

Captive Portal Instance mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#no enable
```

group

Use the **group** command to configure the group number for a captive portal configuration. If a group number is configured, the user entry (Local or RADIUS) must be configured with the same name and the group to authenticate to this captive portal instance. Use the **no** form of this command to reset the group number to the default.

Syntax

group *group-number*

no group

- *group-number*—The number of the group to associate with this configuration (Range: 1–10).

Default Configuration

The default group number is 1.

Command Mode

Captive Portal Instance mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#group 2
```

interface

Use the **interface** command to associate an interface with a captive portal configuration. Use the **no** form of this command to remove an association.

Syntax

interface *interface*

no interface *interface*

- *interface*—An interface or range of interfaces.

Default Configuration

No interfaces are associated with a configuration by default.

Command Mode

Captive Portal Instance Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#interface gi1/0/2
```

locale

The **locale** command is not intended to be a user command. The administrator must use the Web UI to create and customize captive portal web content. This command is primarily used by the **show running-config** command and process as it provides the ability to save and restore configurations using a text based format.

Syntax

locale *web-id*

- *web-id*—The locale number (Range: 1–3)

Default Configuration

Locale 1 is configured by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

Captive Portal supports 3 locales per configuration.

name (Captive Portal)

Use the **name** command to configure the name for a captive portal configuration. Use the **no** form of this command to remove a configuration name.

Syntax

name *cp-name*

no name

- *cp-name*—CP configuration name (Range: 1–32 characters).

Default Configuration

Configuration 1 has the name “Default” by default. All other configurations have no name by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#name cp2
```

protocol

Use the **protocol** command to configure the protocol mode for a captive portal configuration.

Syntax

protocol {http | https}

Default Configuration

The default protocol mode is http.

Command Mode

Captive Portal Instance mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp 2)#protocol http
```

redirect

Use the **redirect** command to enable the redirect mode for a captive portal configuration. Use the “no” form of this command to disable redirect mode.

Syntax

redirect

no redirect

Default Configuration

Redirect mode is disabled by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

Enabling redirect mode will configure the **redirect-url** with an empty URL. Use the redirect-url command to configure the URL to be sent to the HTTP response.

Example

```
console(config-cp 2)#redirect
```

redirect-url

Use the **redirect-url** command to configure the redirect URL for a captive portal configuration.

Syntax

redirect-url *url*

- *url*—The URL for redirection (Range: 1–512 characters).

Default Configuration

There is no redirect URL configured by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

The administrator must enable redirect mode before executing this command. It is not necessary to enter the http/https header information. Only enter the host name and other information that might be required to perform the redirect. HTTP to HTTPS redirection and HTTPS to HTTP redirection are not supported.

Example

```
console(config-cp 2)#redirect-url www.dell.com
```

session-timeout

Use the **session-timeout** command to configure the session timeout for a captive portal configuration. Use the **no** form of this command to reset the session timeout to the default.

Syntax

session-timeout *timeout*

no session-timeout

- *timeout*—Session timeout. 0 indicates timeout not enforced (Range: 0–86400 seconds).

Default Configuration

There is no session timeout by default.

Command Mode

Captive Portal Instance mode.

User Guidelines

Captive portal maintains a table of authenticated users. It is recommended that a timeout be configured for guest users to avoid orphan sessions filling up the authenticated users table. User sessions can be terminated with the no user command in captive portal configuration mode or the captive-portal client deauthenticate command in Privileged Exec mode.

Example

```
console(config-cp 2)#session-timeout 86400
console(config-cp 2)#no session-timeout
```

verification

Use the **verification** command to configure the verification mode for a captive portal configuration.

Syntax

verification { guest | local | radius }

- guest—Allows access for unauthenticated users (users that do not have assigned user names and passwords).
- local—Authenticates users against the local user database.
- radius—Authenticates users against a remote RADIUS database.

Default Configuration

The default verification mode is guest.

Command Mode

Captive Portal Instance mode.

User Guidelines

Guest access does not perform any user verification. Configure a timeout to avoid guest users filling the captive portal authenticated users table. Guest access may be combined with a redirect-url configuration to perform user verification via an external authenticator.

If RADIUS authentication is configured, at least one RADIUS server must be configured and RADIUS must be enabled.

If local authentication is configured, the user information (user ID and password) must be configured in the local user database. See the username command for more information on configuring local users.

Example

```
console(config-cp 2)#verification local
```

Captive Portal Client Connection Commands

captive-portal client deauthenticate

Use the **captive-portal client deauthenticate** command to deauthenticate a specific captive portal client.

Syntax

captive-portal client deauthenticate *macaddr*

- *macaddr*—Client MAC address.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode.

User Guidelines

This command removes the user entry in the authenticated user database an removes the user's MAC address from the list of MAC addresses allowed to access the interface.

Example

```
console#captive-portal client deauthenticate 0002.BC00.1290
```

show captive-portal client status

Use the **show captive-portal client status** command to display client connection details or a connection summary for connected captive portal users.

Syntax

show captive-portal client [*macaddr*] **status**

- *macaddr*—Client MAC address.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal client status
Client MAC Address Client IP Address Protocol Verification Session Time
------------------ ----------------- -------- ------------ ------------
0002.BC00.1290     10.254.96.47      https    Local        0d:00:01:20
0002.BC00.1291     10.254.96.48      https    Local        0d:00:05:20
0002.BC00.1292     10.254.96.49      https    Radius       0d:00:00:20

console#show captive-portal client 0002.BC00.1290 status
Client MAC Address....................... 0002.BC00.1290
Client IP Address........................ 10.254.96.47
Protocol Mode............................ https
Verification Mode........................ Local
CP ID.................................... 1
CP Name.................................. cp1
Interface................................ Gi1/0/1
Interface Description.................... Unit: 1 Slot: 0 Port: 1 Gigabit -
Level
User Name................................ user123
Session Time............................. 0d:00:00:13
```

show captive-portal configuration client status

Use the **show captive-portal configuration client status** command to display the clients authenticated to all captive portal configurations or a to specific configuration.

Syntax

show captive-portal configuration [*cp-id*] **client status**

- *cp-id*—Captive Portal ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal configuration client status
CP ID     CP Name     Client MAC Address Client IP Address Interface
----- --------------- ------------------ ----------------- ---------
1     cp1             0002.BC00.1290     10.254.96.47      Gi1/0/1
                      0002.BC00.1291     10.254.96.48      Gi1/0/2
2     cp2             0002.BC00.1292     10.254.96.49      Gi1/0/3
3     cp3             0002.BC00.1293     10.254.96.50      Gi1/0/4

console#show captive-portal configuration 1 client status
CP ID..................................... 1
CP Name................................... cp1
   Client           Client
 MAC Address      IP Address   Interface       Interface Description
-------------- --------------- --------- --------------------------------
0002.BC00.1290 10.254.96.47    Gi1/0/1      Unit: 1 Slot: 0 Port: 1 Gigabit
0002.BC00.1291 10.254.96.48    Gi1/0/2      Unit: 1 Slot: 0 Port: 2 Gigabit
```

show captive-portal interface client status

Use the **show captive-portal interface client status** command to display information about clients authenticated on all interfaces or a specific interface.

Syntax

show captive-portal interface {**gigabitethernet** unit/slot/port| **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port} **client status**

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal interface client status
                                                 Client           Client
Intf            Intf Description              MAC Address       IP Address
------ ---------------------------------- ----------------- ---------------
Gi1/0/1   Unit: 1 Slot: 0 Port: 1 Gigabit     0002.BC00.1290    10.254.96.47
                                              0002.BC00.1291    10.254.96.48
Gi1/0/2   Unit: 1 Slot: 0 Port: 2 Gigabit     0002.BC00.1292    10.254.96.49
Gi1/0/3   Unit: 1 Slot: 0 Port: 3 Gigabit     0002.BC00.1293    10.254.96.50

console#show captive-portal interface gi1/0/1 client status
Interface................................ Gi1/0/1
Interface Description.................... Unit: 1 Slot: 0 Port: 1 Gigabit

     Client             Client
   MAC Address       IP Address    CP ID       CP Name     Protocol Verification
----------------- --------------- ----- ----------------- -------- ---------
0002.BC00.1290     10.254.96.47   1     cp1               http     local
0002.BC00.1291     10.254.96.48   2     cp2               http     local
```

Captive Portal Interface Commands

show captive-portal interface configuration status

Use the **show captive-portal interface configuration status** command to display the interface to configuration assignments for all captive portal configurations or for a specific configuration.

Syntax

show captive-portal interface configuration [*cp-id*] **status**

- *cp-id*—Captive Portal ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal interface configuration status
CP ID CP Name  Interface Interface Description                Type
----- -------- --------- ------------------------------------   ---------
1      Default Gi1/0/1   Unit:1 Slot: 0 Port: 1 Gigabit .       Physical

console#show captive-portal interface configuration 1 status
CP ID................................... 1
CP Name................................. cp1

Interface        Interface Description          Type
--------- ----------------------------------- --------
Gi1/0/1    Unit: 1 Slot: 0 Port: 1 Gigabit ... Physical
```

Captive Portal Local User Commands

clear captive-portal users

Use the **clear captive-portal users** command to delete all captive portal user entries.

Syntax

clear captive-portal users

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console#clear captive-portal users
```

no user

Use the **no user** command to delete a user from the local user database. If the user has an existing session, it is disconnected.

Syntax

no user *user-id*

- *user-id*—User ID (Range: 1–128).

Default Configuration

There is no default configuration for this command.

Command Mode

Captive Portal Configuration mode.

User Guidelines

Use the show captive-portal configuration client status or the show captive-portal user command to find the captive portal user-id for a session.

Example

```
console(config-cp)#no user 1
```

show captive-portal user

Use the **show captive-portal user** command to display all configured users or a specific user in the captive portal local user database.

Syntax

show captive-portal user [*user-id*]

- *user-id*—User ID (Range: 1–128).

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal user
                              Session
User ID       User Name       Timeout   Group ID    Group Name
------- --------------------- ------- ------------ ------------
1       user123               14400     1           Default
2       user234               0         1           Default
                                        2           group2

console#show captive-portal user 1
User ID....................................... 1
User Name..................................... user123
Password Configured........................... Yes
Session Timeout............................... 0

Group ID            Group Name
-------- --------------------------------
1        Default
2        group2
```

user group

Use the **user group** command to associate a group with a captive portal user. Use the “no” form of this command to disassociate a group and user. A user must be associated with at least one group so the last group cannot be disassociated.

Syntax

user *user-id* **group** *group-id*

- *user-id*—User ID (Range: 1–128).
- *group-id*—Group ID (Range: 1–10).

Default Configuration

A user is associated with group 1 by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#user 1 group 3
```

user-logout

Use the **user-logout** command in Captive Portal Instance mode to enable captive portal users to log out of the portal (versus having the session time out). Use the **no** form of the command to return the user logout configuration to the default.

Syntax

user-logout

no user-logout

Default Configuration

User-logout is disabled by default.

Command Mode

Captive-portal Instance mode

User Guidelines

There are no user guidelines for this command.

Example

In this example, all classes of entries in the mac address-table are displayed.

```
console(config)#captive-portal
console(config-cp)#user 1 name asd
console(config-cp)#configuration 1
console(config-cp 1)#user-logout
console(config-cp 1)#no user-logout
```

user name

Use the **user name** command to modify the user name for a local captive portal user.

Syntax

user *user-id* **name** *name*

- *user-id*—User ID (Range: 1–128).
- *name*—user name (Range: 1–32 characters).

Default Configuration

There is no name for a user by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines.

Example

```
console(config-cp)#user 1 name johnsmith
```

user password

Use the **user password** command to create a local user or change the password for an existing user.

Syntax

user *user-id* **password** {*password* | **encrypted** *enc-password*}

- *user-id*—User ID (Range: 1–128).
- *password*—User password (Range: 8–64 characters).
- *enc-password*—User password in encrypted form.

Default Configuration

There are no users configured by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#user 1 password
Enter password (8 to 64 characters): ********
Re-enter password: ********
```

user session-timeout

Use the **user session-timeout** command to set the session timeout value for a captive portal user. Use the **no** form of this command to reset the session timeout to the default.

Syntax

user *user-id* **session-timeout** *timeout*

no user *user-id* **session-timeout**

- *user-id*—User ID (Range: 1–128).
- *timeout*—Session timeout. 0 indicates use global configuration (Range: 0–86400 seconds).

Default Configuration

The global session timeout is used by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#user 1 session-timeout 86400
console(config-cp)#no user 1 session-timeout
```

Captive Portal Status Commands

show captive-portal configuration

Use the **show captive-portal configuration** command to display the operational status of each captive portal configuration.

Syntax

show captive-portal configuration *cp-id*

- *cp-id*—Captive Portal ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal configuration 1
CP ID................................... 1
CP Name................................. cp1
Operational Status...................... Disabled
Disable Reason.......................... Administrator Disabled
Blocked Status.......................... Not Blocked
Configured Locales...................... 1
Authenticated Users..................... 0
```

show captive-portal configuration interface

Use the **show captive-portal configuration interface** command to display information about all interfaces assigned to a captive portal configuration or about a specific interface assigned to a captive portal configuration.

Syntax

show captive-portal configuration *cp-id* **interface** [{**gigabitethernet** unit/slot/port| **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}]

- *cp-id*—Captive Portal ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal configuration 1 interface
CP ID................................... 1
```

```
CP Name.................................. cp1

                                                    Operational    Block
Interface        Interface Description                 Status      Status
--------- ---------------------------------------- ------------ ---------
Gi1/0/1      Unit: 1 Slot: 0 Port: 1 Gigabit - Level  Disabled     Blocked

console#show captive-portal configuration 1 interface gi1/0/1
CP ID.................................... 1
CP Name.................................. cp1
Interface................................ Gi1/0/1
Interface Description.................... Unit: 1 Slot: 0 Port: 1 Gigab...
Operational Status....................... Disabled
Disable Reason........................... Interface Not Attached
Block Status............................. Not Blocked
Authenticated Users...................... 0
```

show captive-portal configuration locales

Use the **show captive-portal configuration locales** command to display locales associated with a specific captive portal configuration.

Syntax

show captive-portal configuration *cp-id* **locales**

- *cp-id*—Captive Portal Configuration ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal configuration 1 locales
Locale Code
---------------
```

```
en
```

show captive-portal configuration status

Use the **show captive-portal configuration status** command to display information about all configured captive portal configurations or about a specific captive portal configuration.

Syntax

show captive-portal configuration [*cp-id*] **status**

- *cp-id*—Captive Portal ID.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show captive-portal configuration status
CP ID      CP Name        Mode     Protocol  Verification
-----  ---------------  --------  --------  ------------
1      cp1              Enable    https     Guest
2      cp2              Enable    http      Local
3      cp3              Disable   https     Guest

console#show captive-portal configuration 1 status
CP ID........................................ 1
CP Name...................................... cp1
Mode......................................... Enabled
Protocol Mode................................ https
Verification Mode............................ Guest
Group Name................................... group123
Redirect URL Mode............................ Enabled
Redirect URL................................. www.cnn.com
Session Timeout (seconds).................... 86400
```

Captive Portal User Group Commands

user group

Use the **user group** command to create a user group. Use the **no** form of this command to delete a user group. The default user group (1) cannot be deleted.

Syntax

user group *group-id*

no user group *group-id*

group-id—Group ID (Range: 1–10).

Default Configuration

User group 1 is created by default and cannot be deleted.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#user group 2
console(config-cp)#no user group 2
```

user group moveusers

Use the **user group moveusers** command to move a group's users to a different group.

Syntax

user group *group-id* **moveusers** *new-group-id*

- *group-id*—Group ID (Range: 1–10).
- *new-group-id*—Group ID (Range: 1–10).

Default Configuration

There is no default configuration for this command.

Command Mode

Captive Portal Configuration mode

User Guidelines

The new group-id must already exist.

Example

```
console(config-cp)#user group 2
console(config-cp)#user 1 group 2
console(config-cp)#user group 2 moveusers 3
```

user group name

Use the **user group name** command to configure a group name.

Syntax

user group *group-id* **name** *name*

- *group-id*—Group ID (Range: 1–10).
- *name*—Group name (Range: 1–32 alphanumeric characters).

Default Configuration

User groups have no names by default.

Command Mode

Captive Portal Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-cp)#user group 2 name group2
```

Denial of Service Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The Dell EMC Networking DoS capability supports a package of filters intended to provide network administrators the ability to reduce network exposure to common attack vectors. The following list shows the DoS attack detection Dell EMC Networking supports.

- SIP=DIP:
  - Source IP address = Destination IP address.
- First Fragment:
  - TCP Header size smaller then configured value.
- TCP Fragment:
  - IP Fragment Offset = 1.
- TCP Flag:
  - TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and
  - TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and
  - TCP Sequence Number = 0 or TCP Flags SYN and FIN set.
- L4 Port:
  - Source TCP/UDP Port = Destination TCP/UDP Port.
- ICMP:
  - Limiting the size of ICMP Ping packets.
- SMAC=DMAC:
  - Source MAC address = Destination MAC address.
- TCP Port:
  - Source TCP Port = Destination TCP Port.
- UDP Port:
  - Source UDP Port = Destination UDP Port.
- TCP Flag & Sequence:

- TCP Flag SYN set and Source Port < 1024 or TCP Control Flags = 0 and
- TCP Sequence Number = 0 or TCP Flags FIN, URG, and PSH set and
- TCP Sequence Number = 0 or TCP Flags SYN and FIN set.

- TCP Offset:
  - Checks for TCP header offset =1.
- TCP SYN:
  - TCP Flag SYN set.
- TCP SYN & FIN:
  - TCP Flags SYN and FIN set.
- TCP FIN & URG & PSH:
  - TCP Flags FIN and URG and PSH set and TCP Sequence Number = 0.
- ICMP V6:
  - Limiting the size of ICMPv6 Ping packets.
- ICMP Fragment:
  - Checks for fragmented ICMP packets.

dos-control firstfrag

Use the **dos-control firstfrag** command in Global Configuration mode to enable Minimum TCP Header Size Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having a TCP Header Size smaller than the configured value, the packets are dropped.

Syntax

dos-control firstfrag [*size*]

no dos-control firstfrag

- *size* —TCP header size. (Range: 0-255). The default TCP header size is 20. ICMP packet size is 512.

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines a minimum TCP header size of 20. Packets entering with a smaller header size are dropped.

```
console(config)#dos-control firstfrag 20
```

dos-control icmp

Use the **dos-control icmp** command in Global Configuration mode to enable Maximum ICMP Packet Size Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If ICMP Echo Request (PING) packets ingress having a size greater than the configured value, the packets are dropped.

Syntax

dos-control icmp [*size*]

no dos-control icmp

- *size* — Maximum ICMP packet size. (Range: 0-16376). If size is unspecified, the value is 512.

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example activates the Maximum ICMP Packet Denial of Service protection with a maximum packet size of 1023.

```
console(config)#dos-control icmp 1023
```

dos-control l4port

Use the **dos-control l4port** command in Global Configuration mode to enable L4 Port Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having Source TCP/UDP Port Number equal to Destination TCP/UDP Port Number, the packets are dropped.

Syntax

dos-control l4port

no dos-control l4port

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example activates L4 Port Denial of Service protection.

```
console(config)#dos-control l4port
```

dos-control sipdip

Use the **dos-control sipdip** command in Global Configuration mode to enable Source IP Address = Destination IP Address (SIP=DIP) Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress with SIP=DIP, the packets is dropped if the mode is enabled.

Syntax

dos-control sipdip

no dos-control sipdip

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example activates SIP=DIP Denial of Service protection.

```
console(config)#dos-control sipdip
```

dos-control tcpflag

Use the **dos-control tcpflag** command in Global Configuration mode to enable TCP Flag Denial of Service protections. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having TCP Flag SYN set and a source port less than 1024, having TCP Control Flags set to 0 and TCP Sequence Number set to 0, having TCP Flags FIN, URG, and PSH set and TCP Sequence Number set to 0, or having TCP Flags SYN and FIN both set, the packets are dropped.

Syntax

dos-control tcpflag

no dos-control tcpflag

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example activates TCP Flag Denial of Service protections.

```
console(config)#dos-control tcpflag
```

dos-control tcpfrag

Use the **dos-control tcpfrag** command in Global Configuration mode to enable TCP Fragment Denial of Service protection. If the mode is enabled, Denial of Service prevention is active for this type of attack. If packets ingress having IP Fragment Offset equal to one (1), the packets are dropped.

Syntax

dos-control tcpfrag

no dos-control tcpfrag

Default Configuration

Denial of Service is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example activates TCP Fragment Denial of Service protection.

```
console(config)#dos-control tcpfrag
```

rate-limit cpu

Use the **rate-limit cpu** command to reduce the amount of unknown unicast/multicast packets forwarded to the CPU on CoS queues 0 and 1.

This command also configures the rate in packets-per-second for the number of IPv4 and IPv6 data packets trapped to CPU when the packet fails to be forwarded in the hardware due to unresolved MAC address of the destination IPv6 node. Packets exceeding the rate limit are silently discarded.

Use the **no** form of the command to return the rate limit to the default value.

Syntax

rate-limit cpu direction input pps *pps-value*

no rate-limit cpu direction input pps

- pps-value—Range of 50-1024 packets per second

Default Configuration

The default is 1024 packets per second

Command Modes

Global Configuration mode

User Guidelines

Unknown multicast and IPv4/IPv6 data packets destined to hosts in the connected networks on the router for which the MAC address is not resolved are trapped to CPU to trigger the ARP/neighbor discovery resolution of those hosts.

When the ARP or neighbor table is filled, the switch cannot accommodate new entries. In this case, there is no value in receiving the unresolved IPv4/IPv6 packets. Likewise, in cases of a L2 network re-convergence, a large number of neighbors may not be discovered but may be transmitting traffic. In the case of multicast data, certain multicast topologies using multi-access VLANs may result in packets being forwarded to the CPU with no associated PIM or MFDB state.

Receiving large numbers unresolved packets spikes the CPU usage to high levels at no benefit. For Ipv6, it also results in delayed processing of the NUD packets (NS/NA) for the existing neighbor entries leading to NUD anomalies and deletions of existing neighbor entries.

To avoid such an unnecessary CPU load leading to NUD anomalies when the ARP or IPV6 neighbor table is close to full (crossing 95% of table size) or other failures, the switch automatically reduces the rate limit to an empirical value of 50 pps irrespective of the configured rate limit. When the table size falls below 95% of the table size, it is restored to the configured rate limit value.

Use this command to limit the CPU load in situations where large numbers of unknown multicast or IPv4/IPv6 packets with an unknown multicast or unicast IPv4/IPv6 destination are being handled in software. The symptom can be diagnosed by high CPU usage of the ipMapForwardingTask.

Example

An example output is showing higher than normal CPU usage due to packets copied to the software forwarding task below:

```
console#show process cpu

Memory Utilization Report

status bytes
------ ----------
free   1055653888
alloc   672153600

CPU Utilization:

PID        Name                  5 Secs  60 Secs 300 Secs
---------- ------------------- -------- -------- --------
1129       osapiTimer            0.09%    0.02%    0.01%
```

```
1137       bcmCNTR.0            0.19%    0.28%    0.30%
1142       bcmRX               18.00%   12.04%   11.10%
1155       bcmLINK.0            0.39%    0.37%    0.36%
1156       cpuUtilMonitorTask   0.09%    0.04%    0.04%
1170       nim_t                0.09%    0.07%    0.07%
1222       snoopTask            0.09%    0.02%    0.02%
1243       ipMapForwardingTask 27.30%   24.19%   29.06%
1257       tRtrDiscProcessingT  0.09%    0.01%    0.00%
1291       RMONTask             0.00%    0.02%    0.03%
1293       boxs Req             0.00%    0.01%    0.01%
------------------------------ -------- -------- --------
Total CPU Utilization           55.91%  45.40%    48.02%
```

show dos-control

Use the **show dos-control** command to display Denial of Service configuration information.

Syntax

show dos-control

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays Denial of Service configuration information.

```
console#show dos-control
SIPDIP Mode...............................Disable
First Fragment Mode.......................Disable
Min TCP Hdr Size..........................20
TCP Fragment Mode........................ Disable
TCP Flag Mode.............................Disable
L4 Port Mode..............................Disable
```

```
ICMP Mode.................................Disable
Max ICMP Pkt Size.........................512
```

show system internal pktmgr

Use the **show system internal pktmgr** command to display the configured CPU rate limit for unknown packets in packets per second.

Syntax

show system internal pktmgr internal control sw-rate-limit

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec mode

User Guidelines

See the **rate-limit cpu** command for further information on the output of this command.

Example

```
console# show system internal pktmgr internal control sw-rate-limit
Inband pps global threshold 1024
```

storm-control broadcast

Use the **storm-control broadcast** command to enable broadcast storm recovery mode for a specific interface. Use the **no** form of the command to disable storm control or to return the configuration to the default.

Syntax

storm-control broadcast [{**level** *level*| **rate** *rate* | **action** {**shutdown** | **trap**}]

no storm-control broadcast [**level**| **rate** | **action**]

- level— The configured rate as a percentage of link bandwidth (Range: 0-100)

- *rate* — The configured rate in packets per second. (Range: 0-14880000)
- **action shutdown**—Places the interface in the D-disable state if the threshold is exceeded.
- **action trap**—Logs a message and issue a trap if the threshold is exceeded.

Default Configuration

By default, broadcast storm control is disabled on all Ethernet interfaces.

The default threshold for broadcast traffic is 5% of link bandwidth.

The default behavior is to rate limit (drop) traffic exceeding the configured threshold.

There is no default action.

Command Mode

Interface Configuration (Ethernet) mode, Interface Range mode

User Guidelines

Broadcast storm control can only be enabled on Ethernet interfaces. It cannot be configured on port channels.

Setting the level, rate or action enables broadcast storm control. When enabled, broadcast storm control can issue a trap and drop traffic in excess of the configured rate (level) or shut down the port if the rate is exceeded.

Either the level or the rate threshold may be configured, but not both.

Either the trap action or the shutdown action may be specified, but not both.

The **trap** action issues a log message and a trap when the configured threshold is exceeded. Traffic exceeding the threshold is dropped.

The shutdown action shuts down the interface, puts the interface into the D-disable state, issues a log message (WARNING) and a trap. The operator may bring the port back into service using the **no shutdown** command.

Use the **show storm-contro**l action and **show storm-control** all commands to display the storm control settings.

Example

The following example configures any port to drop excess broadcast traffic and issue a log and trap if the received broadcast traffic exceeds 10% of link bandwidth:

```
console(config)#interface range gi1/0/1-24
console(config-if)#storm-control broadcast level 10
console(config-if)#storm-control broadcast action trap
console(config-if)#exit
```

storm-control multicast

Use the **storm-control multicast** command in Interface Configuration mode to enable multicast storm storm control for an interface.

Use the **no** form of the command to disable storm-control in order to return the configuration to the default.

Syntax

storm-control multicast [**level** *level* | **rate** *rate* | **action** {**shutdown** | **trap**}]

no storm-control multicast [**level** | **rate** | **action**]

- level— The configured rate as a percentage of link-speed.
- *rate* — The configured rate in packets per second. (Range: 0-14880000)
- **action shutdown**—Places the interface in the D-disable state if the threshold is exceeded.
- **action trap—**Logs a message and issue a trap if the threshold is exceeded.

Default Configuration

By default, multicast storm control is not enabled on any interfaces.

The default threshold for multicast traffic is 5% of link bandwidth.

The default behavior is to rate limit (drop) traffic exceeding the configured threshold.

The default action is no action.

Command Mode

Interface Configuration (Ethernet) mode, Interface Range mode

User Guidelines

Multicast storm control applies to unknown multicast (i.e., multicast groups that are not control plane traffic and are not currently active on any interface). This is multicast traffic that normally is flooded in the VLAN. Multicast storm control can issue a trap and drop traffic in excess of the configured rate (level), or shut down the ingress port if the rate is exceeded.

Multicast storm control can only be enabled on Ethernet interfaces. It cannot be configured on port channels.

Setting the level, rate or action does not enable multicast storm control. Issue the **storm-control multicast** command separately to enable multicast storm control.

Either the level or the rate threshold may be configured, but not both.

Either the trap action or the shutdown action may be specified, but not both.

The **trap** action issues a log message (WARNING) and a trap when the configured threshold is exceeded. Traffic exceeding the threshold is dropped.

The **shutdown** action shuts down the interface, puts the interface into the D-disable state, issues a log message and a trap. The operator may bring the port back into service using the **no shutdown** command.

Use the **show storm-control action** and **show storm-control all** commands to display the storm control settings.

Example

The following example configures any port to shut down if the received multicast traffic rate exceeds 20% of link bandwidth:

```
console(config)#interface range gi1/0/1-24
console(config-if)#storm-control multicast level 20
console(config-if)#storm-control multicast action shutdown
console(config-if)#exit
```

storm-control unicast

Use the **storm-control unicast** command in Interface Configuration mode to enable storm control for an interface. Unicast storm control limits the number of unicast destination lookup failures (DLFs). Use the **no** form of the command to disable unicast storm control or to return the configuration to the default.

Syntax

storm-control unicast [**level** *level* |**rate** *rate*|**action**{**shutdown**|**trap**}]

no storm-control unicast [**level** | **rate**]

- level— The configured rate as a percentage of link bandwidth (Range: 0-100)
- *rate*—The configured rate in packets per second. (Range: 0-14880000)
- action—The configured action: shutdown or trap.

Default Configuration

By default, unicast storm control is not enabled on any interfaces.

The default threshold for unicast traffic is 5% of link bandwidth.

Command Mode

Interface Configuration (Ethernet) mode, Interface Range mode

User Guidelines

A destination lookup failure (DLF) is when a L2 unicast packet is unable to resolve the destination MAC address to an egress interface (no MAC forwarding address entry exists). The standard behavior for L2 DLFs is to flood the packet on all ports in the VLAN other than the port on which the packet was received. This flooding behavior can cause significant amounts of bandwidth to be consumed, potentially disrupting the forwarding of other traffic.

Unicast storm control can issue a trap and drop packets in excess of the configured rate (level) or shut down the port when the rate is exceeded.

Setting the level, rate or action enables storm control. The shutdown action disables the interface when a packet storm is detected. The trap action issues an SNMP trap to configured SNMP agents.

Unicast storm control can only be enabled on Ethernet interfaces. It cannot be configured on port channels.

Either the level or the rate threshold may be configured, but not both.

Use the **show storm-control action** and **show storm-control all** commands to display the storm control settings.

Example

The following example configures any port to rate limit DLF traffic rate to 5% of link bandwidth:

```
console(config)#interface range gi1/0/1-24
console(config-if)#storm-control unicast level 5
console(config-if)#exit
```

Management ACL Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

In order to ensure the security of the switch management features, the administrator may elect to configure a management access control list. The Management Access Control and Administration List (ACAL) component is used to ensure that only known and trusted devices are allowed to remotely manage the switch via TCP/IP. Management ACLs are only configurable on IP (in-band) VLAN interfaces, not on the out-of-band interface or the serial port, and only filter packets sent to the switch CPU. Packets that are forwarded by the switch are not filtered by Management ACLs. Management ACLs filter packets in firmware after all hardware based ACLs (ip access-list and ipv6 access-list) have been applied. This allows the administrator to configure hardware based filtering criteria for in-band management access and then further refine that criteria with firmware based filtering supplied by the management ACL capability.

When a Management ACAL is enabled, incoming TCP packets initiating a connection (TCP SYN) and UDP packets will be filtered based on their source IP address and destination port. Additionally, other attributes such as VLAN ID can be used to determine if the traffic should be allowed access to the management interface. When the Management Access Control component is disabled, incoming TCP/UDP packets are not filtered in firmware and are processed normally. TCP SYN packets or UDP packets addressed to the following destination port numbers are not processed by the management ACL list: DNS(53), DHCP Server(67), DHCP Client (68), TFTP(69), telnet(23), HTTP(80), HTTPS(443), SNMP(161), SSH(22), and JAVA(4242).

There is also an option to restrict all the above packets from all VLANs. This is done by specifying “console only” in the MACAL component. If this option is enabled, the system management interface is only accessible via the serial port. All TCP SYN packets and UDP packets are dropped except UDP packets sent to the ports listed above.

deny (management)

Use the **deny** command in Management Access-List Configuration mode to set conditions for disallowing packets to flow to the switch management function.

Syntax

deny vlan *vlan-id* **|** [**service** *service*] [**priority** *priority*]

deny ip-source *ip-address* [**mask** *mask* **|** *prefix-length*] [**vlan** *vlan-id*] [**service** *service*] [**priority** *priority*]

- **vlan** *vlan-id* — A valid VLAN identifier.
- *ip-address* — Source IP address.
- **mask** *mask* — Specifies the network mask of the source IP address.
- **mask** *prefix-length* — Specifies the number of bits that comprise the source IP address prefix. The prefix length must be preceded by a forward slash (/). (Range: 0–32)
- **service** *service* — Indicates service type. Can be one of the following: **telnet**, **ssh**, **http**, **https**, **tftp**, **snmp**, **sntp**, or **any**. The **any** keyword indicates that the service match for the ACL is effectively "don't care".
- **priority** *priority* — Priority for the rule. (Range: 1–64)

Default Configuration

This command has no default configuration.

Command Mode

Management Access-list Configuration mode

User Guidelines

Rules with a **vlan** parameter are valid only if an IP address is defined on the appropriate VLAN interface. Ensure that each rule has a unique priority.

Example

The following example shows how all VLANs are denied in the access-list called *mlist*.

```
console(config)# management access-list mlist
console(config-macal)# deny
```

management access-class

Use the **management access-class** command in Global Configuration mode to restrict switch management connections. To disable any restrictions, use the **no** form of this command.

Syntax

management access-class {**console-only** | *name*}

no management access-class

- *name* — A valid access-list name. (Range: 1–32 characters)
- **console-only** — The switch can be managed only from the console.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The active management access-list processes IPv4 TCP/UDP packets only. Packets for certain management protocols are allowed to pass to the CPU without processing by the management ACL list. Specifically, TCP or UDP packets addressed to the following destination port numbers are not processed by the management ACL list: DNS(53), DHCP Server(67), DHCP Client (68), TFTP(69), telnet(23), HTTP(80), HTTPS(443), SNMP(161), SSH(22), and JAVA(4242). A rate-limiting egress CPU ACL would be ideal to mitigate smurf style attacks on these ports.

Only a single management access list can be active at a time. However, it can have up to 64 permit/deny conditions.

Example

The following example configures an access-list called *mlist* as the management access-list.

```
console(config)# management access-class mlist
```

management access-list

Use the **management access-list** command in Global Configuration mode to define an access list for management, and enter the access-list configuration mode for editing the access list conditions. Once in access-list configuration mode, access conditions are configured with the **deny** and **permit** commands. To remove an access list, use the **no** form of this command.

Syntax

management access-list *name*

no management access-list *name*

- *name* — The access list name. (Range: 1–32 printable characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

A management access list is only supported on the switched VLAN interfaces. It is not supported on the out-of-band interface.

This command enters the access-list configuration mode, where access conditions may be defined with **deny** and **permit** commands.

If no match criteria are defined the default is to **deny** the packet (i.e., the packet is dropped).

If editing an access-list context, new rules are appended to the end of the access-list.

Use the **management access-class** command to select the active access-list.

The active management list cannot be updated or removed.

Management access list names can consist of any printable character, including blanks. Enclose the name in quotes to embed blanks in the name. Question marks are disallowed.

Examples

The following example shows how to permit access to switch management via VLAN interface 9. Be sure to restrict access to this VLAN to the fewest ports possible remembering that, by default, trunk mode ports are members of all VLANs.

```
console(config)#vlan 9
console(config-vlan9)#exit
console(config)#management access-list mlist
console(config-macal)#permit vlan 9 priority 1
console(config-macal)#exit
console(config)#management access-class mlist
```

The following example shows how to configure all VLAN interfaces to support switch management access except for two VLAN interfaces.

```
console(config)#vlan 9,10
console(config-vlan9-10)#exit
console(config)#management access-list mlist
console(config-macal)#deny vlan 9 priority 1
console(config-macal)#deny vlan 10 priority 2
console(config-macal)#permit priority 3
console(config-macal)#exit
console(config) #management access-class mlist
```

no priority (management)

Use the no priority command to remove a permit or deny condition from a Management Access list.

Syntax

no priority priority

priority-value—The priority of the permit or deny rule to be removed. The range is 1 to 64.

Default Configuration

This command has no default configuration.

Command Mode

Management Access-list Configuration mode

User Guidelines

A rule with the specified priority-value must exist in order to be removed.

Command History

Command introduced in version 6.5 firmware.

permit (management)

Use the **permit** command in Management Access-List configuration mode to set conditions for allowing packets to flow to the switch management function.

Syntax

permit ip-source *ip-address* [**mask** *mask* | *prefix-length*] [**vlan** *vlan-id* |fortygigabitethernet unit/slot/port][**service** *service*] [**priority** *priority-value*]

permit {**vlan** *vlan-id* } [**service** *service*] [**priority** *priority-value*]

permit service *service* [**priority** *priority-value*]

permit priority *priority-value*

- **vlan** *vlan-id* — A valid VLAN number.
- *ip-address* — Source IP address.
- **mask** *mask* — Specifies the network mask of the source IP address.
- **mask** *prefix-length* — Specifies the number of bits that comprise the source IP address prefix. The prefix length must be preceded by a forward slash (/). (Range: 0–32)
- **service** *service* — Indicates service type. It can be one of the following: **telnet**, **ssh**, **http**, **https**, **tftp**, **snmp**, **sntp**, or **any**. The **any** keyword indicates that the service match for the ACL is effectively "don't care".
- **priority** *priority-value* — Priority for the rule. (Range: 1 – 64)

Default Configuration

This command has no default configuration.

Command Mode

Management Access-list Configuration mode

User Guidelines

Rules with **gigabitethernet**, **tengigabitethernet**, **fortygigabitethernet**, **vlan**, and **port-channel** parameters are valid only if an IP address is defined on the appropriate interface.

If the priority-value is not specified when inputing a rule, the system assigns the lowest numbered unused priority-value in the range 1–64. If a rule is input with an existing priority-value, the original rule is overwritten.

Examples

The following example shows how to permit access to switch management via VLAN interface 9. Be sure to restrict access to this VLAN to the fewest ports possible remembering that, by default, trunk mode ports are members of all VLANs.

```
console(config)#vlan 9
console(config-vlan9)#exit
console(config)#management access-list mlist
console(config-macal)#permit vlan 9 priority 1
console(config-macal)#exit
console(config)#management access-class mlist
```

The following example shows how to configure all VLAN interfaces to support switch management access except for two VLAN interfaces.

```
console(config)#vlan 9,10
console(config-vlan9-10)#exit
console(config)#management access-list mlist
console(config-macal)#deny vlan 9 priority 1
console(config-macal)#deny vlan 10 priority 2
console(config-macal)#permit priority 3
console(config-macal)#exit
console(config) #management access-class mlist
```

show management access-class

Use the **show management access-class** command to display information about the active management access list.

Syntax

show management access-class

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the management access-list information.

```
console# show management access-class
Management access-class is enabled, using access list mlist
```

show management access-list

Use the **show management access-list** command to display management access-lists.

Syntax

show management access-list [*name*]

- *name* — A valid access list name. (Range: 1–32 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the active management access-list.

```
console# show management access-list
mlist
-----
permit priority 1 vlan 9
permit priority 2 vlan 10
! (Note: all other access implicitly denied)
```

Password Management Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The Password Management component supports configuration of strength checks intended to ensure that network operators utilize passwords that are difficult to crack. In addition, the administrator can age passwords, ensure that operators do not reuse passwords, and lock out operator accounts when multiple attempts to enter incorrect passwords are detected. Passwords are masked from view when entered by the user and in the running config.

Configurable Minimum Password Length

The administrator has the option of requiring user passwords to be a minimum length. The administrator can choose to have the switch enforce a minimum length between 8 and 64 characters. The default minimum length is 8 although there is no default password (zero length string).

Password History

Keeping a history of previous passwords ensures that users cannot reuse passwords often. The administrator can configure the switch to store up to 10 of the last passwords for each user. The default operation is that no history is stored.

Password Aging

The switch can implement an aging process on passwords and require users to change them when they expire. The administrator can configure the switch to force a password change between 1 and 365 days. By default, password aging is disabled. When a password expires, the user must enter a new password before continuing.

User Lockout

The administrator may choose to strengthen the security of the switch by enabling the user lockout feature. A lockout count between 1 and 5 attempts can be configured. When a lockout count is configured, then a user that is logging in must enter the correct password within that count. Otherwise, that user is locked out form further remote switch access. Only an administrator with read/write access can reactivate that user. The user lockout feature is disabled by default. The user lockout feature applies to all users on all ports. The administrator can access the serial port even if he/she is locked out and reset the password or clear the config to regain control of the switch. This ensures that if a hacker tries to log in as **admin** and causes the account to be locked out, then the administrator with physical access to the switch can still log in and reactivate the admin account.

Password Strength

Password Strength is a measure of the effectiveness of a password in resisting guessing and brute-force attacks. The strength of a password is a function of length, complexity and randomness. Using strong passwords lowers overall risk of a security breach. The scope of this feature is to enforce a baseline Password Strength for all locally administered users.

The feature doesn't affect users with an existing password until their password ages out. Password Strength is only enforced when a user is configuring a new password or changing their existing password. Strength checking is disabled by default. The network operator has to take care that the Password Strength checking is disabled before downloading scripts containing username configuration to avoid password configuration failure for such users.

Password Strength Definition:

The feature ensures that any password configured on the switch administrators purpose is a strong password and conforms to the following characteristics when configured:

- Minimum number of uppercase letters.
- Minimum number of lowercase letters.
- Minimum number of numeric characters.
- Minimum number of special characters from the set: ` ! " ? $? % ^ & * ( ) _ - + = { [}] : ; @ ' ~ # | \ < , > . ? / .
- Does not contain the associated login name.
- Maximum number of consecutive characters (such as abcd).

- Maximum number of consecutive numbers (such as 1234).
- Maximum number of repetition of characters or numbers (such as 1111 or aaaa).
- Minimum password length.

Configuring a minimum or maximum limit of 0 (as applicable) means the restriction is disabled.

If enabled, the password strength feature applies to all login passwords (user, line, and enable).

NOTE: To change a password, use the **passwords** command, which is described in AAA Commands.

passwords aging

Use the **passwords aging** command in Global Configuration mode to implement aging on passwords for local users. When a user's password expires, the user is prompted to change it before logging in again. Use the **no** form of this command to set the password aging to the default value.

Syntax

passwords aging *1-365*

no passwords aging

Default Configuration

The default value is 0.

Command Mode

Global Configuration mode

User Guidelines

A value of 0 days disables password aging. Password aging uses the time-of-day clock, therefore having an accurate clock source is required. The use on SNTP is strongly recommended.

Example

The following example sets the password age limit to 100 days.

```
console(config)#passwords aging 100
```

passwords history

As administrator, use the **passwords history** command in Global Configuration mode to set the number of previous passwords that are stored for each user account. When a local user changes his or her password, the user is not able to reuse any password stored in password history. This setting ensures that users do not reuse their passwords often. The default is 0. Use the **no** form of this command to set the password history to the default value of 0.

Syntax

passwords history *0-10*

no passwords history

Default Configuration

The default value is 0.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the number of previous passwords remembered by the system at 10.

```
console(config)#passwords history 10
```

passwords lock-out

Use the **passwords lock-out** command in Global Configuration mode to strengthen the security of the switch by locking user accounts that have failed login due to wrong passwords. When a lockout count is configured, a user who is logging in must enter the correct password within that count. Otherwise that user is locked out from further switch access. Only a user with read/write access can reactivate a locked user account. Password lockout does not apply to logins from the serial console. Use the **no** form of this command to set the password lockout count to the default value.

Syntax

passwords lock-out *1-5*

no passwords lock-out

Default Configuration

The default value is 0 or no lockout count is enforced.

Command Mode

Global Configuration mode.

User Guidelines

Password lockout only applies to users with authentication configured to local. RADIUS or TACACS authenticated users will use policies configured on the respective RADIUS/TACACS servers.

Example

The following example sets the number of user attempts before lockout at 2.

```
console(config)#passwords lock-out 2
```

passwords min-length

Use the **passwords min-length** command in Global Configuration mode to enforce a minimum length password length for local users. The value also applies to the **enable** password. The valid range is 8–64. The default is 8. Use the **no** version of this command to set the minimum password length to 8.

Syntax

passwords min-length *length*

no passwords min-length

- *length* — The minimum length of the password (Range: 8–64 characters)

Default Configuration

By default, the minimum password length is 8 characters.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures user **bob** with password **xxxyymmmm** and user level 15.

```
(config)# username bob password xxxyyymmm privilege 15
```

passwords strength-check

Use the **passwords strength-check** command in Global Configuration mode to enable the Password Strength feature. The command is used to enable the checking of password strength during user configuration. Use the **no** form of the command to disable the Password Strength feature.

Syntax

passwords strength-check

no passwords strength-check

Default Configuration

The password strength feature is disabled by default.

Command Mode

Global Configuration

User Guidelines

This command enables/disables enforcement of password strength checking policy as configured by the following commands:

```
passwords strength minimum uppercase-letters
```

```
passwords strength minimum lowercase-letters
passwords strength minimum special-characters
passwords strength minimum numeric-characters
passwords strength max-limit consecutive-characters
passwords strength max-limit repeated-characters
passwords strength minimum character-classes
```

Minimum strength validation validates a password containing a character in the corresponding character class. If a character class is configured with a strength check minimum of 0 (the default), a user may enter a valid password containing only characters from that class and pass the strength check. Therefore, it is recommended that the administrator configure all four minimum strength check character classes if password strength checking is desired. Use the minimum character class check to require the user to enter a password that passes the minimum strength check for more than one minimum strength check character class.

Minimum character class checking validates passwords that contain a character matching a configured character class. If minimum character class checking is enabled, a password must pass at least the minimum number of configured minimum strength class checks to be valid. Non-configured minimum character classes are not counted towards the minimum matching character classes.

If minimum character class checking is disabled and if a password contains a character matching a configured character class, it must meet the specific minimum strength check limit for the matching character class. If the password only contains characters that are in non-configured (0 limit) minimum strength check character class, the password is considered valid.

If the maximum consecutive characters or maximum repeated characters limits, or other validation checks are configured, passwords must pass these tests regardless of the minimum character class checking setting.

passwords strength minimum uppercase-letters

Use this command to enforce a minimum number of uppercase letters that a password must contain. The valid range is 0–16. The default is 1. A minimum of 0 means no restriction on that set of characters. Use the **no** form of the command to reset the minimum uppercase letters to the default value.

Syntax

passwords strength minimum uppercase-letters *0–16*

no passwords strength minimum uppercase-letters

Default Configuration

The default value is 1.

Command Mode

Global Configuration

User Guidelines

This limit is not enforced unless the **passwords strength minimum uppercase-letters** command is configured with a value greater than 0. In other words, with a configuration of 0, a password consisting entirely of upper case letters will pass the minimum strength check criteria.

Example

```
console(config)#passwords strength minimum uppercase-letters 6
```

passwords strength minimum lowercase-letters

Use this command to enforce a minimum number of lowercase letters that a password must contain. The valid range is 0–16. The default is 1. A setting of 0 means no restriction. Use the **no** form of this command to reset the minimum lowercase letters to the default value.

Syntax

passwords strength minimum lowercase-letters *0–16*

no passwords strength minimum lowercase-letters

Default Configuration

The default value is 1.

Command Mode

Global Configuration

User Guidelines

This limit is not enforced unless the **passwords strength minimum lowercase-letters** command is configured with a value greater than 0. In other words, a password consisting entirely of lower case letters will pass the minimum strength check criteria.

Example

```
console(config)#passwords strength minimum lowercase-letters 6
```

passwords strength minimum numeric-characters

Use this command to enforce a minimum number of numeric numbers that a password should contain. The valid range is 0–16. The default is 1. A minimum of 0 means no restriction on that set of characters. Use the **no** form of this command to reset the minimum numeric characters to the default value.

Syntax

passwords strength minimum numeric–characters *0–16*

no passwords strength minimum numeric–characters

Default Configuration

The default value is 1.

Command Mode

Global Configuration

User Guidelines

This limit is not enforced unless the **passwords strength minimum numeric-characters** command is configured with a value greater than 0. In other words, a configuration of 0 allows a password consisting entirely of numeric characters to pass strength check validation.

Example

```
console(config)#passwords strength minimum numeric-characters 6
```

passwords strength minimum special-characters

Use this command to enforce a minimum number of special characters that a password may contain. The valid range is 0–16. The default is 1. A setting of 0 means no restriction. Special characters are one of the following characters (` ! $ % ^ & * ( ) _ - + = { [}] : ; @ ' ~ # | \ < , > . /) Use the **no** form of this command to reset the minimum special characters to the default value.

Syntax

passwords strength minimum special–characters *0–16*

no passwords strength minimum special–characters

Default Configuration

The default value is 1.

Command Mode

Global Configuration

User Guidelines

This limit is not enforced unless the **passwords strength minimum special-characters** command is configured with a value greater than 0. In other words, a configuration of 0 allows a password consisting entirely of special characters to pass strength check validation.

Example

```
console(config)#passwords strength minimum special-characters 6
```

passwords strength max-limit consecutive-characters

Use this command to enforce a maximum number of consecutive characters that a password can contain. If a user enters a password that has more consecutive characters than the configured limit, the system rejects the password. The valid range of consecutive characters is 0–15. The default is 0. A maximum of 0 means there is no restriction on consecutive characters.

Examples of consecutive characters are ABCDEF or 123456 or !"#$%&'(). Use the **no** form of this command to reset the maximum consecutive characters accepted to the default value.

Syntax

passwords strength max-limit consecutive–characters *0–15*

no passwords strength max-limit consecutive-characters

Default Configuration

The default value is 0.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#passwords strength max-limit consecutive-characters 3
```

passwords strength max-limit repeated-characters

Use this command to enforce a maximum repeated characters that a password should contain. If password has repetition of characters more than the configured max-limit, it fails to configure. The valid range is 0-15. The default is 0. A maximum of 0 means again disabling the restriction. Use the **no** form of this command to reset the maximum repeated characters to the default value.

Syntax

passwords strength max-limit repeated-characters ***0-15***

no passwords strength max-limit repeated-characters

Default Configuration

The default value is 0.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)# passwords strength max-limit repeated-characters 3
```

passwords strength minimum character-classes

Use this command to enforce a minimum number of character classes that a password must contain. Character classes are uppercase letters, lowercase letters, numeric characters and special characters. The valid range is 0-4. The default is 0. If a value of 0 is configured then no character class checking is performed, i.e. the password need not contain characters from more than one character class. Configured minimum strength and maximum strength checking is still performed for each individual character class, if configured. Use the **no** form of this command to reset the minimum character-classes to the default value.

Syntax

passwords strength minimum character-classes *0-4*

no passwords strength minimum character–classes

Default Configuration

The default value is 0. This character class limit is not enforced unless the passwords strength minimum character-classes command is configured with a value greater than 0.

Command Mode

Global Configuration

User Guidelines

This command is used to enable password character class checking using the parameters set by the following commands:

- passwords strength minimum uppercase-letters
- passwords strength minimum lowercase-letters
- passwords strength minimum special-characters
- passwords strength minimum numeric-characters

A value greater than 0 specifies the minimum number of character class tests a password must contain. A value of 0 disables checking that the password contains characters from the requisite number of character classes. Minimum character class checking validates passwords that contain at lease one character matching a character class. If minimum character class checking is enabled, a password must contain at least one character from a minimum number of character classes to be valid.

Even if the minimum character class checking is disabled, passwords containing characters from a class must still meet the specific minimum strength limit for the matching class. If the password only contains characters from non-configured character classes, the password is considered valid.

If the maximum consecutive characters or maximum repeated characters limits are configured, passwords must pass these tests regardless of the minimum character class checking setting.

Example

```
console(config)#passwords strength minimum character-classes 4
```

passwords strength exclude-keyword

Use this command to exclude the keyword while configuring the password. The password does not accept the keyword in any form (inbetween the string, case insensitive and reverse) as a substring. You can configure up to a maximum of three keywords. Use the **no** form of this command to reset the restriction for a given string or all the strings configured.

Syntax

passwords strength exclude–keyword *string*

no passwords strength exclude–keyword [*string*]

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config)#passwords strength exclude-keyword dell
```

enable password encrypted

This command is used by an Administrator to transfer the enable password between devices without having to know the password.

Syntax

enable password password encrypted

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The password parameter must be exactly 128 hexadecimal characters.

show passwords configuration

Use the **show passwords configuration** command to display the configured password management settings.

Syntax

show passwords configuration

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed by this command.

Parameter	Description
Minimum Password Length	Minimum number of characters required when changing passwords.
Password History	Number of passwords to store for reuse prevention.
Password Aging	Length in days that a password is valid.
Lockout Attempts	Number of failed password login attempts before lockout.
Minimum Password Uppercase Letters	Minimum number of uppercase characters required when configuring passwords.
Minimum Password Lowercase Letters	Minimum number of uppercase characters required when configuring passwords.
Minimum Password Numeric Characters	Minimum number of numeric characters required when configuring passwords.
Minimum Password Special Characters	Minimum number of special characters required when configuring passwords.

Parameter	Description
Maximum Password Consecutive Characters	Maximum number of consecutive characters required that the password should contain when configuring passwords.
Maximum Password Repeated Characters	Maximum number of repetition of characters that the password should contain when configuring passwords.
Minimum Password Character Classes	Minimum number of character classes (uppercase, lowercase, numeric and special) required when configuring passwords.
Password Exclude-Keywords	Minimum number of character classes (uppercase, lowercase, numeric and special) required when configuring passwords.

Example

The following example displays the command output.

```
console#show passwords configuration
Passwords Configuration
-----------------------
Minimum Password Length........................ 8
Password History............................... 0
Password Aging (days).......................... 0
Lockout Attempts............................... 0
Password Strength Check........................ Enable
Minimum Password Uppercase Letters............. 4
Minimum Password Lowercase Letters............. 4
Minimum Password Numeric Characters............ 3
Minimum Password Special Characters............ 3
Maximum Password Consecutive Characters........ 3
Maximum Password Repeated Characters........... 3
Minimum Password Character Classes............. 4
Password Exclude Keywords...................... dell, dell1, dell2
```

show passwords result

Use the **show passwords result** command to display the last password set result information.

Syntax

show passwords result

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the command output.

```
console#show passwords result
Last User whose password is set....................... dell
Password strength check........................... Enable
Last Password Set Result:
Reason for failure: Could not set user password! Password should contain at
least 4 uppercase letters.
```

SSH Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Management access to the switch is supported via telnet, SSH, or the serial console. The Dell EMC Networking supports secure shell (SSH) and secure sockets layer (SSL) to help ensure the security of network transactions.

Keys and certificates can be generated externally (that is, offline) and downloaded to the target or generated directly by the Dell EMC Networking switch.

crypto key generate dsa

Use the **crypto key generate dsa** command in Global Configuration mode to generate DSA key pairs for the SSH server. A key pair is one public DSA key and one private DSA key. Use the **crypto key zeroize** command to remove the generated private key from the local file system. The public and private keys will be overwritten if the command is subsequently executed.

Syntax

crypto key generate dsa

Default Configuration

DSA key pairs do not exist. By default, 1024-bit DSA keys are generated.

Command Mode

Global Configuration mode

User Guidelines

DSA keys are generated in pairs: one public DSA key and one private DSA key. These keys are used the encrypt communication with the switch when using SSH or HTTPS. If your switch already has DSA keys when you issue this command, you are warned and prompted to replace the existing keys. Existing certificates generated from the previous keys will be invalidated.The keys are not saved in the switch configuration; they are saved in the file system and the private key is never displayed to the user. DSA keys, along with other switch credentials, are distributed to all units in a stack on a configuration save.

Use the **crypto key zeroize dsa** command to remove the DSA key pair from the system.

Private keys should never be shared with unauthorized users. This command generates the following private/public key pair in the ssh_host_dsa_key and ssh_host_dsa_key.pub files. Both the RSA and DSA keys must be generated to enable the SSH server.

Example

The following example generates DSA key pairs.

```
console(config)#crypto key generate dsa
```

crypto key generate ecdsa

Use this command to generate an ECDSA key pair for SSH.

Syntax

crypto key generate ecdsa *key-len*

- *ken-len* — Key length for ECDSA key in bits. Valid lengths are 256, 384, and 521.

Default Configuration

By default, no ECDSA key are present on the switch. Use the crypto key zeroize command to remove the generated private key from the local file system. See the crypto key zeroize {rsa|dsa|ecdsa} command.

Command Mode

Global Configuration mode

User Guidelines

This command overwrites any existing ECDSA keys.

Example

```
console(config)#crypto key generate ecdsa
```

Command History

Command introduced in version 6.7.0 firmware.

crypto key generate rsa

Use the **crypto key generate rsa** command in Global Configuration mode to generate RSA key pairs for use by the SSH or HTTPS server. Use the **crypto key zeroize** form of the command to delete the private key from the local file system.

Syntax

crypto key generate rsa

Default Configuration

RSA key pairs do not exist. By default, 2048-bit RSA keys are generated.

Command Mode

Global Configuration mode

User Guidelines

RSA keys are generated in pairs: one public RSA key and one private RSA key. These keys are used to encrypt communication with the switch when using SSH. If your switch already has RSA keys when you issue this command, you are warned and prompted to replace the existing keys. The keys are not saved in the switch configuration; they are saved in the file system and the private key is never displayed to the user. RSA keys, along with other switch credentials, are distributed to all units in a stack on a configuration save.

Use the **crypto key zeroize rsa** command to remove RSA key pair from the system.

Private keys should never be shared with unauthorized users. This command generates the private public key pairs in the following files:

ssh_host_rsa_key and ssh_host_rsa_key.pub, ssh_host_key and ssh_host_key.pub files. Both the RSA and DSA keys must be generated to enable the SSH server.

Example

The following example generates RSA key pairs.

```
console(config)#crypto key generate rsa
```

crypto key pubkey-chain ssh

Use the **crypto key pubkey-chain ssh** command in Global Configuration mode to enter public key configuration mode in order to manually specify public keys for SSH clients or an individual user.

Syntax

crypto key pubkey-chain ssh user-key *username* {**rsa**|**dsa**|**ecdsa**}

- rsa — RSA key.
- dsa — DSA key.
- ecdsa — Elliptic curve digital signature algorithm.

Default Configuration

By default, this command has no public keys configured.

Command Mode

Global Configuration mode

User Guidelines

This public key is used to authenticate an administrator to the switch when using SSH. This avoids the need for the administrator to enter a password on every login.

The Key String is the contents of the public key in uu-encoded format.

Example

The following example configures a public key for administrator bob, enables the SSH server, and enables public key authentication over SSH.

```
console#configure
console(config)#crypto key generate rsa
console(config)#crypto key generate dsa
console(config)#crypto key pubkey-chain ssh user-key bob rsa
```

```
Key-string row AAAAB3NzaC1yc2EAAAABIwAAAQEAu7WHtjQDUygjSQXHVgyqdUby
Key-string row dxUXEAiDHXcWHVr0R/ak1HDQitBzeEv1vVEToEn5ddLmRhtIgRdKUJHgBHJV
Key-string row R2VaSN/WC0IK53j9re4B11AE+O3qAxwJs0KD7cTkvF9I+YdiXeOM8VE4skkw
Key-string row AiyLDNVWXgNQ6iat8+8Mjth+PIo5t3HykYUCkD8B1v93nzi/sr4hHHJCdx7w
Key-string row wRW3QtgXaGwYt2rdlr3x8ViAF6B7AKYd8xGVVjyJTD6TjrCRRwQHgB/BHsFr
Key-string row z/Rl1SYa0vFjel/7/0qaIDSHfHqWhajYkMa4xPOtIye7oqzAOm1b76l28uTB
Key-string row luBEoLQ+PKOKMiK8sQ==
console(config-pubkey-key)#exit
console(config)#ip ssh server
console(config)#ip ssh pubkey-auth
```

Command History

ECDSA parameter introduced in version 6.7.0 firmware.

crypto key zeroize pubkey-chain

Use the **crypto key zeroize pubkey-chain** command in Global Configuration mode to erase all SSH server public key chains or the public key chain for a user.

Syntax

crypto key zeroize pubkey-chain ssh [**user-key** *username*]

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode.

User Guidelines

The SSH server requires the public and private keys RSA/DSA keys to operate.

Example

```
console(config)#crypto key zeroize pubkey-chain ssh user-key bob
```

crypto key zeroize {rsa|dsa|ecdsa}

Use the **crypto key zeroize** {**rsa**|**dsa**|**ecdsa**} command in Global Configuration mode to delete the RSA, DSA, or ECDSA public and private keys from the switch.

Syntax

crypto key zeroize {**rsa**|**dsa**|**ecdsa**}

- rsa — RSA key.
- dsa — DSA key.
- ecdsa — Elliptic curve digital signature algorithm.

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode.

User Guidelines

The **crypto key zeroize rsa** command removes the following files:

ssh_host_key

ssh_host_rsa_key

ssh_host_key.pub

ssh_host_rsa_key.pub

The **crypto key zeroize dsa** command removes the following files:

ssh_host_dsa_key

ssh_host_dsa_key.pub

Removing the keys does not terminate existing SSH sessions.

Example

```
console(config)#crypto key zeroize rsa
```

Command History

ECDSA parameter introduced in version 6.7.0 firmware.

ip scp server enable

Use the **ip scp server enable** command to enable SCP server functionality for SCP push operations on the switch, which allows files to be transferred from the host device to the switch using the SCP protocol. To allow the SCP file transfers from the host system to the switch, the SCP server must be enabled on the switch.

Use the **no** form of the command to disable SCP server functionality.

Syntax

ip scp server enable

no ip scp server enable

Default Configuration

By default, the SCP server is not enabled.

Command Mode

Global Configuration mode

User Guidelines

The SCP server is capable of accepting *pushed* files from an external host over an in-band or out-of-band interface.

The SCP server shares the key and certificate configuration with the SSH server. To enable the SCP server, follow the same steps as for enabling the SSH server.

The maximum number of simultaneous SSH/SCP sessions is 5.

During SCP file transfer operations, switch management operations are blocked.

Command History

Command introduced in version 6.6 firmware.

Example

These are examples of commands that may be used on a Linux host to send files to the switch.

```
scp switch-config.txt user@10.27.6.122:startup-config
scp icos-3.2.2.45.stk user@10.27.6.122:active
scp icos-3.2.2.49.stk user@10.27.6.122:backup
```

ip ssh port

Use the **ip ssh port** command in Global Configuration mode to specify the TCP port to be used by the SSH server. To use the default port, use the **no** form of this command.

Syntax

ip ssh port *port-number*

no ip ssh port

- *port-number* — Port number for use by the SSH server.
  (Range: 1025–65535)

Default Configuration

The default value is 22.

Command Mode

Global Configuration mode

User Guidelines

The SSH TCP port should not be set to a value that might conflict with other well-known protocol port numbers used on this switch. The following non-exhaustive list of ports are reserved to the system and may not be able to be configured for another purpose: 23 (telnet), 80 (HTTP), 161,162 (SNMP), 514, (SYSLOG), 546,547 (DHCPv6), 2222 (SSH).

Example

The following example specifies the port to be used by the SSH server as 8080.

```
console(config)#ip ssh port 8080
```

ip ssh pubkey-auth

Use the **ip ssh pubkey-auth** command in Global Configuration mode to enable public key authentication for incoming SSH sessions. To disable this function, use the **no** form of this command.

Syntax

ip ssh pubkey-auth

no ip ssh pubkey-auth

Default Configuration

The function is disabled.

Command Mode

Global Configuration mode

User Guidelines

Public key authentication allows administrators with an SSH client access to the switch without requiring a password. Use the **crypto key pubkey-chain ssh user-key** command to configure the administrators public key for use by the SSH server. AAA authentication is independent from this configuration.

Example

The following example enables public key authentication for incoming SSH sessions.

```
console(config)#ip ssh pubkey-auth
```

ip ssh server

Use the **ip ssh server** command in Global Configuration mode to enable the switch to be configured using SSH. To disable this function, use the **no** form of this command.

Syntax

ip ssh server

no ip ssh server

Default Configuration

The SSH server is **disabled** by default.

Command Mode

Global Configuration mode

User Guidelines

To generate SSH server keys, use the commands **crypto key generate rsa** and **crypto key generate dsa** commands. These keys are required to allow the SSH server to operate.

Dell EMC Networking N-Series switches support the SSH service over IPv4 or IPv6. SSH is configured to require a password on accounts that attempt to log into the switch.

Example

The following example enables the switch to be configured using SSH.

```
console(config)#crypto key generate rsa
Do you want to overwrite the existing RSA keys? (y/n):y
RSA key generation started, this may take a few minutes...
RSA key generation complete.
console(config)#crypto key generate dsa
Do you want to overwrite the existing DSA keys? (y/n):y
DSA key generation started, this may take a few minutes...
DSA key generation complete.
console(config)#ip ssh server
```

key-string

Use the **key-string** SSH Public Key Configuration mode to specify an SSH public key manually.

Syntax

key-string *key-string*

key-string row *key-string*

- **row** — To specify the SSH public key row by row.

- *key-string* — The UU-encoded DER format is the same format as the authorized keys file used by OpenSSH.

Default Configuration

By default, the key-string is empty.

Command Mode

SSH Public Key Configuration mode

User Guidelines

The key string is the public key of the specified type (RSA or DSA) generated by the administrator. The administrator will need access to both the public and private key on the host to log in without authenticating via password.

DSA is considered less secure than RSA. Use of RSA is recommended.

Use the **key-string row** command to enter the key-string one row at a time. The row may be enclosed in quotes. This command may be used to enter the key one line at a time should the key-string be greater than 234 characters in length.

Use the **key-string** command without the row parameter to enter the entire key at once if the key-string does not exceed 234 characters.

The switch accepts keys up to 2048 bits in length.

Command History

Modified in version 6.5 firmware.

Examples

The following example shows how to enter a single public key string for a user called “bob.”

```
console(config)#crypto key pubkey-chain ssh user-key bob rsa
Key-string row AAAAB3NzaC1yc2EAAAABIwAAAQEAu7WHtjQDUygjSQXHVgyqdUby
Key-string row dxUXEAiDHXcWHVr0R/ak1HDQitBzeEv1vVEToEn5ddLmRhtIgRdKUJHgBHJV
Key-string row R2VaSN/WC0IK53j9re4B11AE+O3qAxwJs0KD7cTkvF9I+YdiXeOM8VE4skkw
Key-string row AiyLDNVWXgNQ6iat8+8Mjth+PIo5t3HykYUCkD8B1v93nzi/sr4hHHJCdx7w
Key-string row wRW3QtgXaGwYt2rdlr3x8ViAF6B7AKYd8xGVVjyJTD6TjrCRRwQHgB/BHsFr
Key-string row z/Rl1SYa0vFjel/7/0qaIDSHfHqWhajYkMa4xPOtIye7oqzAOm1b76l28uTB
Key-string row luBEoLQ+PKOKMiK8sQ==
```

ssh

Use the ssh command to establish an outboard connection to a remote SSH server from the switch console.

Syntax

ssh [**-l** *login-name*] [**-p** *port*] {*ip-address* | *hostname* }

- ip-address — An IP address in numeric format. Both IPv4 and IPv6 addresses are supported.
- hostname — A hostname that can be resolved by the configured DNS.
- login-name — The user identity configured on the target host.
- port — The TCP port number configured on the target host for receiving SSH connections.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The SSH capability only supports user name and password authentication to the target device.

Example

```
console#ssh -l my-login  mysshserver.dell.net
```

Command History

Command introduced in firmware release 6.6.1. Updated example in firmware release 6.6.2.

ssh session-limit

Use the **ssh session-limit** command to limit the number of outbound SSH sessions.

Syntax

ssh session-limit <*limit*>

- limit — The number of outbound SSH sessions supported. The range is 0 to 5.

Default Configuration

The default limit is 5 sessions.

Command Mode

Global Configuration mode

User Guidelines

Setting the limit to 0 disables establishment of new outbound SSH connections. Existing connections are not affected.

Example

This command disables new outbound SSH sessions.

```
console(config)#ssh session-limit 0
```

Command History

Command introduced in firmware release 6.6.2.

ssh time-out

Use the **ssh time-out** command to configure the delay upon which idle SSH sessions are terminated.

Syntax

ssh time-out <*idle-period*>

- idle-period— The idle period after which a session is terminated. The range is 0 to 160 minutes.

Default Configuration

The default period is 5 minutes.

Command Mode

Global Configuration mode

User Guidelines

This command terminates a session that is idle for the configured number of minutes. Idle means no keystrokes have been sent. Configuring the idle-period to 0 disables idle session termination and is not recommended.

Example

This command configures the idle period to two minutes.

```
console(config)#ssh time-out 2
```

Command History

Command introduced in firmware release 6.6.2.

show crypto key mypubkey

Use the **show crypto key mypubkey** command to display the SSH public keys of the switch.

Syntax

show crypto key mypubkey [**rsa** | **dsa**|**ecdsa**]

- **rsa** — RSA key.
- **dsa** — DSA key.
- **ecdsa** — Elliptic curve digital signature algorithm.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the SSH public keys on the switch.

```
console#show crypto key mypubkey rsa
 rsa key data:
ssh-rsa AAAAB3NzaC1yc2EAAAABIwAAAQEAu7WHtjQDUygjSQXHVgyqdUby
dxUXEAiDHXcWHVr0R/ak1HDQitBzeEv1vVEToEn5ddLmRhtIgRdKUJHgBHJV
R2VaSN/WC0IK53j9re4B11AE+O3qAxwJs0KD7cTkvF9I+YdiXeOM8VE4skkw
AiyLDNVWXgNQ6iat8+8Mjth+PIo5t3HykYUCkD8B1v93nzi/sr4hHHJCdx7w
wRW3QtgXaGwYt2rdlr3x8ViAF6B7AKYd8xGVVjyJTD6TjrCRRwQHgB/BHsFr
z/Rl1SYa0vFjel/7/0qaIDSHfHqWhajYkMa4xPOtIye7oqzAOm1b76l28uTB
luBEoLQ+PKOKMiK8sQ==
Fingerprint(hex): 58:7f:5c:af:ba:d3:60:88:42:00:b0:2f:f1:5a:a8:fc
Fingerprint(bubbleBabble): xodob-liboh-heret-tiver-dyrib-godac-pynah-muzyt-
mofim-bihog-cuxyx
```

Command History

ECDSA parameter introduced in version 6.7.0 firmware.

show crypto key pubkey-chain ssh

Use the **show crypto key pubkey-chain ssh** command to display SSH public keys stored on the switch.

Syntax

show crypto key pubkey-chain ssh [**username** *username*] [**fingerprint bubble-babble** | **hex**]

- *username* — Specifies the remote SSH client username. (Range: 1–48 characters)
- **bubble-babble** — Fingerprints in Bubble Babble format.
- **hex** — Fingerprint in Hex format. If fingerprint is unspecified, it defaults to Hex format.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays all SSH public keys stored on the switch.

```
console#show crypto key pubkey-chain ssh
Username  Fingerprint
--------  -------------------------------------------------
bob       9A:CC:01:C5:78:39:27:86:79:CC:23:C5:98:59:F1:86
john      98:F7:6E:28:F2:79:87:C8:18:F8:88:CC:F8:89:87:C8
The following example displays the SSH public called “dana.”
console#show crypto key pubkey-chain ssh username dana
Username: dana
 rsa key data:
ssh-rsa AAAAB3NzaC1yc2EAAAABIwAAAIEAywqRKTRnexccxVUVTeMl+Gkh
imyUDhcTkgEfssLPMsgoXlTwzCE5+97UIIsSRKQQWR+pBNl45tCYd75LUofV
4LP6Lj1Q5Q0w5lBgiqC2MZ/iBHGSsHMAE0lpYtelZprDu4uiZHMuWezmdQp9
a1PU4jwQ22TlcfaUq3sqC3FMUoU=
 Fingerprint: 2f:09:e7:6f:c9:bf:ab:04:d4:6f:a0:eb:e8:df:7a:11
```

show ip ssh

Use the **show ip ssh** command to display the SSH server configuration.

Syntax

show ip ssh

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The displayed information includes the following:

Field	Description
Administrative Mode	This field indicates whether the administrative mode of SSH is enabled or disabled.
SSH Port	The SSH port.
Protocol Level	The protocol level may have the values of version 1, version 2, or both version 1 and version 2.
SSH Sessions Currently Active	The number of SSH sessions currently active.
Max SSH Sessions Allowed	The maximum number of SSH sessions allowed.
SSH Timeout	The SSH timeout value in minutes.
Keys Present	Indicates whether the SSH RSA, DSA, and ECDSA key files are present on the device. The length of the respective keys is displayed in parenthesis.
Key Generation in Progress	Indicates whether RSA or DSA or ECDSA key file generation is currently in progress.
Pubkey Auth Mode	This field indicates whether passwordless login for SSH client is enabled or not.
SCP Server Administrative Mode	Indicates whether the SCP server is enabled on the switch. To allow file transfers from a host system to the switch using SCP push operations, the SCP server must be enabled.

Example

The following example displays the SSH server configuration.

```
console(config)#show ip ssh

SSH Configuration

Administrative Mode: ........................ Disabled
SSH Port: ................................... 22
Protocol Level: ............................. Version 2
SSH Sessions Currently Active: .............. 0
Max SSH Sessions Allowed: ................... 5
```

```
SSH Timeout (mins): .......................... 5
Keys Present: ................................ DSA(1024) RSA(1024)
ECDSA(256)
Key Generation In Progress: .................. None
SSH Public Key Authentication Mode: .......... Disabled
SCP server Administrative Mode: ............... Disabled
```

Command History

Output updated in version 6.7.0 firmware.

show ssh

Use the **show ssh** command to display the outbound SSH configuration and session count.

Syntax

show ssh

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration, and all sub-modes

Example

```
console(config)#show ssh
```

Command History

Command introduced in firmware release 6.6.2.

5

Data Center Technology Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The data center technology commands allow network operators to deploy centralized controllers capable of controlling network flows on an individualized basis.

OpenFlow Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The OpenFlow feature configures the switch to be managed by a centralized OpenFlow Controller using the OpenFlow protocol. Openflow is not supported in a stacking environment. The OpenFlow agent has been validated with the Helium release of OpenDaylight (ODL).

controller

Use the **controller** command to configure a connection to an OpenFlow controller. Use the **no** form of the command to remove an OpenFlow controller connection.

Syntax

controller ipv4 *ipv4-address* [**port** *port-number*] **security** { **none** | **ssl** }

no controller ipv4 { *ipv4-address* [**port** *port-number*] | **all** }

- *ipv4-address*—The IPv4 address of the controller.
- *port-number*—The TCP port number used for the connection on the controller.
- **security** { none | ssl }—The security used for connection to the controller.
- **all**—Delete all OpenFlow controllers

Default Configuration

No controllers are configured by default.

Command Mode

OpenFlow Configuration

User Guidelines

If connection to the controller over an interface other than the OOB interface is desired, use the OpenFlow mode command prior to issuing this command. Issuing the mode command after a connection has been established drops the connection. The connections are then re-attempted over the new interface as specified by the mode command.

If the OOB interface is used to connect to the OpenFlow controllers, the controllers should be on the same subnet as the OOB interface.

When using the **no** form of the command, if no port number is given, all controller entries for the IP address are deleted.

If SSL is used, an SSL certificate should be downloaded using the copy command prior to configuring the controller.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example enables OpenFlow 1.3 on a switch and configures a connection the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security. A signed CA certificate, switch certificate, and switch private key should be downloaded to the switch using the **copy** command.

```
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
```

hardware profile openflow

Use the **hardware profile openflow** command to select the forwarding mode for the OpenFlow hybrid capability. Use the **no** form of the command to select the default forwarding capability.

Syntax

hardware profile openflow { **full-match** | **layer2-match** }

no hardware profile openflow

- **full-match**—Perform full matching when configured in OpenFlow 1.0 mode.
- **layer2-match**—Perform L2 matching when configured in OpenFlow 1.0 mode.

Default Configuration

By default, layer2 matching is performed.

Command Mode

Global Configuration

User Guidelines

This command configures the switch when operating in OpenFlow 1.0 mode. It has no effect when operating in OpenFlow 1.3 mode.

If the administrator changes the default hardware table for OpenFlow 1.0 and if the switch is currently operating in OpenFlow 1.0 variant then the OpenFlow feature is automatically disabled and re-enabled.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example configures OpenFlow 1.0 full matching, configures a connection to the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security, and enables OpenFlow 1.0 on the switch.

```
console(config)#hardware profile openflow full-match
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
console(config-of-switch)#protocol-version 1.0
console(config-of-switch)#mode auto
console(config-of-switch)#exit
```

ipv4 address

Use the **ipv4 address** command to assign the IPv4 source address utilized for controller connections. Use the **no** form of the command to return the setting to the default.

Syntax

ipv4 address *ipv4-address*

no ipv4 address

- *ipv4-address*— The configured IPv4 address of the switch. A VLAN interface must exist with an identical address.

Default Configuration

By default, the switch selects an address automatically.

Command Mode

OpenFlow Configuration

User Guidelines

This command configures the switch with a static IPv4 address. The switch must be configured in static mode in order to use the configured static address.

Only IPv4 addresses are supported for OpenFlow controllers.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example configures an interface using VLAN 10 with IPv4 address 1.2.3.1, configures a connection to the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security and initiates the connection over the switch front panel interface. The local switch is configured with a static IP address after being configured into static address mode.

```
console(config)#vlan 10
console(config-vlan10)#interface vlan 10
console(config-if-vlan10)#ip address 1.2.3.1 255.255.0.0
console(config-if-vlan10)#interface gi1/0/1
console(config-if-Gi1/0/1)#switchport mode access
console(config-if-Gi1/0/1)#switchport access vlan 10
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
console(config-of-switch)#mode static
console(config-of-switch)#ipv4 address 1.2.3.1
console(config-of-switch)#exit
```

mode

Use the **mode** command to configure the selection of interfaces used to assign the IP address utilized for controller connections. Use the **no** form of the command to return the setting to the default.

Syntax

mode { **auto** | **static** | **oob** }

no mode

- **auto**—Automatically select the switch IP address
- **static**—Use the configured static IP address
- **oob**—Use the OOB interface IP address

Default Configuration

By default, the switch selects an IP address automatically (auto mode).

Command Mode

OpenFlow Configuration

User Guidelines

This command configures the switch to select an IP address from a particular type of interface. The selected IP address is used as the local end-point of the IP connections to the OpenFlow controllers.

The administrator can allow the switch to automatically assign an IP address to the OpenFlow feature or to specifically select which address should be used. The administrator can also direct the OpenFlow feature to always use the out-of-band interface.

When in auto mode, the switch selects an IP address from an interface in this order:

1. The loopback interfaces.
2. The routing interfaces.
3. The out-of-band interface.

Once the IP address is selected, it is used until the interface goes down or the OpenFlow feature is disabled or, in case of automatic address selection, a more preferred interface becomes available.

Only IPv4 addresses are supported for OpenFlow controllers.

Changing the mode causes the connections to controllers to be dropped, and if properly configured, re-established.

If the switch is configured in static mode, OpenFlow will remain operationally disabled until a static IPv4 address is configured, the IPv4 address matches exactly an IPv4 address on a VLAN interface, and the VLAN interface is operationally enabled.

If the OOB interface is manually selected as the OpenFlow IP address then the Open Flow feature becomes enabled immediately, even if there is no IP address assigned to the service port.

If the OOB interface is used to connect to the OpenFlow controllers, the controllers should be on the same subnet as the OOB interface.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example configures an interface using VLAN 10 with IPv4 address 1.2.3.1, configures a connection to the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security and initiates the connection over the switch front panel interface.

```
console(config)#vlan 10
console(config-vlan10)#interface vlan 10
console(config-if-vlan10)#ip address 1.2.3.1 255.255.0.0
console(config-if-vlan10)#interface gi1/0/1
console(config-if-Gi1/0/1)#switchport mode access
console(config-if-Gi1/0/1)#switchport access vlan 10


console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
console(config-of-switch)#mode auto
console(config-of-switch)#exit
```

openflow

Use the **openflow** command to enable OpenFlow on the switch (if disabled) and enter into OpenFlow configuration mode. Use the **exit** command to return to Global Configuration mode.

Syntax

openflow

no openflow

Default Configuration

The OpenFlow capability is disabled by default. No controllers are configured by default. OpenFlow 1.3 mode is selected by default when OpenFlow is enabled. The OpenFlow protocol operates over the OOB interface by default.

Command Mode

Global Configuration

User Guidelines

When the OpenFlow feature is administratively disabled, the switch drops connections with the OpenFlow Controllers. The switch also purges all flows programmed by the controllers and removes the controller configuration.

Dell OpenFlow implements a true hybrid mode implementation of OpenFlow. Resources are allocated on a first-come first serve basis among the legacy switch UI and the OpenFlow controllers. No arbitration of resources is performed and conflicting actions are allowed.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example enables OpenFlow 1.3 on a switch and configures a connection the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security.

```
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
```

passive

Use the **passive** command to set the switch to accept connections initiated by a controller.

Syntax

passive

no passive

Default Configuration

By default, the switch initiates the connection to the controllers.

Command Mode

OpenFlow Configuration

User Guidelines

This command configures the switch to accept a connection request from a controller. When passive mode is enabled, the switch accepts TCP connections to ports 6632 and 6633 respectively using any switch IP address. In this mode, the switch continues to attempt to initiate connections to configured controllers.

The OpenFlow component always initiates the SSL connections and does not accept SSL connections.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example configures a connection to the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security and also configures the controller to accept TCP connections to the switch on port 6633.

```
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
console(config-of-switch)#passive
console(config-of-switch)#mode auto
console(config-of-switch)#exit
```

protocol-version

Use the **protocol-version** command to select the version of the protocol in which to operate. Use the **no** form of the command to return the configuration to the default.

Syntax

protocol-version { 1.0 | 1.3 }

no protocol-version

- 1.0—Operate in OpenFlow 1.0 mode
- 1.3—Operate in OpenFlow 1.3 mode

Default Configuration

By default, the switch operates in OpenFlow 1.3 mode.

Command Mode

OpenFlow Configuration

User Guidelines

If the administrator changes the OpenFlow variant while the OpenFlow feature is enabled, the switch automatically disables and re-enables the OpenFlow feature causing all flows to be deleted and connections to the controllers to be dropped.

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This example enables OpenFlow 1.3 on a switch and configures a connection the controller at IPv4 address 1.2.3.4 TCP port 3435 using SSL security.

```
console(config)#openflow

WARNING! OpenFlow does not operate on stack members. Enable OpenFlow on
stand-alone switches only.

console(config-of-switch)#protocol-version 1.3
console(config-of-switch)#mode auto
console(config-of-switch)#controller ipv4 1.2.3.4 port 3435 security ssl
```

show openflow

Use the **show openflow** command to display OpenFlow configuration and status.

Syntax

show openflow [switch controllers | switch flows | switch groups | switch tables]

- **switch controllers**—Show information about configured controllers
- **switch flows**—Show information regarding flows
- **switch groups**—Show information regarding OpenFlow groups
- **switch tables**—Show information regarding the switch tables

Default Configuration

When invoked with no parameters, the show openflow command shows summary information regarding OpenFlow.

Command Mode

Privileged Exec and Global Configuration

User Guidelines

OpenFlow operates on the management unit in the stack only. Flows may not be configured on stack members. Failover to the stack standby unit is not supported. OpenFlow should only be enabled on stand-alone switches and should not be enabled on stacks of switches. This restriction is not enforced.

The command has the following output.

Parameter	Description
Administrative Mode	The OpenFlow feature administrative mode set by the ‘openflow enable’ command.
Administrative Status	The operational status of the OpenFlow feature. Although the feature may be administratively enabled, it could be operationally disabled due to various reasons.
Disable Reason	If the OpenFlow feature is operationally disabled then this status shows the reason for the feature to be disabled.
IP Address	IPv4 Address assigned to the feature. If the IP address is not assigned then the status is ‘None’.
IP Mode	IP mode assigned by the ‘openflow ip-mode’ command. The IP Mode can be “Auto”, “Static” or “ServicePort IP”
Static IP Address	Static IP address assigned by the ‘openflow static-ip-address’ command.
Network MTU	Maximum network packet size excluding the VLAN Tag.

Parameter	Description
OpenFlow Variant	OpenFlow Protocol Variant. The OpenFlow protocol can be “OpenFlow 1.0” or “OpenFlow 1.3”.
Default Table	The Hardware Table used as the target for flows installed by an OpenFlow 1.0 controller which is not enhanced to handle multiple hardware tables.
Passive Mode	The OpenFlow passive mode set by the ‘passive’ command.

When the **switch tables** parameter is given, the following information is displayed:

Parameter	Description
Flow Table.	OpenFlow Table Identifier (0 – 255).
Flow Table Name.	The name of this table.
Flow Table Description.	A detailed description for this table.
Maximum Size.	Platform-defined maximum size for this flow table.
Number of Entries.	Total number of entries in this table. The count includes delete-pending entries.
Hardware Entries.	Number of entries currently inserted into the hardware.
Software-Only Entries.	Number of entries that are not installed in the hardware for any reason. This includes entries pending for insertion, entries that cannot be inserted due to missing interfaces and entries that cannot be inserted due to table-full condition.
Waiting for Space Entries	Number of entries that are not currently in the hardware because the attempt to insert the entry failed.
Flow Insertion Count.	Total number of flows that were added to this table since the switch powered up.
Flow Deletion Count.	Total number of flows that were deleted from this table since the switch powered up.
Insertion Failure Count.	Total number of hardware insertion attempts that were rejected due to lack of space since the switch powered up.

When the switch groups parameter is given, the following information is displayed:

Parameter	Description
Group Type	Type of Group: Indirect, All, Select, etc.
Group Id	Unique ID for the Group
Reference Count	This count indicates how many Select groups are referring to the current Indirect group. Reference Count is used only for Indirect groups.
Duration	The time since the group was created.
Bucket Count	Number of Buckets in the group.
Reference Group Id	References the Indirect group ID and used for Select group only.

When the switch flows parameter is selected, the following output is shown:

Parameter	Description
Flow Type	Type of the Flow 1.0 Flow or Layer 2 Match etc.
Flow Table	The hardware table where the flow is installed.
Flow Priority	Priority of the flow versus other flows. Higher is better.
Match Criterion	The match criterion specified by the flow with the field and value like ingress port or ether type
Ingress Port	The port on which the flow is active.
Action	The action specified by the flow.
Duration	The time since the flow was created
Idle	The time since the flow was hit.
Installed in hardware	Shows 0 if for some reason the flow could not be added in the hardware.

Command History

Introduced in version 6.3.0.1 firmware.

Example

This output shows an operationally disabled switch:

```
console#show openflow

Administrative Mode........................... Enable
Administrative Status......................... Disabled
Disable Reason................................ No-Suitable-IP-Interface
IP Address.................................... None
IP Mode....................................... Auto
Static IP Address............................. 10.1.1.1
Network MTU................................... 1518
OpenFlow Variant.............................. OpenFlow 1.0
Default Table................................. layer-2-match
Passive Mode.................................. Enable
```

This output shows an operationally enabled switch:

```
console#show openflow

Administrative Mode........................... Enable
Administrative Status......................... Enabled
Disable Reason................................ None
IP Address.................................... 10.27.65.64
IP Mode....................................... Auto
Static IP Address............................. 10.1.1.1
Network MTU................................... 1518
OpenFlow Variant.............................. OpenFlow 1.3
Default Table................................. full-match
Passive Mode.................................. Enable
```

This example shows the output for OpenFlow 1.0 using the **switch tables** parameter:

```
console#show openflow switch tables

Flow Table................................1
Flow Table Name...........................Forwarding Database
Maximum Size..............................64
Number of Entries.........................8
Hardware Entries..........................7
Software-Only Entries.....................1
Waiting for Space Entries.................0
```

```
Flow Insertion Count....................1
Flow Deletion Count.....................0
Insertion Failure Count.................0
Flow Table Description:
The forwarding database maps non-multicast MAC addresses and the ports on
which these addresses are located.
```

This example shows the output for OpenFlow 1.3 using the **switch tables** parameter:

```
console#show openflow switch tables

Flow Table.................................... 60
Flow Table Name............................... Openflow 1.3
Maximum Size.................................. 1920
Number of Entries............................. 0
Hardware Entries.............................. 0
Software-Only Entries......................... 0
Waiting for Space Entries..................... 0
Flow Insertion Count.......................... 0
Flow Deletion Count........................... 0
Insertion Failure Count....................... 0
Flow Table Description........................ The Openflow 1.3 table
matches on the packet layer-2 header, including DA-MAC, SA-MAC, VLAN, Vlan
priority ether type; layer-3 header, including SRC-IP, DST-IP, IP protocol,
IP-TOS; layer-4 header, including UDP/TCP source and dest port, ICMP type,
and code; SRC-IPv6, DST_IPv6, IPv6 Flow Label, ECN, ICMPv6 type and code,
source L4 Port for TCP / UDP / SCTP and input port including physical port
and LAG port.
```

The following example shows the output when the **switch groups** parameter is given:

```
console#show openflow switch groups

Max Indirect Group Entries.........................................  1234
Current Indirect Group Entries in database.........................  123

Max All Group Entries..............................................  1234
Current All Group Entries in database..............................  123

Max Select Group Entries...........................................  1234
Current Select Group Entries in database...........................  123
```

```
Group Id 12345678 type “Indirect”
=================================

Ref Count              1 : Duration           8 : Bucket Count     1

Bucket Entry List:
------------------

Bucket Index         25 : Output Port           1
Src MAC  00:00:00:00:00:AB : Dst MAC  00:00:00:00:00:CD
VLAN              101 : Reference Group Id      NA

Group Id 23456789 type “All”
============================
Ref Count              NA : Duration           10 : Bucket Count     2

Bucket Entry List:
------------------
Bucket Index         26 : Output Port           2
Src MAC              NA : Dst MAC              NA
VLAN               102 : Reference Group Id    NA

Bucket Index         27 : Output Port           3
Src MAC              NA : Dst MAC              NA
VLAN               103 : Reference Group Id    NA

Group Id 34567890 type “Select”
===============================
Ref Count              NA : Duration           10 : Bucket Count     3

Bucket Entry List:
------------------

Bucket Index         28 : Output Port          NA
Src MAC              NA : Dst MAC              NA
VLAN                 NA : Reference Group Id    12345678

Bucket Index         29 : Output Port          NA
Src MAC              NA : Dst MAC              NA
VLAN                 NA : Reference Group Id    12345678

Bucket Index         30 : Output Port          NA
Src MAC              NA : Dst MAC              NA
VLAN                 NA : Reference Group Id    12345678
```

This examples shows the output for OpenFlow 1.0 flows:

```
console#show openflow switch flows

Flow: 00000000              Type: “1DOT0”
Flow Table:        60       Priority:   1          Type: Untagged MAC
Match Criteria:
Ingress port: Gi1/0/1       Egress Port:
VLAN ID:                    VLAN PCP:              EtherType:   0x0800
Src MAC:                    Src IP:                Src IP Port:
Dst MAC:                    Dst IP:                Dst IP Port:
IP Protocol:                TOS:                   DSCP:
Action:            Drop
Duration (secs):   55       Idle (secs): 45        In HW:  Yes
Packet Count:   12321       HW Priority: 2131
```

This example shows the output for OpenFlow 1.3 flows:

```
console#show openflow switch flows

Flow: 000000E1              Type: “1DOT3”

Match Criteria:
Flow Table:        60       Priority:   10
Ingress port: Gi1/0/1       Egress Port: Gi1/0/2
VLAN ID:            1       VLAN PCP: 1            EtherType:   0x0800
Src MAC: 00:00:02:37:38:01  Src IP: 100.0.0.225    Src IP Port: 1
Dst MAC: 00:00:18:37:22:01  Dst IP: 192.0.0.225    Dst IP Port: 1
IP Protocol:       17       TOS:     32            DSCP: 8
Action:
Duration (secs):    5       Idle (secs): 2         In HW:  Yes
Packet Count:       3       HW Priority: 65464


Flow 000001F9 type “1DOT3”

Match Criteria:
Flow Table:        60       Priority:        10
Ingress port: Gi1/0/1       Egress Port: Gi1/0/1
VLAN ID:            1       VLAN PCP:        1     EtherType:   0x0800
Src MAC: 00:00:02:37:38:01  Src IP: 100.0.1.249    Src IP Port: 1
Dst MAC: 00:00:18:37:22:01  Dst IP: 192.0.1.249    Dst IP Port: 1
IP Protocol:       17       TOS:             32    DSCP:   8
```

```
Action:
Duration (secs):    2        Idle (secs):      0    In HW:  Yes
Packet Count:    9879        HW Priority: 786743
```

6

Layer 3 Routing Commands

The sections that follow describe commands that conform to the OSI model's Network Layer (Layer 3). Layer 3 Routing commands enable routing protocols to perform a series of exchanges over various data links to route data between any two nodes in a network. These commands define the addressing and routing structure of the Internet.

The Dell EMC N1100-ON Series switches do not support routing.

This section of the document contains the following Layer 3 topics:

ARP Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

When a host has an IP packet to send on an Ethernet network, it must encapsulate the IP packet in an Ethernet frame. The Ethernet header requires a destination MAC address. If the destination IP address is on the same network as the sender, the sender uses the Address Resolution Protocol (ARP) to determine the MAC address associated with destination IP address. The network device broadcasts an ARP request, identifying the IP address for which it wants a corresponding MAC address. The IP address is called the target IP. If a device on the same physical network is configured with the target IP, it sends an ARP response giving its MAC address. This MAC address is called the target MAC.

If the destination IP address is not on the same network as the sender, the sender generally forwards the packet to a default gateway. The default gateway is a router that forwards the packet to its destination. The host may be configured with a default gateway or may dynamically learn a default gateway.

The router discovery protocol is one method that enables hosts to learn a default gateway. If a host does not know a default gateway, it can learn the first hop to the destination through proxy ARP. Proxy ARP (RFC 1027) is a technique used to make a machine physically located on one network appear to be logically part of a different physical network connected to the same router (may also be a firewall). Typically Proxy ARP hides a machine with a public IP address on a private network behind a router and still allows the machine to appear to be on the public network. The router proxies ARP requests and all network traffic to and from the hidden machine to make this fiction possible.

Proxy ARP is implemented by making a small change to a router's processing of ARP requests. Without proxy ARP, a router only responds to an ARP request if the target IP address is an address configured on the interface where the ARP request arrived. With proxy ARP, the router may also respond if it has a route to the target IP address. The router only responds if all next hops on its route to the destination are through interfaces other than the interface where the ARP request was received.

ARP Aging

Dynamic entries in the ARP cache are aged. When an entry for a neighbor router reaches its maximum age, the system sends an ARP request to the neighbor router to renew the entry. Entries for neighbor routers should remain in the ARP cache as long as the neighbor continues to respond to ARP requests. ARP cache entries for neighbor hosts are renewed more selectively. When an ARP cache entry for a neighbor host reaches its maximum age, the system checks if the cache entry has been used recently to forward data traffic. If so, the system sends an ARP request to the entry's target IP address. If a response is received, the cache entry is retained and its age is reset to 0. By enabling the dynamic renew option, the system administrator can configure ARP to attempt to renew aged ARP entries regardless of their use for forwarding.

If the system learns a new ARP entry but the hardware does not have space to add the new ARP entry, the system attempts to remove entries that have not been used for forwarding recently. This action may create space for new entries in the hardware's ARP table.

arp

Use the **arp** command in Global Configuration mode to create an Address Resolution Protocol (ARP) entry. The **arp** command optionally creates a static ARP entry in the selected VRF. Use the **no** form of the command to remove the entry.

Syntax

arp [**vrf** *vrf-name*] *ip-address hardware-address* [**interface** *interface-id*]

no arp *ip-address*

- *vrf-name*—The name of the VRF with which the ARP entry is to be associated. If no VRF is specified, the ARP entry is associated with the global ARP table.
- *ip-address* — IP address of a device on a subnet attached to an existing routing interface.
- *hardware-address* — A unicast MAC address for that device.

- *interface-id*—An optional IP numbered or unnumbered (VLAN) interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the vrf parameter.

The vrf parameter is only available on the N3000-ON/N3100-ON/N3200-ON switches.

The interface identifier is the identifier of the unnumbered interface, not the loopback interface from which the IP address is borrowed.

When adding a static ARP entry with an unnumbered interface, the ip address must match the mask of the unnumbered interface.

A static ARP entry is only installed if the IP address matches one of the local subnets. In case of unnumbered interfaces, static ARP entries created for the unnumbered-peer do not match any of the local subnets and cannot be resolved to an interface. By specifying the interface explicitly in the static ARP command, static ARP entries for unnumbered-peers can be configured.

Example

The following example creates an ARP entry consisting of an IP address and a MAC address.

```
console(config)#arp 192.168.1.2 00A2.64B3.A245
```

arp cachesize

Use the **arp cachesize** command in Global Configuration mode to configure the maximum number of entries in the ARP cache. To return the maximum number of ARP cache entries to the default value, use the no form of this command.

Syntax

arp cachesize *integer*

no arp cachesize

- *integer* — Maximum number of ARP entries in the cache. Use the **show sdm prefer** command to display the supported ARP cache size.

Default Configuration

The switch defaults to using the maximum allowed cache size.

Command Mode

Global Configuration mode

User Guidelines

The ARP cache size is dependent on the switching hardware used. The allowed range of values may be different from the example given below for a given switch model.

On VRF enabled switches, the ARP cache is shared among all VRF instances. Configuration of the cache size is shared among all VRF instances.

Example

The following example defines an arp cachesize of 1000.

```
console(config)#arp cachesize 1000
```

arp dynamicrenew

Use the **arp dynamicrenew** command in Global Configuration mode to enable the ARP component to automatically renew dynamic ARP entries when they age out. To disable the automatic renewal of dynamic ARP entries when they age out, use the **no** form of the command.

Syntax

arp dynamicrenew

no arp dynamicrenew

Default Configuration

The default state is enabled.

Command Mode

Global Configuration mode

User Guidelines

When an ARP entry reaches its maximum age, the system must decide whether to retain or delete the entry. If the entry has recently been used to forward data packets, the system will renew the entry by sending an ARP request to the neighbor. If the neighbor responds, the age of the ARP cache entry is reset to 0 without removing the entry from the hardware. Traffic to the host continues to be forwarded in hardware without interruption. If the entry is not being used to forward data packets, the system sends an ARP request to renew the entry. When an entry is not renewed, it is removed from the hardware and subsequent data packets to the host trigger an ARP request. Traffic to the host is lost until the router receives an ARP reply from the host. Gateway entries, and entries for a neighbor router, are always renewed. The dynamic renew option only applies to host entries.

The disadvantage of enabling dynamic renew is that once an ARP cache entry is created, that cache entry continues to take space in the ARP cache as long as the neighbor continues to respond to ARP requests, even if no traffic is being forwarded to the neighbor. If the ARP cache is full and a new host is learned, the oldest ARP cache entry is replaced with the new host entry.In a network where the number of potential neighbors is greater than the ARP cache capacity, enabling dynamic renew could prevent some neighbors from communicating because the ARP cache is full. Dynamic renewal should be disabled in these networks.

Example

```
console#configure
console(config)#arp dynamicrenew
console(config)#no arp dynamicrenew
```

arp purge

Use the **arp purge** command to cause the specified IP address to be removed from the ARP cache. Only entries of type dynamic or gateway are affected by this command. The **arp purge** command optionally removes a static ARP entry in the selected VRF.

Syntax

arp purge [**vrf** *vrf-name*] *ip-address* [**interface** *interface-id*]

- *vrf-name*—The name of the VRF associated with the ARP entry which is to be removed. If no VRF is specified, the ARP entry is associated with the global ARP table is removed.
- *ip-address* — The IP address to be removed from ARP cache.
- *interface-id*—An optional IP numbered or unnumbered (VLAN) interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the vrf parameter.

The vrf parameter is only available on the N3000-ON/N3100-ON/N3200-ON switches.

The interface identifier is the identifier of the unnumbered interface, not the loopback interface from which the IP address is borrowed.

When the IP address does not uniquely identify an ARP entry, the interface must be given to uniquely identify the ARP entry. The interface may be numbered or unnumbered.

Example

The following example removes the specified IP address from arp cache.

```
console#arp purge 192.168.1.10
```

arp resptime

Use the **arp resptime** command in Global Configuration mode to configure the ARP request response time-out. To return the response time-out to the default value, use the no form of this command.

Syntax

arp resptime *integer*

no arp resptime

- *integer* — IP ARP entry response time out. (Range: 1-10 seconds)

Default Configuration

The default value is 1 second.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines a response time-out of 5 seconds.

```
console(config)#arp resptime 5
```

arp retries

Use the **arp retries** command in Global Configuration mode to configure the ARP count of maximum requests for retries. To return to the default value, use the **no** form of this command.

Syntax

arp retries *integer*

no arp retries

- *integer* — The maximum number of requests for retries. (Range: 0-10)

Default Configuration

The default value is 4 retries.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines 6 as the maximum number of retries.

```
console(config)#arp retries 6
```

arp timeout

Use the **arp timeout** command in Global Configuration mode to configure the ARP entry age-out time. Use the no form of the command to set the age-out time to the default.

Syntax

arp timeout *integer*

no arp timeout

- *integer* — The IP ARP entry age-out time. (Range: 15-21600 seconds)

Default Configuration

The default value is 1200 seconds.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines 900 seconds as the timeout.

```
console(config)#arp timeout 900
```

clear arp-cache

Use the **clear arp-cache** command to remove all ARP entries of type dynamic from the ARP cache.

Syntax

clear arp-cache [**vrf** *vrf-name*] [**gateway**]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.
- **gateway** — Removes the dynamic entries of type **gateway**, as well.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Example

The following example clears all entries ARP of type dynamic, including gateway, from ARP cache.

```
console#clear arp-cache gateway
```

clear arp-cache management

Use the **clear arp-cache management** command to clear all entries that show as management arp entries in the **show arp** command.

Syntax

clear arp-cache management

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

In the example below, out-of-band management entries are shown, for example, those from the out-of-band interface.

```
console#show arp

Age Time (seconds)............................ 1200
Response Time (seconds)................... 1
Retries............................................... 4
Cache Size.......................................... 6144
Dynamic Renew Mode...................... Disable
Total Entry Count Current / Peak...... 0 / 0
Static Entry Count Configured / Active / Max.. 0 / 0 / 128

  IP Address        MAC Address      Interface        Type        Age
---------------  -----------------  --------------  --------  -----------
10.27.20.241     001A.A0FF.F662     Management      Dynamic   n/a
10.27.20.243     0019.B9D1.29A3     Management      Dynamic   n/a
console#clear arp-cache management
```

ip local-proxy-arp

Use the **ip local proxy-arp** command in Interface Configuration mode to enable proxying of ARP requests. This allows the switch to respond to ARP requests within a subnet where routing is not enabled.

Syntax

ip local-proxy-arp

no ip local-proxy-arp

Default Configuration

Proxy arp is disabled by default.

Command Mode

Interface (VLAN) Configuration

User Guidelines

This command has no user guidelines.

Example

This example enables proxying of ARP requests on VLAN 10.

```
console(config-if-Gi1/0/1)#interface vlan 10

console(config-if-vlan10)#ip local-proxy-arp
```

ip proxy-arp

Use the **ip proxy-arp** command in Interface Configuration mode to enable proxy ARP on a router interface. Without proxy ARP, a device only responds to an ARP request if the target IP address is an address configured on the interface where the ARP request arrived. With proxy ARP, the device may also respond if the target IP address is reachable. The device only responds if all next hops in its route to the destination are through interfaces other than the interface that received the ARP request. Use the no form of the command to disable proxy ARP on a router interface.

Syntax

ip proxy-arp

no ip proxy-arp

Default Configuration

Enabled is the default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The **ip proxy-arp** command is not available in interface range mode.

Example

The following example enables proxy arp for VLAN 15.

```
(config)#interface vlan 15
console(config-if-vlan15)#ip proxy-arp
```

show arp

Use the **show arp** command to display all entries in the Address Resolution Protocol (ARP) cache. The displayed results are not the total ARP entries. To view the total ARP entries, the operator should view the show ARP results.

Syntax

show arp [**vrf** *vrf-name*] [**brief**]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- brief — Display ARP parameters.

Default Configuration

This command has no default configuration.

Command Mode

User Exec and Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The show arp command will display static (user-configured) ARP entries regardless of whether they are reachable over an interface or not.

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example shows **show arp** command output.

```
console#show arp
Static ARP entries are only active
when the IP address is reachable on a local subnet

Age Time (seconds)............................ 1200
Response Time (seconds)....................... 1
Retries....................................... 4
Cache Size.................................... 6144
Dynamic Renew Mode.......................... Disable
Total Entry Count Current / Peak............. 0 / 0
Static Entry Count Configured / Active / Max .. 1 / 0 / 128

IP Address MAC Address    Interface  Type   Age
---------- -------------- ---------  ------ -------
1.1.1.3    0000.0000.0022  n/a       Static n/a
```

Bidirectional Forwarding Detection Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Bidirectional Forwarding Detection (BFD) verifies bidirectional connectivity between forwarding engines, which can be a single hop or multiple hops away. The protocol works over any underlying transmission mechanism and protocol layer with a wide range of detection times, especially in scenarios where fast failure detection is required in data plane level for multiple concurrent sessions.

Use the following commands to configure Bidirectional Forwarding Detection commands (BFD).

feature bfd

Use this command to enable BFD on the router. Use the **no** form of the command to disable BFD and clear any dynamic state.

Syntax

feature bfd

no feature bfd

Default Configuration

BFD is not enabled by default.

Command Mode

Global Configuration

User Guidelines

BFD supports fast detection of forwarding failures on a routing interface. BFD provides an advantage for forwarding plane failure detection over that provided by the individual protocols, each having different hello protocol timers and detection periods.

The BFD feature provides notification to BGP or OSPF when an interface is detected to not be in a forwarding state. No other routing protocols are supported.

BFD is supported in the default VRF only.

BFD should be configured on routed interfaces only. BFD should not be configured on mirrored ports or on interfaces enabled for IEEE 802.1x.

BFD is supported across link aggregation groups, but does not detect individual LAG member link failure.

BFD does not operate on the out-of-band interface.

The **no feature bfd** command does not remove administrator-supplied configuration.

A BFD session is created per VLAN routing interface. On trunk ports, multiple BFD sessions may be established.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# configure
console(config)# feature bfd
console(config)# exit
```

bfd echo

This command enables BFD echo mode on an interface. Use the **no** form of the command to disable BFD echo mode.

Syntax

bfd echo

no bfd echo

Default Configuration

BFD echo mode is not enabled by default.

Command Mode

Interface (VLAN) Configuration and Interface (VLAN) range mode.

User Guidelines

BFD echo mode enables fast sending and turnaround of BFD echo packets. Use the **bfd slow-timer** command to adjust the sending of BFD control plane packets when BFD echo mode is enabled.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# configure
console(config)# interface vlan 10
console(config-if-vlan10)# bfd echo
```

bfd interval

This command configures BFD session parameters for a VLAN routing interface. It overwrites any BFD configuration present on the interface. Use the **no** form of the command to return the parameters to their default values.

Syntax

bfd interval *transmit-interval* **min_rx** *minimum-receive-interval* **multiplier** *detection-time-multiplier*

no bfd interval

- *transmit-interval*—Refers to the desired minimum transmit interval, which is the minimum interval the user wants to use while transmitting BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms with a change granularity of 100 ms and with a default value of 100 ms.
- *minimum-receive-interval*—Refers to the required minimum receive interval, which is the minimum interval at which the system can receive BFD control packets. It is represented in milliseconds. Its range is 100 ms to 1000 ms with a granularity of 100 ms and with a default value of 100 ms.

- *detection-time-multiplier*—Specifies the number of BFD control packets which, if missed consecutively, will cause a session to be declared down. Its range is 3 to 50 with a default value of 3.

Default Configuration

The default transmit-interval is 100ms.

The default minimum-receive-interval is 100ms.

The default detection-time-multiplier is 3.

Command Mode

Interface (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

In this example, VLAN 100 is created, assigned an IP address to make it a routable interface, and the bfd interval is set to 100 ms, the minimum receive interface is 100 ms, and the multiplier is 5.

```
console#configure
console(config)#vlan 100
console(config-vlan100)#exit
console(config)#interface vlan 100
console(config-if-vlan100)#ip address 192.168.10.11 /24
console(config-if-vlan100)#bfd interval 100 min_rx 100 multiplier 5
console(config-if-vlan100)#exit
console(config)#interface te1/0/1
console(config-if-Te1/0/1)#switchport mode trunk
```

bfd slow-timer

This command configures the BFD periodic slow transmission interval for BFD Control packets. Use the **no** form of the command to return the slow transmission interval value to the default.

Syntax

bfd slow-timer *receive-interval*

no bfd slow-timer

- *receive-interval*—The slow transmission interval. Range 1000–30000 milliseconds.

Default Configuration

The default receive-interval is 2000 ms.

Command Mode

Global Configuration mode

User Guidelines

The argument *receive-interval* refers to the slow transmission interval for BFD Control packets. This timer is only used when the BFD echo function is enabled. When the BFD echo mode is enabled, the rate of BFD control packets is kept low as the echo function is used to detect forwarding failures.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# configure
console(config)# bfd slow-timer 1000
```

ip ospf bfd

Use the **ip ospf bfd** command to enable sending of BFD events to OSPF on a VLAN routing interface. Use the **no** form of the command to disable sending of BFD events.

Syntax

ip ospf bfd

no ip ospf bfd

Default Configuration

BFD is not enabled by default.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

BFD processing notifies OSPF of L3 connectivity issues with the peer. The interface must be a VLAN interface enabled for routing.

BFD must also be enabled in OSPF router configuration mode in order to BFD processing to occur.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example

```
console#configure
console(config)#ip routing
console(config)#interface vlan 3
console(config-if-vlan3)#ip address 192.168.0.1 /24
console(config-if-vlan3)#ip ospf area 0
console(config-if-vlan3)#ip ospf bfd
onsole(config-if-vlan3)#exit
console(config)#router ospf
console(config-router)#bfd
```

ipv6 ospf bfd

Use the **ipv6 ospf bfd** command to enable sending of BFD events to OSPF on a VLAN routing interface. Use the **no** form of the command to disable sending of BFD events.

Syntax

ipv6 ospf bfd

no ipv6 ospf bfd

Default Configuration

BFD is not enabled by default.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

BFD processing notifies OSPFv3 of level 3 connectivity issues with the peer. The interface must be a VLAN interfaced enabled for routing.

BFD must also be enabled in OSPFv3 router configuration mode for BFD processing to occur.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#configure
console(config)#ipv6 unicast-routing
console(config)#interface vlan 3
console(config-if-vlan3)#ipv6 address fe80::1214
console(config-if-vlan3)#ipv6 ospf area 0
console(config-if-vlan3)#ipv6 ospf bfd
onsole(config-if-vlan3)#exit
console(config)#ipv6 router ospf
console(config-router6)#bfd
```

neighbor fall-over bfd

This command enables BFD support for a BGP neighbor. Use the **no** form of the command to disable BFD for the specified BGP neighbor.

Syntax

neighbor{ *ipv4-address* **|** *ipv6-address* [**interface vlan** *vlan-id*] **fall-over bfd**

no neighbor { *ipv4-address* **|** *ipv6-address* [**interface vlan** *vlan-id*] **fall-over bfd interval**

- *ipv4-address*—The IPv4 address of a configured neighbor reachable over a VLAN routing interface expressed in dotted quad notation.

- *ipv6-address*—The IPv6 address of a configured neighbor reachable over an IPv6 VLAN routing interface.
- *vlan-id*—If specified, the VLAN on which the IPv6 address is configured.

Default Configuration

No BFD neighbors are configured by default.

Command Mode

Router BGP Configuration mode

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)# router bgp
console(config-router)# neighbor 172.16.11.6 fall-over bfd
```

show bfd neighbor

This command displays the neighbors for which BFD has established adjacencies.

Syntax

show bfd neighbor [**details**] [*ip-address*]

- **details**—Display additional information regarding each BFD neighbor, including sent and received message counts.
- *ip-address*—The IPv4 or IPv6 address of a BFD neighbor. Limits the output to the specific neighbor.

Default Configuration

There is no default configuration for this command.

Command Mode

User mode, Privileged Exec mode, Global Configuration mode, all show modes

User Guidelines

The local address displayed in the output is the IP address of the interface through which the neighbor is connected.

Update is displayed in the format dd hh:mm:ss where:

- dd is days
- hh is hours
- mm is minutes
- ss is seconds

The operational intervals are the intervals used as a result of negotiation with the BFD link partner.

The following information is displayed.

Parameters	Description
Our IP address	The current IP address.
Neighbor IP address	The IP address of the active BFD neighbor.
State	The current state, either Up or Down.
Interface	The current interface.
Uptime	The amount of time the interface has been up.
Registered Protocol	The protocol from which the BFD session was initiated and that is registered to receive events from BFD. (for example, BGP).
Local Diag	The diagnostic state specifying the reason for the most recent change in the local session state.
Demand mode	Indicates if the system wishes to use Demand mode. Note: Demand mode is not supported in Dell 6.7.
Minimum transmit interval	The minimum interval to use when transmitting BFD control packets.
Actual TX Interval	The transmitting interval being used for control packets.

Parameters	Description
Actual TX Echo interval	The transmitting interval being used for echo packets.
Minimum receive interval	The minimum interval at which the system can receive BFD control packets.
Detection interval multiplier	The number of BFD control packets that must be missed in a row to declare a session down.
My discriminator	Unique Session Identifier for Local BFD Session.
Your discriminator	Unique Session Identifier for Remote BFD Session.
Tx Count	The number of transmitted BFD packets.
Rx Count	The number of received BFD packets.
Drop Count	The number of dropped packets.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# show bfd neighbors

Local Address  Neighbor          Uptime       State    Interface
-------------  --------------    -----------  ------   ---------
172.16.10.1    172.16.10.20      02:18:49     Up       VLAN10
10.1.10.1      10.1.10.20        01:15:25     Up       Gi1/0/5
fdf8:f53b::53  fdf8:f53b::58     00:38:11     Up       Gi1/0/1

console# show bfd neighbors details

Local IP address............................. 2.1.1.1
Neighbor IP address.......................... 2.1.1.2
State........................................ Up
Interface.................................... VLAN 10
Uptime....................................... 0 00:01:54
Registered Protocol.......................... BGP
Local Diag................................... 0
Demand mode.................................. FALSE
Minimum transmit interval.................... 100 ms
Minimum receive interval..................... 100 ms
Operational transmit interval................ 100 ms
Operational transmit echo interval........... 0 ms
Detection interval multiplier................ 3
Local discriminator.......................... 1
Remote discriminator......................... 1
Tx Count..................................... 105
```

```
Rx Count....................................... 107
Drop Count..................................... 0
```

Border Gateway Protocol Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

This section describes the commands you use to view and configure Border Gateway Protocol (BGP), which is an exterior gateway routing protocol that you use to route traffic between autonomous systems. The BGP CLI commands are available in the N3000-ON/N3100-ON/N3200-ON Series switches.

CAUTION: The commands in this section are in one of three functional groups.

- Show commands display switch settings, statistics, and other information.
- Configuration commands configure features and options of the switch. For every configuration command, there is a show command that displays the configuration setting.
- Clear commands reset part of the protocol state.

router bgp

Use the **router bgp** command to enable BGP and identify the autonomous system (AS) number for the router. Only a single instance of BGP can be run and the router can only belong to a single AS.

Syntax

router bgp *as-number*

no router bgp *as-number*

- as-number—The router's autonomous system number in asplain format. Dell EMC Networking BGP supports four byte AS numbers, in the range of 0-429496729.

Default Configuration

By default, BGP is inactive.

Command Mode

Global Configuration mode

User Guidelines

The **no router bgp** command disables BGP and all BGP configurations revert to default values. Alternatively, the administrator can use the **no enable** command in BGP router configuration mode to disable BGP globally without clearing the BGP configuration.

ASNs 0, 56320–64511, and 65535 are reserved and cannot be used.

Command History

Introduced in version 6.2.0.1 firmware. Command updated in version 6.6 firmware.

Example

The following example creates a BGP routing instances and enables BGP routing for AS `4324`.

```
console(config)#router bgp 4324
```

address-family

Use the **address-family** command in peer template configuration mode to configure policy parameters within a peer template to be applied to a specific address family. To delete all policy commands for an address family in a peer template, use the **no** form of this command

Syntax

address-family { **ipv4** | **ipv6** }

no address-family { **ipv4** | **ipv6** }

- **ipv4—**Configure policy parameters to be applied to IPv4 routes.
- **ipv6—**Configure policy parameters to be applied to IPv6 routes.

Default Configuration

No peer templates are configured by default.

Command Mode

Peer Template Configuration mode

User Guidelines

This command enters address family configuration mode within the peer template. Policy commands configured within this mode apply to the address family. The following commands can be added to a peer template in address family configuration mode:

- activate
- **advertisement-interval** *seconds*
- default-originate
- **filter-list** *as-path-list-number* {**in** | **out**}
- **maximum-prefix** { *maximum* | unlimited } [*threshold*]
- next-hop-self
- **prefix-list** *prefix-list-name* { **in** | **out** }
- remove-private-as
- route-reflector-client
- **route-map** *map-name* { **in** | **out** }
- **send-community**

The **activate** command is only available in **address-family ipv6** mode.

If an IPv6 peer inherits a template that specifies **address family ipv4** parameters, those parameters are ignored.

Command History

Introduced in version 6.2.0.1 firmware.

Example

In this example, the peer template AGGR sets the keepalive timer to 3 seconds and the hold timer to 9 seconds, allows communities to be sent for both IPv4 and IPv6 routes, and configures different inbound and outbound route maps for IPv4 and IPv6. Two neighbors, 172.20.1.2 and 172.20.2.2, inherit these parameters from the template.

```
console(config)# router bgp 65000
```

```
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.2.2 remote-as 65001
console(config-router)# template peer AGGR
console(config-rtr-tmplt)# timers 3 9
console(config-rtr-tmplt)# address-family ipv4
console(config-rtr-tmplt-af)# send-community
console(config-rtr-tmplt-af)# route-map RM4-IN in
console(config-rtr-tmplt-af)# route-map RM4-OUT out
console(config-rtr-tmplt-af)# exit
console(config-rtr-tmplt)# address-family ipv6
console(config-rtr-tmplt-af)# send-community
console(config-rtr-tmplt-af)# route-map RM6-IN in
console(config-rtr-tmplt-af)# route-map RM6-OUT out
console(config-rtr-tmplt-af)# exit
console(config-rtr-tmplt)# exit
console(config-router)# neighbor 172.20.1.2 inherit peer AGGR
console(config-router)# neighbor 172.20.2.2 inherit peer AGGR
console(config-router)# address-family ipv6
console(config-router)# neighbor 172.20.1.2 activate
console(config-router)# neighbor 172.20.2.2 activate
```

address-family ipv4 vrf

Use the **address-family ipv4 vrf** command to enter IPv4 VRF configuration mode for a particular VRF instance to configure the BGP VRF parameters.

Use the **no** form of this command to delete the IPv4 VRF configuration.

Syntax

address-family ipv4 vrf *vrf-name*

no address-family ipv4 vrf *vrf-name*

- *vrf-name* — The VRF instance name.

Default Configuration

There is no default configuration.

Command Mode

BGP Router Configuration mode

User Guidelines

Commands entered in this mode enable peering with BGP neighbors in this VRF instance. All the neighbor specific commands are given in this mode as well.

VRF configuration is disabled by default.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config-router)# address-family ipv4 vrf Red
```

address-family ipv6

Use the **address-family ipv6** command to enter IPv6 family configuration mode to specify IPv6 configuration parameters. Use the **no** form of the command to delete all IPv6 configuration.

Syntax

address-family ipv6

no address-family ipv6

Default Configuration

By default, the exchange of IPv6 routes is disabled.

Command Mode

BGP Router Configuration mode

User Guidelines

The **address-family ipv6** command moves the CLI to IPv6 address family configuration mode. Commands entered in this mode can be used to enable exchange of IPv6 routes over IPv6 or IPv4 peering sessions, specify IPv6 prefixes to be originated, and configure inbound and outbound policies to be applied to IPv6 routes. The **no** version of this command clears all IPv6 address family configuration

ASNs 0, 56320–64511, and 65535 are reserved cannot be used.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)# address-family ipv6
```

address-family vpnv4 unicast

Use the **address-family vpnv4 unicast** command to configure a BGP routing session to advertise VPN IPv4 prefixes.

Use the **no** form of this command to delete the VPN IPv4 configuration.

Syntax

address-family vpn4 unicast

no address-family vpn4 unicast

Default Configuration

VPN-IPv4 address family mode is not configured by default.

Command Mode

Router BGP Configuration mode

User Guidelines

When an iBGP neighbor is configured in this mode, each VPN-IPv4 prefix is made globally unique by the addition of an 8-byte route distinguisher (RD). Only unicast prefixes are advertised to the iBGP neighbor. To exit from VPN-IPv4 address family mode, use the **exit** command.

This command enters VPN-IPv4 address family configuration mode. All neighbor commands available in IPv4 Address Family configuration mode are applicable to this mode as well.

Two additional options to the neighbor command are available in VPN-IPv4 address family configuration mode. See the bold keywords in the commands below for the additions:

- neighbor *ip-address* **activate**
- neighbor *ip-address* send-community **extended**

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows how to enter the VPN-IPv4 address family mode and to distribute VPN4-IPv4 addresses to a neighbor with the extended community attribute:

```
console(config)# router bgp 10
console(config-router)# neighbor 1.1.1.1 remote-as 5000
console(config-router)# address-family vpnv4 unicast
console(config-router-af)# neighbor 1.1.1.1 activate
console(config-router-af)# neighbor 1.1.1.1 send-community extended
console(config-router-af)# exit
console(config-router)#
```

aggregate-address

Use the **aggregate-address** command to configure a summary address for BGP.

Syntax

aggregate-address { *ipv4-prefix mask* | *ipv6-prefix/prefix-length* } [**as-set**] [**summary-only**]

no aggregate-address { *ipv4-prefix mask* | *ipv6-prefix/prefix-length* } [**as-set**] [**summary-only**]

- *ipv4-prefix mask*—A summary prefix and mask in dotted-quad notation. The default route (0.0.0.0 0.0.0.0) cannot be configured as an aggregate-address. The mask cannot be a 32-bit mask (255.255.255.255). The combination of prefix and mask must be a valid IPv4 unicast destination prefix
- *ipv6-prefix*—An IPv6 network prefix. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons. Counters are cleared only for the matching prefixes.

- *prefix-length*—The length of the IPv6 prefix given as part of the ipv6-prefix. This is required if a prefix is specified. A decimal value in the range 0 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /length format. A slash must precede the decimal value in /length format.
- **as-set**— If the as-set option is configured, the aggregate is advertised with a non-empty AS_PATH. (Normally, the aggregate is advertised with an empty AS path and the ATOMIC_AGGREGATE attribute.) If the AS_PATH of all contained routes is the same, the AS_PATH of the aggregate is the AS_PATH of the contained routes. Otherwise, if the contained routes have different AS_PATHs, the AS_PATH attribute includes an AS_SET with each of the AS numbers listed in the AS PATHs of the aggregated routes. If the as-set option is not configured, the aggregate is advertised with an empty AS_PATH.
- **summary-only** — When specified, the more-specific routes within the aggregate address are not advertised to neighbors.

Default Configuration

No aggregate addresses are configured by default. Unless the options are specified, the aggregate is advertised with the ATOMIC_AGGREGATE attribute and an empty AS path, and the more specific routes are advertised along with the aggregate.

Command Mode

- BGP Router Configuration mode
- IPv6 Address Family Configuration mode

User Guidelines

To be considered a match for an aggregate address, a prefix must be more specific (i.e., have a longer prefix length) than the aggregate address. A prefix whose prefix length equals the length of the aggregate address is not considered a match.

When BGP originates a summary address, it installs a reject route in the common routing table for the summary prefix. Any received packets that match the summary prefix but not a more specific route match the reject route and are dropped.

BGP accepts up to 128 summary addresses for each address family.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#aggregate-address 10.27.21.0 255.255.255.0
```

bgp aggregate-different-meds (BGP Router Configuration)

Use the **bgp aggregate-different-meds** command to control the aggregation of routes with different multi-exit discriminator (MED) attributes. By default, BGP only aggregates routes that have the same MED value.

Syntax

bgp aggregate-different-meds

no bgp aggregate-different-meds

Default Configuration

By default, all the routes aggregated by a given aggregate address must have the same MED value.

Command Mode

BGP Router Configuration mode

User Guidelines

When this command is used, the path for an active aggregate address is advertised without an MED attribute and the MED attribute is not considered in aggregating routes. When this command is not used, if multiple routes match an aggregate address, but have different MEDs, the aggregate takes the MED of the first matching route and any other matching prefix with the same MED is included in the aggregate. Matching prefixes with different MEDs are not considered part of the aggregate and continue to be advertised as individual routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp aggregate-different-meds
```

bgp aggregate-different-meds (IPv6 Address Family Configuration)

Use the **bgp aggregate-different-meds** command to allow IPv6 routes with different MEDs to be aggregated.

Syntax

bgp aggregate-different-meds

no bgp aggregate-different-meds

Default Configuration

By default, all the routes aggregated by a given aggregate address must have the same MED value.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

When this command is used, the path for an active aggregate address is advertised without an MED attribute and the MED attribute is not considered in aggregating routes. When this command is not used, if multiple routes match an aggregate address, but have different MEDs, the aggregate takes the MED of the first matching route and any other matching prefix with the same MED is included in the aggregate. Matching prefixes with different MEDs are not considered part of the aggregate and continue to be advertised as individual routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#bgp aggregate-different-meds
```

bgp always-compare-med

Use this command to compare MED values during the decision process in paths received from different autonomous systems. To revert to the default behavior, only comparing MED values from paths received from neighbors in the same AS, use the **no** form of this command.

Syntax

bgp always-compare-med

no bgp aways-compare-med

Default Configuration

By default, all routes aggregated by a given aggregate address must have the same MED value.

Command Mode

- BGP Router Configuration mode
- IPv6 Address Family Configuration mode

User Guidelines

The MED is a 32-bit integer, commonly set by an external peer to indicate the internal distance to a destination. The decision process compares MED values to prefer paths that have a shorter internal distance. Since different autonomous systems may use different internal distance metrics or have different policies for setting the MED, the decision process normally does not compare MED values in paths received from peers in different autonomous systems. This command allows you to force BGP to compare MEDs regardless of if paths are received from a common AS.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp always-compare-med
```

bgp client-to-client reflection (BGP Router Configuration)

Use the **bgp client-to-client reflection** command to enable client-to-client reflection. By default, a route reflector reflects routes received from its clients to its other clients. However, if a route reflector's clients have a full iBGP mesh, the route reflector does not reflect to the clients.

Syntax

bgp client-to-client reflection

no bgp client-to-client reflection

Default Configuration

Client-to-client reflection is enabled by default when a router is configured as a route reflector.

Command Mode

BGP Router Configuration mode

User Guidelines

Route reflection can change the routes clients select. A route reflector only reflects those routes it selects as best routes. Best route selection can be influenced by the IGP metric of the route to reach the BGP next hop. Since a client's IGP distance to a given next hop may differ from route reflector's IGP distance, a route reflector may not re-advertise a route a client would have selected as best in the absence of route reflection. One way to avoid this effect is to fully mesh the clients within a cluster. When clients are fully meshed, there is no need for the cluster's route reflectors to reflect client routes to other clients within the cluster. When client-to-client reflection is disabled, a route reflector continues to reflect routes from non-clients to clients and from clients to non-clients.

In BGP Router Configuration mode, this command only affects advertisement of IPv4 routes. The same command is available in Address-Family IPv6 Configuration mode for IPv6 routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp client-to-client reflection
```

bgp client-to-client reflection (IPv6 Address Family Configuration)

Use the **bgp client-to-client reflection** command to enable client-to-client reflection. By default, a route reflector reflects routes received from its clients to its other clients. However, if a route reflector's clients have a full iBGP mesh, the route reflector does not reflect to the clients.

Syntax

bgp client-to-client reflection

no bgp client-to-client reflection

Default Configuration

Client-to-client reflection is enabled by default when a router is configured as a route reflector.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Route reflection can change the routes clients select. A route reflector only reflects those routes it selects as best routes. Best route selection can be influenced by the IGP metric of the route to reach the BGP next hop. Since a client's IGP distance to a given next hop may differ from route reflector's IGP distance, a route reflector may not re-advertise a route a client would have selected as best in the absence of route reflection. One way to avoid this effect is to fully mesh the clients within a cluster. When clients are fully meshed, there is no need for the cluster's route reflectors to reflect client routes to other clients within the cluster. When client-to-client reflection is disabled, a route reflector continues to reflect routes from non-clients to clients and from clients to non-clients.

The same command is available in BGP Router Configuration mode for IPv4 routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#bgp client-to-client reflection
```

bgp cluster-id

Use the bgp cluster-id command to specify the cluster ID of a route reflector. To revert the cluster ID to its default, use the **no** form of this command.

Syntax

bgp cluster-id *cluster-id*

no bgp cluster-id

- *cluster-id*—A non-zero 32-bit identifier that uniquely identifies a cluster of route reflectors and their clients. The cluster ID may be entered in dotted notation like an IPv4 address or as an integer.

Default Configuration

A route reflector whose cluster ID has not been configured uses its BGP router ID (configured with **bgp router-id**) as the cluster ID.

Command Mode

BGP Router Configuration mode

User Guidelines

A route reflector and its clients form a cluster. Since a cluster with a single route reflector has a single point of failure, a cluster may be configured with multiple route reflectors. To avoid sending multiple copies of a route to a client, each route reflector in a cluster should be configured with the same cluster ID. Route reflectors with the same cluster ID must have the same set of clients; otherwise, some routes may not be reflected to some clients. The same cluster ID is used for both IPv4 and IPv6 route reflection.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp cluster-id 1
```

bgp default local-preference

Use the **bgp default local-preference** command to enable the network operator to specify the default local preference. Local preference is an attribute sent to internal peers to indicate the degree of preference for a route. A route with a numerically higher local value is preferred over a route with a numerically lower value.

Syntax

bgp default local-preference *number*

no bgp default local-preference

- *number*—The value to use as the local preference for routes advertised to internal peers. The range is 0 to 4,294,967,295.

Default Configuration

If no other value is configured, BGP advertises a local preference of 100 in UPDATE messages to internal peers.

Command Mode

BGP Router Configuration mode

User Guidelines

BGP assigns the default local preference to each path received from an external peer. (BGP retains the LOCAL_PREF on paths received from internal peers.) BGP also assigns the default local preference to locally-originated paths. If you change the default local preference, the local preference on paths previously received is not changed; it is only applied to paths received after the change. To apply the new local preference to paths previously received, use **clear ip bgp** to force a soft inbound reset.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp default local-preference 1
```

bgp fast-external-fallover

Use this command to configure BGP to immediately reset the adjacency with an external peer if the routing interface to the peer goes down.

Syntax

bgp fast-external-fallover

no bgp fast-external-fallover

Default Configuration

Fast external fallover is enabled by default.

Command Mode

BGP Router Configuration mode

User Guidelines

When BGP gets a routing interface down event, BGP drops the adjacency with all external peers whose IPv4 address is in one of the subnets on the failed interface. This behavior can be overridden for specific interfaces using **ip bgp fast-external-fallover**.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)# bgp fast-external-fallover
```

bgp fast-internal-fallover

Use the **bgp fast-internal-fallover** command to configure BGP to immediately reset the adjacency with an internal peer when there is a loss of reachability to an internal peer.

Syntax

bgp fast-internal-fallover

no bgp fast-internal-fallover

Default Configuration

By default, fast internal fallover is enabled.

Command Mode

BGP Router Configuration mode

User Guidelines

BGP tracks the reachability of each internal peer's IP address. If a peer becomes unreachable (that is, the RIB no longer has a non-default route to the peer's IP address), BGP drops the adjacency.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)# bgp fast-internal-fallover
```

bgp listen

Use the **bgp listen** command to create an IPv4 listen range and associates it with the specified peer template. The **bgp listen** command also activates the IPv4 or IPv6 BGP dynamic neighbors feature. Use the **no** form of the command to remove an IPv4 or IPv6 listen range.

Syntax

bgp listen { **limit** *max-number* **|** **range** *network/length* [**inherit peer** *peer-template-name*] }

no bgp listen { **limit** **|** **range** *network/length* [**inherit peer** *peer-template-name*] }

- **limit** *max-number* — Sets a maximum limit number of IPv4 BGP dynamic subnet range neighbors. The number is from 1 to 100. Default is 20.
- **range** *network/length* — Specifies a listen subnet range that is to be created. The IP prefix representing a subnet is specified by *network*, and *length* is the subnet mask in bits. The network argument can be valid IPv4 prefix (BGP Router Configuration mode or IPv4 Address Family Configuration mode) or an IPv6 prefix (IPv6 Address Family Configuration mode).
- **inherit peer** *peer-template-name* — (Optional) Specifies a BGP peer template name that is to be associated with the specified listen subnet range and inherited with dynamically created neighbors.

Default Configuration

No subnets are associated with a BGP listen subnet range, and the BGP dynamic neighbor feature is not activated.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode, IPv6 Address Family Configuration mode

User Guidelines

This command can be used to configure IPv4 BGP neighbors (BGP Router Configuration mode) as well as IPv6 BGP neighbors (IPv6 Address Family Configuration mode).

Use the **limit** keyword and *max-number* argument to define the global maximum number of IPv4 BGP dynamic neighbors that can be created.

BGP dynamic neighbors are configured using a range of IP addresses. Each range can be configured as a subnet IP address. After a subnet range is configured for a BGP peer group, and a TCP session is initiated by the neighbor for an IP address in the subnet range, a new BGP neighbor is dynamically configured on the local switch. Dynamically created neighbors are not displayed in the running-config.

It is acceptable that the template peer name is not specified. In this case, all dynamic neighbors are created with the default parameters. The template peer name can be assigned/changed for a listen range at any time.

The limit on the total number of both IPv4 and IPv6 listen range groups is 10.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows how to create an IPv4 listen range with a template to be inherited with dynamically created BGP neighbors:

```
console#configure
console(config)# router bgp 100
console(config-router)#bgp listen limit 10
console(config-router)#bgp listen range 10.12.0.0/16
console(config-router)#bgp listen range 10.27.0.0/16 inherit peer ABC
```

bgp log-neighbor-changes

Use the **bgp log-neighbor-changes** command to enable logging of adjacency state changes.

Syntax

bgp log-neighbor-changes

no bgp log-neighbor-changes

Default Configuration

Neighbor state changes are not logged by default.

Command Mode

BGP Router Configuration mode

User Guidelines

Both backward and forward adjacency state changes are logged. Forward state changes, except for transitions to the Established state, are logged at the Informational severity level. Backward state changes and forward changes to Established are logged at the Notice severity level

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)# bgp log-neighbor-changes
```

bgp maxas-limit

Use this command to specify a limit on the length of AS Paths that BGP accepts from its neighbors. To revert the limit to its default, use the **no** form of this command.

Syntax

bgp maxas-limit *limit*

no bgp maxas-limit

- *limit*—The maximum length of an AS Path that BGP accepts from its neighbors. The length is the number of autonomous systems listed in the path. The limit may be set to any value from 1 to 100.

Default Configuration

BGP accepts AS paths with up to 75 AS numbers

Command Mode

BGP Router Configuration mode

User Guidelines

If BGP receives a path whose AS PATH attribute is longer than the configured limit, BGP sends a NOTIFICATION and resets the adjacency.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp maxas-limit 1
```

bgp router-id

Use the **bgp router-id** command to set the BGP router ID.

Syntax

bgp router-id *router-id*

no bgp router-id

- *router-id*—An IPv4 address in dotted quad notation. This is the address for BGP to use as it's router ID.

Default Configuration

There is no default BGP router ID. The system does not select a router ID automatically. One must be configured manually.

Command Mode

BGP Router Configuration mode

User Guidelines

The BGP router ID must be a valid IPv4 unicast address, but is not required to be an address assigned to the router. The router ID is specified in the dotted notation of an IPv4 address. Changing the router ID disables and re-enables BGP, causing all adjacencies to be re-established.

BGP is enabled by default once the administrator has specified the local AS number with the **router bgp** command and configured a router ID with the **bgp router-id** command.

BGP is not operable until a BGP router ID has been assigned. The BGP administrative state (as set by the enable command) has no operational effect until a router id is assigned to the BGP router.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#bgp router-id 10.27.21.142
```

clear ip bgp

Use the **clear ip bgp** command to reset peering sessions with all of a subnet of BGP peers. The command arguments specify which peering sessions are reset and the type of reset performed.

Syntax

clear ip bgp [**vrf** *vrf-name*]{* | *as-number* | *ipv4-address* | *ipv6-address* [**interface** *interface-id*] {**listen range** *network/length*}} [**soft** [**in** | **out**]]

- *vrf-name*—This optional parameter identifies the VRF for which to reset peering sessions. If not given, the default sessions are reset.
- *— Reset adjacency with every BGP peer.
- *as-number*— Only reset adjacencies with BGP peers in the given autonomous system. The router's autonomous system number in asplain format. Dell EMC Networking BGP supports four byte AS numbers, in the range of 0-429496729.
- *ipv4-address*—Only reset the adjacency with a single specified peer with a given IPv4 peer address.
- *ipv6-address* [**interface** *interface-id*]—Only reset the adjacency with a single specified peer with a given IPv6 peer address. If the interface-id is given, only reset the adjacency on the specified interface. The interface id must be a routing interface (a routed VLAN identifier). An adjacency that is formed with the auto-detect feature cannot be reset with the command.

- **listen range** – Reset all adjacencies that are included in the listen subnet range.
- **soft**—BGP resends all updates to the neighbors and reprocesses updates from the neighbors.
- **in | out**—If the in keyword is given, updates from the neighbor are reprocessed. If the out keyword is given, updates are resent to the neighbor. If neither keyword is given, updates are reprocessed in both directions.

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Soft inbound reset causes BGP to send a Route Refresh request to each neighbor being reset. If a neighbor does not support the Route Refresh capability, the updated policy is applied to routes previously received from the neighbor.

When a change is made to an outbound policy, BGP schedules an outbound soft reset to update neighbors according to the new policy.

This command applies to routes for all address families.

When **clear ip bgp** is issued for any peers, any pending policy configuration changes are applied, for all global policy and for all peers.

Command History

Introduced in version 6.2.0.1 firmware. Updated in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

```
console(config-router)#clear ip bgp
```

clear ip bgp counters

Use the **clear ip bgp counters** resets all BGP counters to 0. These counters include send and receive packet and prefix counters for all neighbors.

Syntax

clear ip bgp [**vrf** ***vrf-name***] **counters**

- *vrf-name*—This optional parameter identifies the VRF for which to clear counters. If not given, the default VRF counters are cleared.

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

There are no user guidelines.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config-router)#clear ip bgp counters
```

default-information originate (BGP Router Configuration)

Use the **default-information originate** command to enable BGP to originate a default route.

Syntax

default-information originate [always]

no default-information originate Default Configuration

- **always**—Allows BGP to originate a default route even if the common routing table has no default route.

Default Configuration

By default BGP does not originate a default route. If a default route is redistributed into BGP, BGP does not advertise the default route unless the **default-information originate** command has been given. The **always** option is disabled by default.

Command Mode

BGP Router Configuration mode

User Guidelines

Origination of the default route is not subject to a prefix filter configured with the **distribute-list out** command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#default-information originate
```

default-information originate (IPv6 Address Family Configuration)

Use this command in IPv6 Address Family Config mode to allow BGP to originate an IPv6 default route.

Syntax

default-information originate [**always**]

no default-information originate Default Configuration

- **always**—Allows BGP to originate a default route even if the common routing table has no default route.

Default Configuration

By default BGP does not originate a default route. If a default route is redistributed into BGP, BGP does not advertise the default route unless the **default-information originate** command has been given. The **always** option is disabled by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Origination of the default route is not subject to a prefix filter configured with the **distribute-list out** command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#default-information originate
```

default metric (BGP Router Configuration)

This command sets the value of the Multi Exit Discriminator (MED) attribute on routes redistributed into BGP when no metric has been specified in the **redistribute** command.

Syntax

default-metric *value*

no default-metric

- *value*—The value to as the MED. The range is 1 to 4,294,967,295.

Default Configuration

By default, no default metric is set and no MED is included in redistributed routes.

Command Mode

BGP Router Configuration mode

User Guidelines

There are no user guidelines.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#default-metric 1
```

default metric (IPv6 Address Family Configuration)

This command sets the metric of redistributed IPv6 routes when a metric is not configured in the redistribute command.

Syntax

default-metric *value*

no default-metric

- *value*—The value to as the MED. The range is 1 to 4,294,967,295.

Default Configuration

By default, no default metric is set and no MED is included in redistributed routes.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

There are no user guidelines.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#default-metric 1
```

distance

Use this command to set the preference (also known as administrative distance) of BGP routes to specific destinations.

Syntax

distance *distance* [prefix *wildcard-mask* [*prefix-list*]]

no distance *distance* [prefix *wildcard-mask* [*prefix-list*]]

- *distance*—The preference value for matching routes. The range is 1 to 255.
- *prefix wildcard-mask*— Routes learned from BGP peers whose address falls within this prefix are assigned the configured distance value. The wildcard-mask is an inverted network mask whose 1 bits indicate the don’t care portion of the prefix.
- *prefix-list*—A prefix list can optionally be specified to limit the distance value to a specific set of destination prefixes learned from matching neighbors.

Default Configuration

BGP assigns preference values according to the **distance bgp** command, unless overridden for specific neighbors or prefixes by this command.

Command Mode

BGP Router Configuration mode

User Guidelines

You may enter up to 128 instances of this command. Two instances of this command may not have the same prefix and wildcard mask. If a **distance** command is configured that matches an existing **distance** command’s prefix and wildcard mask, the new command replaces the existing command. There can be overlap between the prefix and mask configured for different commands. When there is overlap, the command whose prefix and wildcard mask are the longest match for a neighbor's address is applied to routes from that neighbor.

An ECMP route's distance is determined by applying **distance** commands to the neighbor that provided the best path.

The **distance** command is not applied to existing routes. To apply configuration changes to the **distance** command itself or the prefix list to which a **distance** command applies, you must force a hard reset of affected neighbors.

Command History

Introduced in version 6.2.0.1 firmware.

Example

To set the preference value of the BGP route to 100.0.0.0/8 from neighbor 10.1.1.1, use the following **distance** command:

```
(R1) (Config)# ip prefix-list pfx-list1 permit 100.0.0.0/8
(R1) (Config)# router bgp 1
(R1) (Config-router)# distance 25 10.1.1.1 0.0.0.0 pfx-list1
```

To set the preference value to 12 for all BGP routes from neighbor 10.1.1.1, use the following distance command:

```
(R1) (Config-router)# distance 12  10.1.1.1  0.0.0.0
```

To set the preference value of all routes within 100.0.0.0/8 from any neighbor, use the following distance command:

```
(R1) (Config)# ip prefix-list pfx-list2 permit 100.0.0.0/8 ge 8
(R1) (Config)# router bgp 1
(R1) (Config-router)#distance 25 0.0.0.0 255.255.255.255 pfx-list2
```

distance bgp (BGP Router Configuration)

Use this command to set the preference (also known as administrative distance) of BGP routes.

Syntax

distance bgp *external-distance internal-distance local-distance*

no distance bgp

- *external-distance*—The preference value for routes learned from external peers. The range is 1 to 255.
- *internal-distance*—The preference value for routes learned from internal peers. The range is 1 to 255.
- *local-distance*—The preference value for locally-originated routes. The range is 1 to 255.

Default Configuration

- external-distance—20
- internal-distance—200
- local-distance—200

Command Mode

BGP Router Configuration mode

User Guidelines

Different distance values can be configured for routes learned from external peers, routes learned from internal peers, and BGP routes locally originated. A route with a lower preference value is preferred to a route with a higher preference value to the same destination. Routes with a preference of 255 may not be selected as best routes and used for forwarding.

The change to the default BGP distances does not affect existing routes. To apply a distance change to existing routes, you must force the routes to be deleted from the RIB and relearned, either by resetting the peers from which the routes are learned or by disabling and re-enabling BGP.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#distance bgp 20 200 200
```

distance bgp (IPv6 Address Family Configuration)

Use this command to set the preference (also known as administrative distance) of BGP routes.

Syntax

distance bgp *external-distance internal-distance local-distance*

no distance bgp

- *external-distance*—The preference value for routes learned from external peers. The range is 1 to 255.
- *internal-distance*—The preference value for routes learned from internal peers. The range is 1 to 255.
- *local-distance*—The preference value for locally-originated routes. The range is 1 to 255.

Default Configuration

- external-distance—20
- internal-distance—200
- local-distance—200

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Different distance values can be configured for routes learned from external peers, routes learned from internal peers, and BGP routes locally originated. A route with a lower preference value is preferred to a route with a higher preference value to the same destination. Routes with a preference of 255 may not be selected as best routes and used for forwarding.

The change to the default BGP distances does not affect existing routes. To apply a distance change to existing routes, you must force the routes to be deleted from the RIB and relearned, either by resetting the peers from which the routes are learned or by disabling and re-enabling BGP.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#distance bgp 20 200 200
```

distribute-list prefix in

Use this command to configure a filter that restricts the routes that BGP accepts from all neighbors based on destination prefix.

Syntax

distribute-list prefix *list-name* **in**

no distribute-list prefix *list-name* **in**

- *list-name*—A prefix list used to filter routes received from all peers based on destination prefix.

Default Configuration

No distribute lists are defined by default.

Command Mode

- BGP Router Configuration mode
- IPv6 Address Family Configuration mode

User Guidelines

The distribute list is applied to all routes received from all neighbors. Only routes permitted by the prefix list are accepted. If the command refers to a prefix list that does not exist, the command is accepted and all routes are permitted.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#distribute-list prefix 255 in
```

distribute-list prefix out (BGP Router Configuration)

Use this command to configure a filter that restricts the advertisement of routes based on destination prefix.

Syntax

distribute-list prefix *list-name* **out** [*protocol* | **connected** | **static**]

no distribute-list prefix *list-name* **out** [*protocol* | **connected** | **static**]

- *prefix list-name*—A prefix list used to filter routes advertised to neighbors.
- *protocol*|**connected**|**static**—(Optional) When a route source is specified, the distribute list applies to routes redistributed from that source. Only routes that pass the distribute list are redistributed. The *protocol* value may be either **rip** or **ospf**.

Default Configuration

No distribute lists are defined by default.

Command Mode

BGP Router Configuration mode

User Guidelines

Only one instance of this command may be defined for each route source (RIP, OSPF, static, connected). One instance of this command may also be configured as a global filter for outbound prefixes.

If the command refers to a prefix list that does not exist, the command is accepted and all routes are permitted.

When a distribute list is added, changed, or deleted for route redistribution, BGP automatically reconsiders all best routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#distribute-list prefix 255 out
```

distribute-list prefix out (IPv6 Address Family Configuration)

Use this command to apply an IPv6 prefix list to IPv6 routes advertised via BGP.

Syntax

distribute-list prefix *list-name* **out** [*protocol* | **connected** | **static**]

no distribute-list prefix *list-name* **out** [*protocol* | **connected** | **static**]

- *prefix list-name*—A prefix list used to filter routes advertised to neighbors.
- *protocol*|**connected**|**static**—(Optional) When a route source is specified, the distribute list applies to routes redistributed from that source. Only routes that pass the distribute list are redistributed. The *protocol* value may be either **rip** or **ospf**.

Default Configuration

No distribute lists are defined by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Only one instance of this command may be defined for each route source (RIP, OSPF, static, connected). One instance of this command may also be configured as a global filter for outbound prefixes.

If the command refers to a prefix list that does not exist, the command is accepted and all routes are permitted.

When a distribute list is added, changed, or deleted for route redistribution, BGP automatically reconsiders all best routes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#distribute-list prefix 255 out
```

enable

This command globally enables BGP, while retaining the configuration.

Syntax

enable

no enable

Default Configuration

By default, BGP is enabled once the administrator has specified the local AS number with the **router bgp** command and configured a router id with **bgp router-id**.

Command Mode

BGP Router Configuration mode

User Guidelines

When disabling BGP using **no enable**, BGP retains its configuration. The **no router bgp** command resets all BGP configuration to default values.

When BGP is administratively disabled, BGP sends a NOTIFICATION message to each peer with a Cease error code.

The **no enable** command persists in the running-config (and startup-config) only when a router-id has assigned using the bgp router-id command. If no router-id has been assigned, the administrative state will not appear in the running-config or in the startup-config.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#enable
```

ip as-path access-list

Use this command to create an AS path access list. To delete an AS path access list, use the **no** form of this command.

Syntax

ip as-path access-list *as-path-list-number* { **permit** | **deny** } *regexp*

no ip as-path access-list *as-path-list-number*

- *as-path-list-number*—A number from 1 to 500 uniquely identifying the list. All AS path access list commands with the same as-path-list-number are considered part of the same list.
- **permit**—Permit routes whose AS Path attribute matches the regular expression.
- **deny**—Deny routes whose AS Path attribute matches the regular expression.
- *regexp*—A regular expression used to match the AS path attribute of a BGP path where the AS path is treated as an ASCII string.

Default Configuration

No AS path lists are configured by default. There are no default values for any of the parameters of this command.

Command Mode

Global Configuration mode

User Guidelines

An AS path access list filters BGP routes on the AS path attribute of a BGP route. The AS path attribute is a list of the autonomous system numbers along the path to the destination. An AS path access list is an ordered sequence of statements. Each statement specifies a regular expression and a permit or deny action. If the regular expression matches the AS path of the route expressed as an ASCII string, the route is considered a match and the statement's action is taken. An AS path list has an implicit deny statement at the end. If a path does not match any of the statements in an AS path list, the action is considered to be deny.

Once an path list is created, individual statements cannot be deleted from it. To remove an individual statement, delete the AS path list and recreate it without the statement to be deleted.

Statements are applied in the order in which they are created. New statements are added to the end of the list. The statement with the first matching regular expression is applied.

Up to 128 AS path access lists can be configured, with up to 64 statements each. To enter the question mark within a regular expression, first enter CTRL-V to prevent the CLI from interpreting the question mark as a request for help.

Special Character/Symbol		Behavior
asterisk	*	Matches zero or more sequences of the pattern.
brackets	[]	Designates a range of single-character patterns.
caret	^	Matches the beginning of the input string.
dollar sign	$	Matches the end of the input string.
hyphen	-	Separates the end points of a range.
period	.	Matches any single character, including white space.
plus sign	+	Matches 1 or more sequences of the pattern.
question mark	?	Matches 0 or 1 occurrences of the pattern.
underscore	_	Matches a comma (,), left brace ({), right brace (}), left parenthesis, right parenthesis, the beginning of the input string, the end of the input string, or a space.

Command History

Introduced in version 6.2.0.1 firmware.

Example

In the following example, the router is configured to reject routes received from neighbor 172.20.1.1 with an AS path that indicates the route originates in or passes through AS 100.

```
console(config)# ip as-path access-list 1 deny _100_
console(config)# ip as-path access-list 1 deny ^100$
console(config)# router bgp 1
```

```
console(config-router)# neighbor 172.20.1.1 remote-as 200
console(config-router)# neighbor 172.20.1.1 filter-list 1 in
```

ip bgp-community new-format

Use this command to display BGP standard communities in AA:NN format. To display BGP standard communities as 32-bit integers, use the **no** form of this command.

Syntax

ip bgp-community new-format

no ip bgp-community new-format

Default Configuration

Standard communities are displayed in AA:NN format.

Command Mode

Global Configuration mode

User Guidelines

RFC 1997 specifies that the first two bytes of a community number are considered to be an autonomous system number. The new format displays a community number as the ASN followed by a 16-bit AS-specific number.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)# ip bgp-community new-format
```

ip bgp fast-external-fallover

Use the **ip bgp fast-external-fallover** command to configure fast external failover behavior for a specific routing interface.

Syntax

ip bgp fast-external-fallover { permit | deny }

no ip bgp fast-external-fallover

- **permit**—Enables fast external fallover on the interface, regardless of the global configuration of the feature.
- **deny**—Disables fast external fallover on the interface, regardless of the global configuration of the feature.

Default Configuration

Fast external fallover is enabled globally by default. There is no default interface configuration.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command overrides for a specific routing interface the fast external fallover behavior configured globally. If **permit** is specified, the feature is enabled on the interface, regardless of the global configuration. If **deny** is specify, the feature is disabled on the interface, regardless of the global configuration. The command **no ip bgp fast-external-fallover** clears the interface settings and indicates that the global settings should be used.

Example

```
console(config-if-vlan1)#ip bgp fast-external-fallover permit
```

ip community-list

Use this command to create or configure a BGP community list. To delete a community list, use the **no** form of this command.

Syntax

ip community-list standard *list-name* {**permit** | **deny**} [*community-number*] [**no-advertise**] [**no-export**] [**no-export-subconfed**] [**no-peer**]

no ip community-list standard *list-name*

- **standard** *list-name*—Identifies a named standard community list. The name may contain up to 32 characters.
- **permit**—Indicates that matching routes are permitted.

- **deny**—Indicates that matching routes are denied.
- *community-number*—From zero to sixteen community numbers formatted as a 32-bit integers or in AA:NN format, where AA is a 2-byte autonomous system number and NN is a 16 bit integer. The range is 1 to 4,294,967,295 (any 32-bit integer other than 0). Communities are separated by spaces.
- **no-advertise**—The well-known standard community: NO_ADVERTISE (0xFFFFFF02), which indicates the community is not to be advertised.
- **no-export**—The well-known standard community: NO_EXPORT, (0xFFFFFF01), which indicates the routes are not to be advertised outside the community.
- **no-export-subconfed**—The well-known standard community: NO_EXPORT_SUBCONFED (0xFFFFFF03), which indicates the routes are not to be advertised to external BGP peers.

Default Configuration

No community lists are configured by default.

Command Mode

Global Configuration mode

User Guidelines

A community list statement with no community values is considered a match for all routes, regardless of their community membership. So the statement

ip community-list bullseye permit

is a "permit all" statement.

A community number may be entered in either format, as a 32-bit integer or a pair of 16-bit integers separated by a colon, regardless of whether the ip bgp-community new-format command is active. Up to 16 communities, including the well-known communities, can be listed in a single command. Up to 32 statements may be configured with a given community list name. Up to 128 unique community list names may be configured.

Successive invocations of the command are additive in that they add to the configured communities up to the maximum.

If more than the maximum allowed communities are configured, the excess entries are ignored.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)# ip community-list standard test permit
```

ip extcommunity-list

Use the **ip extcommunity-list** command to create an extended community list to configure VRF route filtering. Use the **no** form of the command to configure VRF route filtering.

Syntax

ip extcommunity-list *standard-list* [**permit | deny**][**rt** *value*] [**soo** *value*]

no ip extcommunity-list *standard-list*

- *standard-list* — A standard list number from 1 to 99 that identifies one or more permit or deny groups of extended communities.
- **permit | deny**— Permits or denies access for a matching condition. Once a permit value has been configured to match a given set of extended communities, the extended community list defaults to an implicit deny for all other values.
- **rt** *value*— Specifies the route target (RT) extended community value. The route target can be configured only with standard extended community lists. This value can be entered in one of the following formats:
  - 16-bit AS number: a 32-bit value (Ex: 64496:11)
  - 32-bit IPv4 address: a 16-bit value (Ex: 10.1.1.1:22)
  - 32-bit AS number: a 32-bit value (Ex: 65537:60110)
- **soo** *value*— Specifies the site of origin (SOO) extended community value. The site of origin can be configured only with standard extended community lists. This value can be entered in one of the following formats:
  - 16-bit AS number: a 32-bit value (Ex: 64496:11)
  - 32-bit IPv4 address: a 16-bit value (Ex: 10.1.1.1:22)

– 32-bit AS number: a 32-bit value (Ex: 65527:60110)

Default Configuration

No subnets are associated with a BGP listen subnet range, and the BGP dynamic neighbor feature is not activated.

Command Mode

Global Config mode

User Guidelines

This command is used to configure numbered extended community lists. Extended community attributes are used to filter routes for VRFs. All the standard rules of access lists apply to the configuration of extended community lists. The route target (RT) and site of origin (SOO) extended community attributes are supported by the standard range of extended community lists.

Once the first permit/deny clause has been entered for a community list, subsequent permit/deny clauses with the same list identifier are appended to the end of the list.

Expanded community list and regular expressions are not supported.

Route Target Extended Community Attribute

The route target (RT) extended communities attribute is configured with the **rt** keyword. This attribute is used to identify a set of sites and VRFs that may receive routes that are tagged with the configured route target. Configuring the route target extended attribute with a route allows that route to be placed in the per-site forwarding tables that are used for routing traffic that is received from corresponding sites.

Site of Origin Extended Community Attribute

The site of origin (SOO) extended communities attribute is configured with the **soo** keyword. This attribute uniquely identifies the site from which the provider edge (PE) router learned the route. All routes learned from a particular site must be assigned the same site of origin extended community attribute, regardless if a site is connected to a single PE router or multiple PE routers. Configuring this attribute prevents routing loops from occurring when a site is multi-homed. The SOO extended community attribute is configured using a route map in both outbound and inbound directions. The SOO should not be configured for stub sites or sites that are not multi-homed

Command History

Introduced in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

The following example shows the creation of an extended community list that permits routes from route target 1:1 and site of origin 2:2 and denies routes from route target 3:3 and 4:4.

```
(R1)(Config)# ip extcommunity-list 10 permit rt 1:1
(R1)(Config)# ip extcommunity-list 10 permit rt 2:2
(R1)(Config)# ip extcommunity-list 20 deny rt 3:3 rt 4:4
```

List 10 shows a logical OR condition which means the first match is processed.

List 20 shows a logical AND condition which means all the community values must match in order for list 20 to be processed.

The following example show how the extended communities list is used by route-maps.

```
(R1)(config)# route-map SEND_OUT permit 10
(R1)(config-route-map)# match extcommunity 10
(R1)(config-route-map)# set extcommunity rt 10:10 additive
(R1)(config-route-map)# exit
```

The following example shows the usage of extended communities attribute in BGP configuration mode and sending of the extended communities attribute to external peer at 1.1.1.1.

```
(R1)(Config)# router bgp 1
(R1)(Config-router)# neighbor 1.1.1.1 remote-as 2
(R1)(Config-router)# neighbor 1.1.1.1 route-map SEND_OUT out
(R1)(Config-router)# address-family vpnv4 unicast
(R1)(Config-router-af)# neighbor 1.1.1.1 send-community extended
(R1)(Config-router-af)# neighbor 1.1.1.1 activate
```

match extcommunity

Use the **match extcommunity** command to match BGP extended community list attributes. Use the **no** form of this command to remove the match extcommunity from the configuration and BGP extended community list attribute entry.

NOTE: This command is effective only if BGP is running on the router.

Syntax

match extcommunity *standard-list*

no match extcommunity *standard-list*

- *standard-list*—A standard list identifier that identifies one or more permit or deny groups of extended communities. The range if from 0–100.

Default Configuration

BGP extended community list attributes are not matched.

Command Mode

Route Map Configuration mode

User Guidelines

The match extcommunity command is used to configure match clauses that use extended community attributes in route maps. All the standard rules of match and set clauses apply to the configuration of extended community attributes.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows that the routes that match extended community list 10 will set the additional route target attribute to 10:10.

```
(R1)(config)# ip extcommunity-list 10 permit rt 1:1
(R1)(config)# route-map SEND_OUT permit 10
(R1)(config-route-map)# match extcommunity 10
(R1)(config-route-map)# set extcommunity rt 10:10 additive
```

```
(R1)(config-route-map)# exit
```

maximum-paths (BGP Router Configuration)

Use this command to specify the maximum number of next hops BGP may include in an Equal Cost Multipath (ECMP) route derived from paths received from neighbors outside the local autonomous system.

Syntax

maximum-paths *number-of-paths*

no maximum-paths

- *number-of-paths*—The maximum number of next hops in a BGP route. The range is from 1 to 32 unless the platform or currently selected SDM template further restricts the range.

Default Configuration

BGP advertises a single next hop by default.

Command Mode

BGP Router Config

User Guidelines

Paths are considered for ECMP when their attributes are the same (local preference, AS path, origin, MED, peer type and IGP distance). When BGP uses multiple paths in an ECMP route, BGP still selects one path as the best path and advertises only that path to its peers.

Refer to Appendix A-1 in the *Users Configuration Guide* for the default per platform ECMP ranges using the entry "Number of ECMP next hops per route." The number of ECMP next hops is dependent on the chosen STM template and may be greater or lesser than the default. Use the **show sdm prefer** command to display the ECMP Next Hops for the currently selected template.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#maximum-paths 5
```

maximum-paths (IPv6 Address Family Configuration)

Use this command to limit the number of ECMP next hops in IPv6 routes from external peers.

Syntax

maximum-paths *number-of-paths*

no maximum-paths

- *number-of-paths*—The maximum number of next hops in a BGP route. The range is from 1 to 32 unless the platform or SDM template further restricts the range.

Default Configuration

BGP advertises a single next hop by default.

Command Mode

IPv6 Address Family Configuration

User Guidelines

Paths are considered for ECMP when their attributes are the same (local preference, AS path, origin, MED, peer type and IGP distance). When BGP uses multiple paths in an ECMP route, BGP still selects one path as the best path and advertises only that path to its peers.

The following ranges are supported:

- N40xx—1-4
- N30xx—1-16
- N20xx—1-1

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#maximum-paths 5
```

maximum-paths ibgp (BGP Router Configuration)

Use this command to specify the maximum number of next hops BGP may include in an Equal Cost Multipath (ECMP) route derived from paths received from neighbors within the local autonomous system.

Syntax

maximum-paths ibgp *number-of-paths*

no maximum-paths ibgp

- *number-of-paths*—The maximum number of next hops in a BGP router. The range is from 1 to 32 unless the platform or SDM template further restricts the range.

Default Configuration

BGP uses a single next hop by default.

Command Mode

BGP Router Configuration mode

User Guidelines

Paths are considered for ECMP when their attributes are the same (local preference, AS path, origin, MED, and IGP distance) and the paths are received from different routers.When BGP uses multiple paths in an ECMP route, BGP still selects one path as the best path and advertises only that path to its peers.

The following ranges are supported in the default SDM template:

- N40xx 1-4
- N30xx 1-4
- N20xx 1-1

Configure the data-center version of the desired SDM template to increase the ECMP paths.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#maximum-paths ibgp 5
```

maximum-paths ibgp (IPv6 Address Family Configuration)

Use this command to limit the number of ECMP next hops in IPv6 routes from internal peers.

Syntax

maximum-paths ibgp *number-of-paths*

no maximum-paths ibgp

- *number-of-paths*—The maximum number of next hops in a BGP router. The range is from 1 to 32 unless the platform or SDM template further restricts the range.

Default Configuration

BGP uses a single next hop by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Paths are considered for ECMP when their attributes are the same (local preference, AS path, origin, MED, and IGP distance) and the paths are received from different routers.When BGP uses multiple paths in an ECMP route, BGP still selects one path as the best path and advertises only that path to its peers.

The following ranges are supported in the default SDM template:

- N40xx 1-4
- N30xx 1-4

- N20xx 1-1

Configure the data-center version of the desired SDM template to increase the ECMP paths.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#maximum-paths ibgp 5
```

neighbor activate

Use this command to enable the exchange of IPv6 routes with a neighbor. To disable the exchange of IPv6 addresses, use the **no** form of this command.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* }} **activate**

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* }} **activate**

- *ip-address*—The IP address of a peer.
- *ipv6-address*—The IPv6 address of a peer.
- *interface-id* — If the neighbor's IPv6 address is a link local address, the local interface must also be specified. This must be a VLAN routing interface and is specified using the VLAN keyword.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface. Range is 1–4093.

Default Configuration

The exchange of IPv6 routes is disabled by default.

Command Mode

IPv4 Address Family Configuration mode, IPv6 Address Family Configuration mode

User Guidelines

The neighbor address must be the same IP address used in the neighbor remote-as command to create the peer.

When IPv6 is enabled or disabled for a neighbor, the adjacency is brought down and restarted to communicate to the change to the peer. Completely configure IPv6 policy for the peer before activating the peer.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

The following example enables the exchange of IPv6 routes with the external peer at 172.20.1.2 and sets the next hop for IPv6 routes sent to that peer.

```
console (config)# router bgp 1
console (config-router)# neighbor 172.20.1.2 remote-as 2
console (config-router)# address-family ipv6
console (Config-router-af)# neighbor 172.20.1.2 activate
console (Config-router-af)# neighbor 172.20.1.2 route-map SET-V6-NH out
console (Config-router-af)# exit
console (config-router)# exit
console (config)# route-map SET-V6-NH permit 10
console (route-map)# set ipv6 next-hop 2001:1:200::1
```

neighbor advertisement-interval (BGP Router Configuration)

Use this command to configure the minimum time that must elapse between advertisements of the same route to a given neighbor.

Syntax

neighbor { *ip-address* [**interface** *interface-id*]} **advertisement-interval** *seconds*

no neighbor { *ip-address* [**interface** *interface-id*]} **advertisement-interval**

- *interface-id*—A routing interface identifier.
- *ip-address*—The neighbor's IPv4 address.

- *seconds*—The minimum time between route advertisement, in seconds. The range is 0 to 600 seconds.

Default Configuration

The default value is 30 seconds for external peers and 5 seconds for internal peers.

Command Mode

BGP Router Configuration mode

User Guidelines

RFC 4271 recommends the interval for internal peers be shorter than the interval for external peers to enable fast convergence within an autonomous system. This value does not limit the rate of route selection, only the rate of route advertisement. If BGP changes the route to a destination multiple times while waiting for the advertisement interval to expire, only the final result is advertised to the neighbor.

Dell EMC Networking BGP enforces the advertisement interval by limiting how often phase 3 of the decision process can run for each update group. The interval applies to withdrawals as well as active advertisements.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)# neighbor 10.27.9.99 advertisement-interval 100
```

neighbor advertisement-interval (IPv6 Address Family Configuration)

In IPv6 Address Family mode, this command controls the time between sending Update messages containing IPv6 routes.

Syntax

neighbor { *ipv6-address* [**interface** *interface-id*]} **advertisement-interval** *seconds*

no neighbor { *ipv6-address* [**interface** *interface-id*]} **advertisement-interval**

- *interface-id*—A routing interface identifier.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *seconds*—The minimum time between route advertisement, in seconds. The range is 0 to 600 seconds.

Default Configuration

The default value is 30 seconds for external peers and 5 seconds for internal peers.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

RFC 4271 recommends the interval for internal peers be shorter than the interval for external peers to enable fast convergence within an autonomous system. This value does not limit the rate of route selection, only the rate of route advertisement. If BGP changes the route to a destination multiple times while waiting for the advertisement interval to expire, only the final result is advertised to the neighbor.

Dell EMC Networking BGP enforces the advertisement interval by limiting how often phase 3 of the decision process can run for each update group. The interval applies to withdrawals as well as active advertisements. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan
10 advertisement-interval 50
```

neighbor allowas-in

Use the **neighbor allowas-in** command to accept prefixes even if local ASN is part of the AS_PATH attribute. Use the **no** form of the command to disable acceptance of prefixes if the local ASN is part of the AS_PATH.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface vlan** *vlan-id* } **allowas-in** *count*

no neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id* } **allowas-in**

- *interface-id* **—** A routing interface identifier beginning with the VLAN keyword.
- *ip-address* **—** The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] **—** The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **autodetect interface** *interface-id* **—** The VLAN routing interface on which the neighbor's link local IPv6 address is auto detected. Use the **vlan** keyword and a VLAN identifier.
- **allowas-in** *count* **—** The maximum number of occurrences of the local ASN allowed in the AS_PATH attribute received in the prefix updates. The allowed range is <1-10>.

Default Configuration

The router does not accept prefixes with the local ASN is part of the AS_PATH attribute.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

A neighbor can inherit this configuration from a peer template.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# router bgp 65000
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.1.2 allowas-in 1
console(config-router)# neighbor 2001::2 remote-as 65003
console(config-router)# neighbor 2001::2 allowas-in 3
```

neighbor connect-retry-interval

Use this command in to configure the initial connection retry time for a specific neighbor.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id*} **connect-retry-interval** *retry-time*

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id*} **connect-retry-interval**

- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. The interface must be a VLAN routed interface.
- **interface** *interface-id*—A routing interface identifier (VLAN identifier).
- **autodetect interface** *interface-id*—The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface must be a VLAN routed interface.
- *retry-time*—The number of seconds to wait before attempting to establish a TCP connection with a neighbor after a previous attempt failed.

Default Configuration

The default value is 2 seconds.

Command Mode

BGP Router Configuration mode

IPv4 Address Family Configuration mode

User Guidelines

If a neighbor does not respond to an initial TCP connection attempt, the switch retries three times. The first retry is after the retry interval configured with **neighbor connect-retry-interval**. Each subsequent retry doubles the previous retry interval. So by default, the TCP connection is retried after 2, 4, and 8 seconds. If none of the retries is successful, the adjacency is reset to the IDLE state and the IDLE hold timer is started. BGP skips the retries and transitions to IDLE state if TCP returns an error, such as destination unreachable, on a connection attempt. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
connect-retry-interval 10
```

neighbor default-originate (BGP Router Configuration)

To configure BGP to originate a default route to a specific neighbor, use the **neighbor default-originate** command in BGP Router Configuration mode.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*]} **default-originate** [**route-map** *map-name*]

- *interface-id*—A routing interface identifier (VLAN interface).
- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* —The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *map-name*—(Optional) A route map may be configured to set attributes on the default route advertised to the neighbor.

Default Configuration

No default is originated by default.

Command Mode

BGP Router Configuration mode

User Guidelines

By default, a neighbor-specific default has no MED and the Origin is IGP. Attributes may be set using an optional route map. A neighbor-specific default is only advertised if the Adj-RIB-Out does not include a default learned by other means, either from the default-information originate (BGP Router Configuration) command or a default learned from a peer. This type of default origination is not conditioned on the presence of a default route in the routing table. This form of default origination does not install a default route in the BGP routing table (it will not appear in the show ip bgp command), nor does it install a default route in the Adj-RIB-Out for the update group of peers so configured (it will not appear in the show ip bgp neighbors advertised-routes command).

Origination of the default route is not subject to a prefix filter configured with the command distribute-list prefix out (BGP Router Configuration).

A route map may be configured to set attributes on the default route sent to the neighbor. If the route map includes a **match ip-address** term, that term is ignored. If the route map includes **match community** or **match as-path** terms, the default route is not advertised. If there is no route map with the route map name given, the default route is not advertised. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
default-originate
```

neighbor default-originate (IPv6 Address Family Configuration)

To configure BGP to originate a default IPv6 route to a specific neighbor, use the **neighbor default-originate** command in IPv6 Address Family configuration mode.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] } **default-originate** [**route-map** *map-name*]

- interface-id—A routing interface identifier (VLAN interface).
- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* —The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *map-name*—(Optional) A route map may be configured to set attributes on the default route advertised to the neighbor.

Default Configuration

No default is originated by default.

Command Mode

IPv6 Address Family Configuration

User Guidelines

By default, a neighbor-specific default has no MED and the Origin is IGP. Attributes may be set using an optional route map. A neighbor-specific default is only advertised if the Adj-RIB-Out does not include a default learned by other means, either from the default-information originate (BGP Router Configuration) command or a default learned from a peer. This type of default origination is not conditioned on the presence of a default route in the routing table. This form of default origination does not install a default route in the BGP routing table (it will not appear in the show ip bgp command), nor does it install a default route in the Adj-RIB-Out for the update group of peers so configured (it will not appear in the show ip bgp neighbors advertised-routes command).

Origination of the default route is not subject to a prefix filter configured with the command distribute-list prefix out (BGP Router Configuration).

A route map may be configured to set attributes on the default route sent to the neighbor. If the route map includes a **match ip-address** term, that term is ignored. If the route map includes **match community** or **match as-path** terms, the default route is not advertised. If there is no route map with the route map name given, the default route is not advertised. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan
10 default-originate
```

neighbor description

Use this command to record a text description of a neighbor. The description is informational and has no functional impact.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id* } **description** *text*

no neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*]**autodetect interface** *interface-id* } **description**

- *interface-id*—A routing interface identifier (VLAN interface).
- *ip-address*—The neighbor's IP address.
- *ipv6-address* [**interface** *interface-id*]—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. The *interface-id* must specify a routing interface identifier (VLAN ID).
- *text*—Text description of neighbor. Up to 80 characters are allowed.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface.

Default Configuration

No description is configured by default.

Command Mode

BGP Router Configuration mode

IPv4 Address Family Configuration mode

User Guidelines

The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
description Test-System
```

neighbor ebgp-multihop

Use the **neighbor ebgp-multihop** command to configure BGP to form neighborship with external peers that are not directly connected.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* } **ebgp-multihop** *hop-count*

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* } **ebgp-multihop** *hop-count*

- *ip-address* — The neighbor's IPv4 address. This is the IP address of the neighbor on the connected link.
- *ipv6-address* — The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. Valid in IPv6 address family configuration mode.

- **interface** *interface-id* —The local VLAN routing interface over which the IPv6 neighbor can be reached or is auto-detected. Use the vlan keyword and a VLAN ID. Range 1-4093.
- **autodetect interface** *interface-id* — The VLAN routing interface on which the neighbor's link local IPv6 address is auto detected. Use the vlan keyword and a VLAN ID. Range 1-4093.
- *hop-count* — The maximum hop-count allowed to reach the neighbor. The allowed range is 1–255.

Default Configuration

The default hop count is 64.

Command Mode

BGP Router Configuration mode, IPv6 Address Family Configuration mode

User Guidelines

The ebgp-multihop parameter is relevant only for external BGP neighbors. For internal BGP neighbors, the TTL value remains 64 and can't be modified. A neighbor can inherit this configuration from a peer template. To make the update-source config work for external BGP neighbors, **ebgp-multihop hop-count** should be configured to a TTL value larger than the default TTL of 1.

Autodetect Interface

When BGP is deployed in an IPv6 data center network, it is desirable to use IPv6 link local addresses as BGP neighbors. Using link local addresses avoids the need to assign and manage global IPv6 addresses on interconnect links.

Dell EMC Networking already supports BGP neighbors with link local IPv6 addresses, but it requires that the link local IPv6 address of the neighbor be configured using the BGP "neighbor" command. Since the link local address is derived from the switch MAC address, the network administrator needs to know the MAC address of all the switches deployed in the network, and if one switch fails and is replaced with a different switch then all the BGP neighbor switches need to be reconfigured to change the link local address specified in their neighbor commands.

The IPv6 Link Local Address Auto Detect feature eliminates the need for the network administrator to configure the link local IPv6 address of every neighbor. Instead of specifying the link local IPv6 address, the network administrator can use a special keyword "autodetect" to refer to the link local IPv6 address of the neighbor. For example: "neighbor autodetect interface 0/21 remote-as 10000"

There are several restrictions to this feature:

1. The "interface" can only refer to non-multiple access VLAN routing interfaces. It does not work on tunnels.
2. Only one "autodetect" neighbor can be configured per interface.
3. If autodetect neighbor is configured on an interface, a link-local IPv6 neighbor cannot be configured on the same interface.
4. If more than one link local IPv6 address is detected on the specified interface, this is considered to be an error and the address auto-detection fails.
5. The feature is supported only on platforms that also support the RFC 5549.
6. The feature is applicable only for directly connected neighbors.
7. Multiple access VLANs are not supported.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# router bgp 65000
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.1.2 ebgp-multihop 3
console(config-router)# neighbor 2001::2 remote-as 65003
console(config-router)# neighbor 2001::2 ebgp-multihop 4
```

neighbor filter-list (BGP Router Configuration)

This command filters advertisements to or from a specific neighbor according to the advertisement's AS Path.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **filter-list** *as-path-list-number* {**in** | **out**}

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **filter-list** *as-path-list-number* {**in** | **out**}

- *interface-id*—A routing interface identifier (VLAN interface).
- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* —The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *as-path-list-number* —Identifies an AS path list.
- **in**—The AS Path list is applied to advertisements received from the neighbor.
- **out**—The AS Path list is applied to advertisements to be sent to the neighbor.

Default Configuration

No neighbor filter lists are configured by default.

Command Mode

BGP Router Configuration mode

User Guidelines

Only a single AS path list can be configured in each direction for each neighbor. If you invoke the command a second time for a given neighbor, the new AS path list number replaces the previous AS path list number.

If you assign a neighbor filter list to a nonexistent AS path access list, all routes are filtered. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
filter-list 1 in
```

neighbor filter-list (IPv6 Address Family Configuration)

This command filters BGP to apply an AS path access list to UPDATE messages received from or sent to a specific neighbor. Filtering for IPv6 is independent of filtering configured for IPv4. If an UPDATE message includes both IPv4 and IPv6 NLRI, it could be filtered for IPv4 but accepted for IPv6 or vice versa.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **filter-list** *as-path-list-number* {**in** | **out**}

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **filter-list** *as-path-list-number* {**in** | **out**}

- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*]—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *as-path-list-number* —Identifies an AS path list.
- **in**—The AS Path list is applied to advertisements received from the neighbor.
- **out**—The AS Path list is applied to advertisements to be sent to the neighbor.

Default Configuration

No neighbor filter lists are configured by default.

Command Mode

BGP Router Configuration mode

User Guidelines

If you assign a neighbor filter list to a nonexistent AS path access list, all routes are filtered. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan
10 filter-list 1 in
```

neighbor inherit peer

To configure a BGP peer to inherit peer configuration parameters from a peer template, use the **neighbor inherit peer** command. To remove the inheritance, use the **no** form of this command.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]] | **autodetect interface** *interface-id*} **inherit peer** *template-name*

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id*} **inherit peer** *template-name*

- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*]—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **autodetect interface** *interface-id* – The VLAN routing interface on which the neighbor's link local IPv6 address is auto detected.
- *template-name*—The name of the peer template whose peer configuration parameters are to be inherited by this neighbor.

Default Configuration

No peer configuration parameters are inherited by default.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

Neighbor session and policy parameters can be configured once in a peer template and inherited by multiple neighbors, eliminating the need to configure the same parameters for each neighbor. Parameters are inherited from the peer template specified and from any templates it inherits from. A neighbor can inherit directly from only one peer template.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config)# router bgp 65000
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.2.2 remote-as 65001
console(config-router)# template peer AGGR
console(config-rtr-tmp)# timers 3 9
console(config-rtr-tmp)# address-family ipv4
console(config-rtr-tmp-af)# send-community
console(config-rtr-tmp-af)# route-map RM4-IN in
console(config-rtr-tmp-af)# route-map RM4-OUT out
console(config-rtr-tmp-af)# exit
console(config-rtr-tmp)# exit
console(config-router)# neighbor 172.20.1.2 inherit peer AGGR
console(config-router)# neighbor 172.20.2.2 inherit peer AGGR
```

neighbor local-as

Use the **neighbor local-as** command to configure BGP to advertise the local-as instead of the router's own AS in the routes advertised to the neighbor.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface vlan** *vlan-id* } **local-as** *as-number* **no-prepend replace-as no neighbor** { *ip-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* } **local-as**

- interface-id—A routing interface identifier (VLAN interface).

- *ip-address* **—** The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] **—** The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **autodetect interface** *interface-id* **—** The VLAN routing interface on which the neighbor's link local IPv6 address is auto detected.
- **local-as** *as-number* **—** The AS number to advertise as the local AS in the AS PATH sent to the neighbor. The *as-number* is the router's autonomous system number in asplain format. Dell EMC Networking BGP supports four byte AS numbers, in the range of 0-429496729.
- **no-prepend —** The local-as is not prepended in the AS PATH received in the updates from this neighbor.
- **replace-as** — Replace the router's own AS with the local-as in the AS PATH sent to the neighbor.

Default Configuration

No local-as is configured for any peer.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

In typical data center deployments using CLOS networks, the peering is all external BGP between the BGP devices requiring an unique ASN for each router. Normally, the private BGP networks are expected to use private AS numbers. But, there are only 1024 private AS numbers in the standard 2-byte ASN.

Due to this limitation, data center deployments are forced to use public ASNs in their private networks. When such private networks are interconnected to each other, there needs to be a way to manipulate the public ASNs in the route advertisements so that the private networks with the public ASNs don't experience ASN conflicts.

With the options *no-prepend* and *replace-as*

- The router replaces the global AS of the router with the configured *local-as* when advertising the routes to the peer on which this command is configured.
- As well the *local-as* is not prepended to the routes received from the neighbor on which this command is configured.

This command is allowed only on external BGP neighbors. A neighbor can inherit this configuration from a peer template.

When the local-as is configured for a peer, the BGP peer adjacency gets reset.

Command History

Introduced in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

```
console(config)#router bgp 65000
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.1.2 local-as 65002 no-prepend
replace-as
console(config-router)# neighbor 2001::2 remote-as 65003
console(config-router)# neighbor 2001::2 local-as 65002 no-prepend replace-
as
```

neighbor maximum-prefix (BGP Router Configuration)

Use the **neighbor maximum-prefix** command to configure the maximum number of IPv4 prefixes that BGP will accept from a specified neighbor.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **maximum-prefix** { **maximum** [*threshold*] [**warning-only**] | **unlimited** }

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **maximum-prefix**

- *ip-address*—The neighbor's IP address.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.

- *interface-id*—If the neighbor's IPv6 address is a link local address, the local VLAN routing interface must also be specified.
- **maximum**—The maximum number of prefixes BGP will accept from this neighbor. Range 0-4294967295. Values greater than the free space in the route table are not enforced.
- *threshold*—The percentage of the maximum number of prefixes BGP configured for this neighbor. When the number of prefixes received from the neighbor exceeds this percentage of the maximum, BGP writes a log message. The range is 1 to 100 percent. The default is 75%. Unless warning-only is specified, BGP shuts down the adjacency when the threshold is reached.
- **unlimited—**Do not enforce any prefix limit. Use this option when inbound filtering will reduce the number received prefixes such that they will fit in the routing table. Exceeding the capacity of the routing table will cause the adjacency to be shut down unless the warning-only option is configured.
- **warning-only—**(Optional) If BGP receives more than the maximum number of prefixes, BGP writes a log message rather than shutting down the adjacency.

Default Configuration

There is no prefix limit by default. The default warning threshold is 75%. A neighbor that exceeds the limit is shut down by removing the adjacency unless the **warning-only** option is configured.

Command Mode

BGP Router Configuration mode

User Guidelines

If the peering session is shut down, the adjacency stays down until **clear ip bgp** is issued for the neighbor.

Different limits can be set for IPv4 and IPv6. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
maximum-prefix unlimited
```

neighbor maximum-prefix (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **neighbor maximum-prefix** command specifies the maximum number of IPv6 prefixes that BGP will accept from a given neighbor.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **maximum-prefix** { **maximum** [*threshold*] [**warning-only**] | **unlimited** }

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **maximum-prefix**

- *ip-address*—The neighbor's IP address.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- *interface-id*—If the neighbor's IPv6 address is a link local address, the local VLAN routing interface must also be specified.
- **maximum**—The maximum number of prefixes BGP will accept from this neighbor. Range 0-4294967295. Values greater than the free space in the route table are not enforced.
- *threshold*—The percentage of the maximum number of prefixes BGP configured for this neighbor. When the number of prefixes received from the neighbor exceeds this percentage of the maximum, BGP writes a log message. The range is 1 to 100 percent. The default is 75%. Unless warning-only is specified, BGP shuts down the adjacency when the threshold is reached.

- **unlimited—**Do not enforce any prefix limit. Use this option when inbound filtering will reduce the number received prefixes such that they will fit in the routing table. Exceeding the capacity of the routing table will cause the adjacency to be shut down unless the warning-only option is configured.
- **warning-only—**(Optional) If BGP receives more than the maximum number of prefixes, BGP writes a log message rather than shutting down the adjacency.

Default Configuration

There is no prefix limit by default. The default warning threshold is 75%. A neighbor that exceeds the limit is shut down by removing the adjacency unless the **warning-only** option is configured.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

If the peering session is shut down, the adjacency stays down until **clear ip bgp** is issued for the neighbor.

Different limits can be set for IPv4 and IPv6. In IPv6 address family mode, the command accepts either an IPv4 or an IPv6 address. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan
10 maximum-prefix unlimited
```

neighbor next-hop-self (BGP Router Configuration)

The **neighbor next-hop-self** command configures BGP to set the next hop attribute to a local IP address when advertising a route to an internal peer. Normally, BGP retains the next hop attribute received from the external peer.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **next-hop-self**

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **next-hop-self**

- *ip-address* – The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] – The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.

Default Configuration

This is not enabled by default.

Command Mode

BGP Router Configuration mode

User Guidelines

When the next hop attribute in routes from external peers is retained, internal peers must have a route to the external peer's IP address. This is commonly done by configuring the IGP on the border router to advertise the external (or "DMZ") subnet. The **next-hop-self** option eliminates the need to advertise the external subnet in the IGP. The **neighbor next-hop-self** command sets the next hop for all routes sent to a neighbor. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
next-hop-self
```

neighbor next-hop-self (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **neighbor next-hop-self** command configures BGP to use a local address as the IPv6 next hop when advertising IPv6 routes to a specific peer.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **next-hop-self**

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **next-hop-self**

- *ip-address* – The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] – The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.

Default Configuration

This is not enabled by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

When the next hop attribute in routes from external peers is retained, internal peers must have a route to the external peer's IP address. This is commonly done by configuring the IGP on the border router to advertise the external (or "DMZ") subnet. The **next-hop-self** option eliminates the need to advertise the external subnet in the IGP.

In IPv6 Address Family Configuration mode, the command accepts either an IPv4 or an IPv6 address. For IPv6, BGP uses an IPv6 address from the local interface that terminates the peering session. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan
10 next-hop-self
```

neighbor password

Use the **neighbor password** command to enable MD5 authentication of TCP segments sent to and received from a neighbor, and to configure an authentication key.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id* } **password** *string*

no neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id*} **password**

- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] – The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. The *interface-id* must specify a routing interface identifier (VLAN ID).
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface.
- *string*—Case-sensitive password from 1 to 25 characters in length.

Default Configuration

MD5 authentication is disabled by default.

Command Mode

BGP Router Configuration mode

IPv4 Address Family Configuration mode

User Guidelines

MD5 must either be enabled or disabled on both peers. The same password must be configured on both peers. After a TCP connection is established, if the password on one end is changed, then the password on the other end must be changed to match before the hold time expires. Using the default hold times, both passwords must be changed within 120 seconds to guarantee the connection is not dropped. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
password sample
```

neighbor prefix-list (BGP Router Configuration)

Use the **neighbor prefix-list** command to filter advertisements sent to a specific neighbor based on the destination prefix of each route.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **prefix-list** *prefix-list-name* { **in** | **out** }

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **prefix-list** *prefix-list-name* { **in** | **out** }

- *ip-address*—The neighbor's IPv4 address.
- *prefix-list-name*—The name of an IP prefix list.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. This command is available in IPv6 address family mode.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range: 1-4093.
- **in**—Apply the prefix list to advertisements received from this neighbor.

- **out**—Apply the prefix list to advertisements to be sent to this neighbor.

Default Configuration

No prefix list is configured.

Command Mode

BGP Router Configuration mode

User Guidelines

Only one prefix list may be defined for each neighbor in each direction. If a prefix list that does not exist is assigned, all prefixes are permitted. The VLAN interface must also be specified if a link-local address is specified.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor FE80::0202:B3FF:FE1E:8329 interface vlan 10
prefix-list test in
```

neighbor prefix-list (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **neighbor prefix-list** command specifies an IPv6 prefix list to filter routes received from or advertised to a given peer.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **prefix-list** *prefix-list-name* { **in** | **out** }

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **prefix-list** *prefix-list-name* { **in** | **out** }

- *ip-address*—The neighbor's IPv4 address.
- *prefix-list-name*—The name of an IP prefix list.

- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. This command is available in IPv6 address family mode.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range: 1-4093.
- **in**—Apply the prefix list to advertisements received from this neighbor.
- **out**—Apply the prefix list to advertisements to be sent to this neighbor.

Default Configuration

No prefix list is configured.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

Only one prefix list may be defined for each neighbor in each direction. If a prefix list that does not exist is assigned, all prefixes are permitted.

In IPv6 address family mode, the command accepts either an IPv4 or an IPv6 address.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor 10.130.14.55 prefix-list test in
```

neighbor remote-as

Use the **neighbor remote-as** command to configure a neighbor and identify the neighbor's autonomous system.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*] | **autodetect interface** *interface-id* } **remote-as** *as-number*

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*] | **autodetect interface** *interface-id* } **remote-as**

- *ip-address*—The neighbor's IPv4 address. For external peers, this address must be an IPv4 address on the link that connects the two peers. For internal peers, the neighbor address can be any address, such as the IPv4 address of a loopback interface.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. This command is available in IPv6 address family mode.
- **interface vlan** *vlan-id*—The local routing interface/VLAN ID over which the IPv6 neighbor can be reached. Range: 1-4093.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface. Range is 1–4093.
- **remote-as** *as-number*—The router's autonomous system number of the neighbor's AS in asplain format. Dell EMC Networking BGP supports four byte AS numbers, in the range of 0-429496729. If the neighbor's AS number is the same as the local router and the peer is considered an internal peer. Otherwise, the peer is an external peer.

Default Configuration

No neighbors are configured by default.

Command Mode

BGP Router Configuration mode

IPv4 Address Family Configuration mode

User Guidelines

Up to 100 neighbors can be configured.

Command History

Introduced in version 6.2.0.1 firmware. Updated in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 remote-as 10
```

neighbor remove-private-as

Use the **neighbor remove-private-as** command to remove private AS numbers when advertising IPv4 routes to an external peer. To stop removing private AS numbers, use the **no** form of this command.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **remove-private-as** [**all replace-as**]

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **remove-private-as**

- *ip-address* – The neighbor's IPv4 address.
- *ipv6-address*– The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **interface vlan** *vlan-id* – The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range 1-4093.
- **all replace-as** – (Optional) To retain the original AS path length, replace each private AS number with the local AS number.

Default Configuration

Private AS numbers are not removed by default.

Command Mode

BGP Router Configuration mode

User Guidelines

This command can only be applied to external peers. Private AS numbers are removed or replaced whether or not the original AS path includes any non-private AS numbers. The AS path advertised to the external peer always includes at least one instance of the local AS number; therefore, removing private AS numbers never results in advertisement of an empty AS_PATH attribute. AS numbers from 64512 to 65535 inclusive are considered private. Although 65535 is a reserved ASN and not technically part of the private range, it is treated as a private ASN when removing or replacing private ASNs. ASNs in the range 64496-64511 and 65536-65551 are for documentation purposes only and should never be used in a network.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 remove-private-as
```

neighbor rfc5549-support

Use the **neighbor rfc5549-support** command to enable advertisement of IPv4 routes over IPv6 next hops selectively to an external BGP IPv6 peer. To disable advertisement of these routes, use the **no** form of this command.

Syntax

neighbor { *ipv6-address* | **autodetect interface** *interface-id* } **rfc5549-support**

no neighbor { *ipv6-address* | **autodetect interface** *interface-id* } **rfc5549-support**

- interface-id—A routing interface identifier (VLAN interface).
- *ipv6-address* — The neighbor's IPv6 address.
- autodetect interface *interface-id* — The routing interface on which the neighbor's link local IPv6 address is auto detected.

Default Configuration

RFC 5549 support is enabled by default for all neighbors.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

This command can only be applied to external BGP peers via a single hop.

The Next Hop Address advertised for the IPv4 prefixes consists of the link-local IPv6 address and the global IPv6 address (if configured on the interface).

When the Extended Next Hop Encoding capability is not received from a neighbor, Dell EMC Networking does not advertise the RFC 5549 routes to the neighbor. The Dell EMC Networking solution is interoperable with routers that do not support RFC 5549.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example results in the connected IPv4 networks 1.1.1.0/24 and 2.2.2.0/24 advertised with next hop set to 2001::1 only to eBGP IPv6 peer 2001::2 and not to eBGP peer 2002::2.

```
console(config)#ip routing
console(config)#ipv6 unicast-routing
console(config)#vlan 10,20,30
console(config-vlan10,20,30)#exit
console(config)#interface vlan 10
console(config-if-vlan10)#ipv6 enable
console(config-if-vlan10)#ipv6 address 2001::1/64
console(config-if-vlan10)#exit
console(config)#interface vlan 20
console(config-if-vlan20)#ipv6 enable
console(config-if-vlan20)#ip address 1.1.1.1 /24
console(config-if-vlan20)#ipv6 address 2002::1/64
console(config-if-vlan20)#exit
console(config)#interface vlan 30
console(config-if-vlan30)#ip address 2.2.2.2 /24
console(config-if-vlan30)#exit
console(config)#router bgp 100
console(config-router)#redistribute connected
console(config-router)#neighbor 2001::2 remote-as 200
console(config-router)#neighbor 2001::2 rfc5549-support
console(config-router)#neighbor 2002::2 remote-as 300
```

neighbor route-map (BGP Router Configuration)

Use the **neighbor route-map** command to apply a route map to incoming or outgoing routes for a specific neighbor. To remove the route map, use the **no** form of this command.

Syntax

neighbor *ip-address* **route-map** *map-name* { **in** | **out** }

no neighbor *ip-address* **route-map** *map-name* { **in** | **out** }

- *ip-address*—The neighbor's IP address.
- **route-map** *map-name*—The name of the route map to be used to filter route updates on the specified interface.
- **in** | **out**—Whether the route map is applied to incoming or outgoing routes.

Default Configuration

No route maps are applied by default.

Command Mode

A route map can be used to change the local preference, MED, or AS Path of a route. Routes can be selected for filtering or modification using an AS path access list or a prefix list. If a **neighbor route-map** statement refers to a non-existent route map, all routes are denied.

Neighbor route maps configured with this command in router configuration mode are only applied to IPv4 routes.

User Guidelines

BGP Router Configuration mode

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 route-map test in
```

neighbor route-map (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **neighbor route-map** command specifies a route map to be applied to inbound or outbound IPv6 routes. To remove the route map, use the **no** form of this command.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **route-map** *map-name* { **in** | **out** }

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **route-map** *map-name* { **in** | **out** }

- *ip-address*—The neighbor's IP address.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. Valid in IPv6 address family mode.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range 1-4093.
- **route-map** *map-name*—The name of the route map to be used to filter route updates on the specified interface.
- **in** | **out**—Whether the route map is applied to incoming or outgoing routes.

Default Configuration

No route maps are applied by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

A route map can be used to change the local preference, MED, or AS Path of a route. Routes can be selected for filtering or modification using an AS path access list or a prefix list. If a **neighbor route-map** statement refers to a non-existent route map, all routes are denied.

Neighbor route maps configured with this command in router configuration mode are only applied to IPv4 routes. In IPv6 address family mode, the command accepts either an IPv4 or an IPv6 address.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor 10.130.14.55 route-map test in
```

neighbor route-reflector-client (BGP Router Configuration)

To configure an internal peer as an IPv4 route reflector client, use the **neighbor route-reflector-client** command.

Syntax

neighbor *ip-address* **route-reflector-client**

no neighbor *ip-address* **route-reflector-client**

- *ip-address*—The neighbor's IPv4 address.

Default Configuration

Peers are not route reflector clients by default.

Command Mode

BGP Router Configuration

User Guidelines

Normally, a router does not re-advertise BGP routes received from an internal peer to other internal peers. If you configure a peer as a route reflector client, this router will re-advertise such routes. A router is a route reflector if it has one or more route reflector clients. Configuring the first route reflector client automatically makes the router a route reflector.

If you configure multiple route reflectors within a cluster, you must configure each route reflector in the cluster with the same cluster ID. Use the **bgp cluster-id** command to configure a cluster ID.

An external peer may not be configured as a route reflector client.

When reflecting a route, BGP ignores the set statements in an outbound route map to avoid causing the receiver to compute routes that are inconsistent with other routers in the AS.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 route-reflector-client
```

neighbor route-reflector-client (IPv6 Address Family Configuration)

To configure an internal peer as an IPv4 route reflector client, use the **neighbor route-reflector-client** command.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*] } **route-reflector-client**

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*]} **route-reflector-client**

- *ip-address*—The neighbor's IPv4 address.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range 1-4093.

Default Configuration

Peers are not route reflector clients by default.

Command Mode

IPv6 Address Family Configuration

User Guidelines

Normally, a router does not re-advertise BGP routes received from an internal peer to other internal peers. If you configure a peer as a route reflector client, this router will re-advertise such routes. A router is a route reflector if it has one or more route reflector clients. Configuring the first route reflector client automatically makes the router a route reflector.

If you configure multiple route reflectors within a cluster, you must configure each route reflector in the cluster with the same cluster ID. Use the **bgp cluster-id** command to configure a cluster ID.

An external peer may not be configured as a route reflector client.

When reflecting a route, BGP ignores the set statements in an outbound route map to avoid causing the receiver to compute routes that are inconsistent with other routers in the AS.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor 10.130.14.55 route-reflector-client
```

neighbor send-community (BGP Router Configuration)

Use the **neighbor send-community** command to configure the local router to send the BGP communities attribute in UPDATE messages to a specific neighbor.

Syntax

neighbor *ip-address* **send-community**

no neighbor *ip-address* **send-community**

- *ip-address* – The neighbor's IPv4 address.

Default Configuration

The communities attribute is not sent to neighbors by default.

Command Mode

BGP Router Configuration mode

User Guidelines

There are no user guidelines.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 send-community
```

neighbor send-community (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **neighbor send-community** command tells BGP to send the COMMUNITIES attribute with routes advertised to the peer.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **send-community**

no neighbor { *ip-address* | *ipv6-address* [**interface** *interface-id*]} **send-community**

- *ip-address* – The neighbor's IPv4 address.
- *ipv6-address* [**interface** *interface-id*] – The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.

Default Configuration

The communities attribute is not sent to neighbors by default.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

The command accepts either an IPv4 or an IPv6 address.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#neighbor 10.130.14.55 send-community
```

neighbor shutdown

Use the **neighbor shutdown** command to administratively disable communications with a specific BGP neighbor. The effect is to gracefully bring down the adjacency with the neighbor. If the adjacency is up when the command is given, the peering session is dropped and all route information learned from the neighbor is purged.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id* } **shutdown**

no neighbor { *ip-address* **|** *ipv6-address* [**interface** *interface-id*] **| autodetect interface** *interface-id* } **shutdown**

- *ip-address* **–** The neighbor's IPv4 address. This is the IP address of the neighbor on the connected link.
- *ipv6-address*– The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified. Valid in IPv6 address family configuration mode.
- *interface-id* – The local VLAN routing interface over which the IPv6 neighbor can be reached. Use the vlan keyword and a VLAN ID. Range 1-4093.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface. Range is 1–4093.

Default Configuration

Neighbors are administratively enabled by default.

Command Mode

BGP Router Configuration, IPv4 Address Family Configuration, IPv6 Address Family Configuration

User Guidelines

When a neighbor is shut down, BGP first sends a NOTIFICATION message with a Cease error code. When an adjacency is administratively shut down, the adjacency stays down until administratively re-enabled (using **no neighbor shutdown**).

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 shutdown
```

neighbor timers

Use the **neighbor timers** command to override the global keepalive and hold timer values as well as set the keepalive and hold timers for a specific neighbor.

Syntax

neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*] | **autodetect interface** *interface-id* } **timers** *keepalive holdtime*

no neighbor { *ip-address* | *ipv6-address* [**interface vlan** *vlan-id*] | **autodetect interface** *interface-id* } **timers**

- *ip-address*—The neighbor's IPv4 address. This is the IP address of the neighbor on the connected link.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range 1-4093.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface. Range is 1–4093.

- *keepalive*—The time, in seconds, between BGP KEEPALIVE packets sent to a neighbor. The range is 0 to 65,535 seconds. A small internal jitter is applied to the keepalive interval timer in order to reduce the CPU load that may occur when multiple timers expire simultaneously.
- *holdtime*—The time, in seconds, that BGP continues to consider a neighbor to be alive without receiving a BGP KEEPALIVE or UPDATE packet from the neighbor. If no KEEPALIVE is received from a neighbor for longer than the hold time, BGP drops the adjacency. If the hold time is set to 0, then BGP does not enforce a hold time and BGP does not send periodic KEEPALIVE messages. The range is 0, 3 to 65,535 seconds.

Default Configuration

The keepalive and hold timers default to the globally configured values set with the **timers bgp** command.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

The new values are not applied to adjacencies already in the ESTABLISHED state. Updated keepalive or hold time values are only applied when an adjacency is newly formed.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 timers 1000 500
```

neighbor update-source

The **neighbor update-source** command configures BGP to use a specific IP address as the source address for the TCP connection with a neighbor. This IP address must be the IP address configured on the peer BGP router as the neighbor address for this router.

Syntax

neighbor { *ip-address* **|** *ipv6-address* [**interface vlan** *vlan-id*] **| autodetect interface** *interface-id* }} **update-source** *interface*

no neighbor { *ip-address* **|** *ipv6-address* [**interface vlan** *vlan-id*] **| autodetect interface** *interface-id* }} **update-source**

- *ip-address*—The neighbor's IPv4 address. This is the IP address of the neighbor on the connected link.
- *ipv6-address*—The neighbor's IPv6 address. If the neighbor's IPv6 address is a link local address, the local interface must also be specified.
- **interface vlan** *vlan-id*—The local interface/VLAN ID over which the IPv6 neighbor can be reached. Range: 1-4093.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface. Range is 1–4093.
- **update-source** *interface* – Use the primary IPv4 address on the specified interface as the source IP address for the TCP connection with the neighbor.

Default Configuration

When no update source is configured, the BGP TCP connections use the primary IPv4 address on the outgoing interface to the neighbor.

Command Mode

BGP Router Configuration mode, IPv4 Address Family Configuration mode

User Guidelines

The IP address used as the source address in IP packets sent to a neighbor must be the same address used to configure the local system as a neighbor on the peer BGP router. In other words, if the update source is configured, it must be the same IP address used in the **neighbor remote-as** command on the peer.

It is common to use an IP address on a loopback interface as an update source because a loopback interface is always reachable as long as any routing interface is up. The peering session will stay up as long as the loopback interface remains reachable. If you use an IP address on a routing interface, then the peering session will go down if that interface goes down.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console(config-router)#neighbor 10.130.14.55 update-source 100
```

network (BGP Router Configuration)

The **network** command configures BGP to advertise an address prefix.The prefix is only advertised if the common routing table includes a non-BGP route with the same prefix. The route may be a connected route, a static route, or a dynamic route from another routing protocol.

Syntax

network *prefix* **mask** *network-mask* [**route-map** *rm-name*]

no network *prefix* **mask** *network-mask* [**route-map** *rm-name*]

network *ipv6-prefix/prefix-length* [**route-map** *rm-name*]

no **network** *ipv6-prefix/prefix-length*

- *prefix*—An IPv4 address prefix in dotted decimal notation.
- *network-mask*—The network mask for the prefix in dotted-quad notation (e.g., 255.255.0.0) where a zero bit in the mask indicates a don’t care condition for the corresponding address bits.
- *ipv6-prefix*—An IPv6 network prefix. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons.

- *prefix-length*—The length of the IPv6 prefix given as part of the ipv6-prefix. Required if a prefix is specified. A decimal value in the range 1 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /length format. A slash mark must precede the decimal value in /length format.
- *rm-name*—The name of a route map used to filter prefixes or set attributes of prefixes advertised by this network. The route map statements are evaluated in order, and the first match terminates processing of the route map. If the specified route map does not exist, the network prefix is not advertised (all routes are denied).

Default Configuration

No networks are advertised by default.

Command Mode

BGP Router Configuration

User Guidelines

BGP supports up to 64 networks. The network command may also be used specify a default route (**network** 0.0.0.0 **mask** 0.0.0.0).

If a route map is configured to set attributes on the advertised routes, **match as-path** and **match community** terms in the route map are ignored. A **match ip-address prefix-list** term is honored in this context. If the route map includes such a match term, the network is only advertised if the prefix list permits the network prefix. If the specified route map does not exist, the network is not advertised.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#network 10.130.14.55 255.255.0.0
```

network (IPv6 Address Family Configuration)

In IPv6 address family configuration mode, the **network** command identifies network IPv6 prefixes that BGP originates in route advertisements to its neighbors.

Syntax

network *prefix* **mask** *network-mask* [**route-map** *rm-name*]

no network *prefix* **mask** *network-mask* [**route-map** *rm-name*]

network *ipv6-prefix/prefix-length* [**route-map** *rm-name*]

no network *ipv6-prefix/prefix-length*

- *prefix*—An IPv4 address prefix in dotted decimal notation.
- *network-mask*—The network mask for the prefix in dotted-quad notation (e.g., 255.255.0.0) where a zero bit in the mask indicates a don't care condition for the corresponding address bits.
- *ipv6-prefix*—An IPv6 network prefix. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons.
- *prefix-length*—The length of the IPv6 prefix given as part of the ipv6-prefix. Required if a prefix is specified. A decimal value in the range 1 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /length format. A slash mark must precede the decimal value in /length format.
- *rm-name*—The name of a route map used to filter prefixes or set attributes of prefixes advertised by this network. The route map statements are evaluated in order, and the first match terminates processing of the route map. If the specified route map does not exist, the network prefix is not advertised (all routes are denied).

Default Configuration

No networks are advertised by default.

Command Mode

IPv6 Address Family Configuration

User Guidelines

BGP supports up to 64 networks. The network command may also be used specify a default route (**network** 0.0.0.0 **mask** 0.0.0.0).

If a route map is configured to set attributes on the advertised routes, **match as-path** and **match community** terms in the route map are ignored. A **match ip-address prefix-list** term is honored in this context. If the route map includes such a match term, the network is only advertised if the prefix list permits the network prefix. If the specified route map does not exist, the network is not advertised.

Example

```
console(config-router-af)#network 10.130.14.55 255.255.0.0
```

Default Configuration

The default tag value is 0.

There is no default metric or route map configured.

Command Mode

Router BGP Configuration mode

User Guidelines

The configured metric value is specific to the routes distributed. Use the default-metric command to configure a default metric for all redistributed routes.

The RIP metric is a hop count. The metric for a redistributed route limits the distance the route can be redistributed in the RIP network. Since the maximum valid metric in a RIP network is 15, redistributing routes into RIP with a metric of 12 implies that the route can only be redistributed across 3 hops in the RIP network.

In general, redistributing routes from BGP into a RIP network is not recommended.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#redistribute rip
```

rd

Use the **rd** command to configure a BGP routing session to advertise VPN-IPv4 prefixes. Use the **no** form of this command to delete the VPN-IPv4 configuration.

Syntax

rd *route-distinguisher*

no rd

route-distinguisher— A 2-byte or an 8-byte value to be prepended to an IPv4 prefix to create a VPN IPv4 prefix. The RD value can be specified in either of the following formats:

- 16-bit AS number: a 32-bit value (Ex: 64496:11)
- 32-bit IPv4 address: a 16-bit value (Ex: 10.1.1.1:22)
- 32-bit AS number: a 32-bit value (Ex: 65537:60110)

Default Configuration

VRG configuration mode

Command Mode

Privileged Exec mode

User Guidelines

An RD creates routing and forwarding table instance and specifies the default route distinguisher for a VPN. The RD is prepended to IPv4 prefixes to change them into globally unique VPN-IPv4 prefixes.

An RD is either:

- ASN related – Composed of an autonomous system number and an arbitrary number.
- IP address related – Composed of an IP address and an arbitrary number.

Once an RD has been configured, it may not be reconfigured. Use the no form of the command to remove the RD before configuring a new RD value.

This command is effective only if BGP is running on the router.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows how to configure an RD for a VRF instance in ASN format:

```
console(config)#ip vrf Customer_A
console(config-vrf-Customer_A)#rd 62001:10
console(config-vrf-Customer_A)#exit
```

The following example shows how to configure an RD for a VRF instance in IPv4 address format:

```
console(config)#ip vrf Customer_A
console(config-vrf-Customer_A)#rd 192.168.10.1:10
console(config-vrf-Customer_A)#exit
```

redistribute (BGP)

The **redistribute** command configures BGP to advertise routes learned by means outside of BGP. BGP can redistribute local (connected), static, OSPF, and RIP routes.

Syntax

redistribute { ospf [match {[internal][external 1] [external 2] [nssa-external 1] [nssa-external 2]}] | rip | connected | static} [metric *metric-value*] [**route-map** *map-tag*]

no redistribute { ospf [match {[internal][external 1] [external 2] [nssa-external 1] [nssa-external 2]}] | rip | connected | static} [metric *metric-value*] [**route-map** *map-tag*]

- **ospf, rip, connected, static**—A source of routes to redistribute.
- **metric** *metric-value*—(Optional) When this option is specified, BGP advertises the prefix with the Multi Exit Discriminator path attribute set to the configured value. If this option is not specified, but a default metric

is configured for BGP (**default metric** command), the MED is set to the default metric. If both a default metric and a metric value are not configured, the prefix is advertised without an MED attribute.

- **match—**(Optional) By default, if BGP is configured to redistribute OSPF routes, BGP only redistributes internal routes (OSPF intra-area and inter-area routes). Use of the **match** option configures BGP to also redistribute specific types of external routes, or to disable redistribution of internal OSPF routes. The match option is only valid for OSPF originated routes.
- **route-map** *map-tag***—**(Optional) A route map can be used to filter redistributed routes by destination prefix using a prefix list.

Default Configuration

BGP redistributes no routes by default. When BGP redistributes OSPF routes, it redistributes only internal routes unless the **match** option specifies external routes.

Command Mode

BGP Router Configuration mode

User Guidelines

The **distribute-list out** command can also be used to filter redistributed routes by prefix. Either a redistribute route map or a distribute list may be configured, but not both.

Successive invocations of the **redistribute** command are additive. The **redistribute** command does not overwrite previous **redistribute** command configuration or the default configuration. Use the **no redistribute** command to remove the redistribution of internal or external routes.

A default route cannot be redistributed unless the **default-information-originate** command is given.

The configured metric value is specific to the routes distributed. Use the default-metric command to configure a default metric for all redistributed routes.

The RIP metric is a hop count. The metric for a redistributed route limits the distance the route can be redistributed in the RIP network. Since the maximum valid metric in a RIP network is 15, redistributing routes into RIP with a metric of 12 implies that the route can only be redistributed across 3 hops in the RIP network.

In conformance with RFC 1475, information learned via BGP from peers within the same AS is not redistributed to OSPF.

In general, redistributing routes from BGP into a RIP network is not recommended.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#redistribute rip
```

redistribute (BGP IPv6)

In IPv6 address family configuration node, the **redistribute** command configures BGP to redistribute non-BGP originated routes from the IPv6 routing table.

Syntax

redistribute { **ospf** [**match** {[**internal**][**external 1**] [**external 2**] [**nssa-external 1**] [**nssa-external 2**]}] | **rip** | **connected** | **static**} [**metric** *metric-value*] [**route-map** *map-tag*]

no redistribute { **ospf** [**match** {[**internal**][**external 1**] [**external 2**] [**nssa-external 1**] [**nssa-external 2**]}] | **rip** | **connected** | **static**} [**metric** *metric-value*] [**route-map** *map-tag*]

- **ospf, rip, connected, static**—A source of routes to redistribute.
- **metric** *metric-value*—(Optional) When this option is specified, BGP advertises the prefix with the Multi Exit Discriminator path attribute set to the configured value. If this option is not specified, but a default metric is configured for BGP (**default metric** command), the MED is set to the default metric. If both a default metric and a metric value are not configured, the prefix is advertised without a MED attribute.

- **match**—(Optional) By default, if BGP is configured to redistribute OSPF routes (**redistribute ospf** command), BGP only redistributes internal routes (OSPF intra-area and inter-area routes). Use of the **match** option configures BGP to also redistribute specific types of external or internal routes, or to disable redistribution of OSPF routes. The match option is only valid for OSPF originated routes. Successive redistribute commands are additive. Use the **no** form of the command to disable redistribution of a route source.
- **route-map** *map-tag*—(Optional) A route map can be used to filter redistributed routes by destination prefix using a prefix list.

Default Configuration

BGP redistributes no routes by default. When BGP redistributes OSPF routes, it redistributes only internal routes unless the **match** option specifies external routes.

Command Mode

IPv6 Address Family Configuration mode

User Guidelines

The **distribute-list out** command can also be used to filter redistributed routes by prefix. Either a redistribute route map or a distribute list may be configured, but not both.

Successive invocations of the **redistribute** command are additive. The **redistribute** command does not overwrite previous **redistribute** command configuration or the default configuration. Use the **no redistribute** command to remove the redistribution of internal or external routes.

A default route cannot be redistributed unless the **default-information-originate** command is given. The configured metric value is specific to the routes distributed. Use the **default-metric** command to configure a default metric for all redistributed routes.

In IPv6 address family configuration mode, the syntax and behavior is the same as for IPv4, except that Dell EMC Networking does not support RIP for IPv6.

In conformance with RFC 1475, information learned via BGP from peers within the same AS is not redistributed to OSPF.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router-af)#redistribute rip
```

route-target

Use the **route-target** command to create a list of export, import, or both route target (RT) extended communities for the specified VRF instance.

Use the **no** form of the command to remove the route target from a VRF instance.

Syntax

route-target {**export** | **import** | **both**} *rt-ext-comm*

no route-target {**export** | **import** | **both**} *rt-ext-comm*

- **export** — Exports routing information to the target VPN extended community.
- **import**—Imports routing information from the target VPN extended community.
- both—Exports and imports the routing information to/from the target VPN extended community.
- *rt-ext-comm* — The route-target extended community attributes to be added to the list of import, export or both (import and export) route-target extended communities.

  The route target specifies a target VPN extended community. Like a route distinguisher, the route-target extended community can be specified in either of the following formats:

  - 16-bit AS number: a 32-bit value (Ex: 64496:11)
  - 32-bit IPv4 address: a 16-bit value (Ex: 10.1.1.1:22)
  - 32-bit AS number: a 32-bit value (Ex: 65537:60110)

Default Configuration

No route targets are configured by default.

Command Mode

Privileged Exec mode

User Guidelines

Configure the route-target command once for each target extended community. Routes that are learned and carry a specific route-target extended community are imported into all VRFs configured with that particular extended community as an import route target.

The configured export RT is advertised as an extended community in the MP-BGP format to the eBGP peer. An RT is either:

- ASN related – Composed of an autonomous system number and an arbitrary number.
- IP address related – Composed of an IP address and an arbitrary number.

This command is effective only if BGP is running on the router.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows how to configure route target extended community attributes for a VRF instance in IPv4. The result of this command sequence is that VRF named Customer_A has two export extended communities (100:10 and 300:10) and two import extended communities (300:10 and 192.168.10.1:10).

```
console(config)#ip vrf Customer_A
console(config-vrf-Customer_A)#route-target export 100:10
console(config-vrf-Customer_A)#route-target import 192.168.10.1:10
console(config-vrf-Customer_A)#route-target both 300:10
console(config-vrf-Customer_A)#exit
```

set extcommunity rt

Use the **set extcommunity rt** command to set BGP extended community attributes for the route target. Use the **no** form of the command to remove the extended community attributes for the route target.

NOTE: This command is effective only if BGP is running on the router.

Syntax

set extcommunity rt *value* [**additive**]

no set extcommunity rt

- *value* — Specifies the route target extended community value. This value can be entered in one of the following formats:
  - 16-bit AS number: a 32-bit value (Ex: 64496:11)
  - 32-bit IPv4 address: a 16-bit value (Ex: 10.1.1.1:22)
  - 32-bit AS number: a 32-bit value (Ex: 65537:60110)
- **additive**–Adds a route target to the existing route target list without replacing any existing route targets.

Default Configuration

No RT extended community attributes are set.

Command Mode

Route Map Configuration mode

User Guidelines

The route target (RT) extended community attribute is configured with the **rt** keyword. This attribute is used to identify VRFs that may receive routes that are tagged with the configured route target. Configuring the route target extended attribute with a route allows that route to be placed in the per-site forwarding tables that are used for routing traffic that is received from corresponding sites. Only one route target can be specified in a single **set extcommunity rt** command. To specify more than one route target, issue the command again with the **additive** keyword.

By default, specifying route targets causes the system to replace existing route targets with the new route targets, unless the additive keyword is used. The use of the **additive** keyword causes the system to add the new route targets to the existing route target list, but does not replace any existing route targets.

Command History

Introduced in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

The following example shows how to set the extended community attribute for route target with route-maps.

```
(R1)(Config)# ip extcommunity-list 10 permit rt 1:1
(R1)(config)# route-map SEND_OUT permit 10
(R1)(config-route-map)# match extcommunity 13
(R1)(config-route-map)# set extcommunity rt 10:10 additive
(R1)(config-route-map)# exit
```

set extcommunity soo

Use the **set extcommunity soo** command to set BGP extended community attributes for the site of origin. Use the **no** form of the command to remove the extended community attributes for the site of origin.

NOTE: This command is effective only if BGP is running on the router.

Syntax

set extcommunity soo *value* [**additive**]

no set extcommunity soo

- *value* — Specifies the site of origin extended community value. This value can be entered in one of the following formats:
  - 16-bit AS number: a 32-bit value (Ex: 64496:11)
  - 32-bit IPv4 address: a16-bit value (Ex: 10.1.1.1:22)
  - 32-bit AS number: a 32-bit value (Ex: 65537:60110)
- **additive**–Adds a route target to the existing route target list without replacing any existing route targets.

Default Configuration

No site of origin extended community attributes are set.

Command Mode

Route Map Configuration mode

User Guidelines

The site of origin (SOO) extended communities attribute is configured with the **soo** keyword. This attribute uniquely identifies the site from which the Provider Edge (PE) router learned the route. All routes learned from a particular site must be assigned the same SOO extended community attribute, whether a site is connected to a single PE router or multiple PE routers. Configuring this attribute prevents routing loops from occurring when a site is multi-homed. The SOO extended community attribute is configured on the interface and is propagated into BGP through redistribution. The SOO can be applied to routes that are learned from VRFs. The SOO should not be configured for stub sites or sites that are not multi-homed

Command History

Introduced in version 6.3.0.1 firmware. Command updated in version 6.6 firmware.

Example

The following example shows how to set the extended community attribute for site of origin with route-maps on the sending BGP router.

```
(R1)(Config)# ip extcommunity-list 10 permit
(R1)(config)# route-map RECV_IN permit 10
(R1)(config-route-map)# set extcommunity soo 10:10
(R1)(config-route-map)# exit
```

The receiving BGP router will apply the route map with an extended community list in the inward direction.

show bgp ipv6

Use this command to display IPv6 routes in the BGP routing table. This command deprecates and replaces the s**how ipv6 bgp** command.

Syntax

show bgp ipv6[*ipv6-prefix*/*prefix-length* [**longer-prefixes | shorter-prefixes** [*length*]] **| filter-list** *as-path-list*]

- *ipv6-prefix*—An IPv6 network prefix. This argument must be in the form where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons. Limits the output to a specific prefix.
- *prefix-length*—The length of the IPv6 prefix given as part of the ipv6-prefix. This is required if a prefix is specified. A decimal value in the range 1 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /length format. A slash mark must precede the decimal value in /length format.
- **longer-prefixes**—Displays the specified prefix and any longer prefixes within the same range.
- **shorter-prefixes** [*length*]—Used with the *ipv6-prefix/prefix-length* option to show routes whose prefix length is shorter than prefix-length, and, optionally, longer than a specified length. This option may not be given if the longer-prefixes option is given.
- **filter-list** *as-path-list*—Filters the output to the set of routes that match the specified AS Path list. This option may not be given if an *ipv6-prefix/prefix-length* option is given.

Default Configuration

There is no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The following fields are displayed.

Field	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented.

Status codes	• s—The route is aggregated into an aggregate address configured with the summary-only option • *—Dell EMC Networking BGP never displays invalid routes; so this code is always displayed (to maintain consistency with the industry standard) • >—Indicates that BGP has selected this path as the best path to the destination • i—If the route is learned from an internal peer
Network	IPv6 Destination prefix
Next Hop	The route's BGP next hop
Metric	Multi-Exit Discriminator
LocPrf	The local preference
Path	The AS path
Origin	The value of the Origin attribute

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console# show bgp ipv6

BGP table version is 5, local router ID is 20.1.1.1
Status codes: s suppressed, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network               Next Hop     Metric   LocPrf   Path
*> 2001:DB8::/48      3FFE:100::1        10      100   20 10  i
                      3FFE:200::4
*> 2001:DB8:4:5::/64  3FFE:100::1        10      100   20 10  ?
```

show bgp ipv6 aggregate-address

Use this command to display the configured IPv6 aggregate addresses and indicates if each address is currently active. This command replaces and deprecates the **show ipv6 bgp aggregate-address** command.

Syntax

show bgp ipv6 aggregate address-group

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
Prefix/Len	Destination prefix and prefix length.
AS Set	Indicates if an empty AS path is advertised with the aggregate address (N) or an AS SET is advertised with the set of AS numbers for the paths contributing to the aggregate (Y).
Summary Only	Indicates if the individual networks are suppressed (Y) or advertised (N).
Active	Indicates if the aggregate is currently being advertised.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console# show bgp ipv6 aggregate-address

Prefix/Len          AS Set    Summary Only    Active
----------------    ------    ------------    ------
2001:DB8::/48            N               Y         Y
3ffe:4000:1::/48         N               Y         Y
```

show bgp ipv6 community

Use this command to display IPv6 routes that belong to the specified set of communities. This command replaces and deprecates the **show ipv6 bgp community** command

Syntax

show bgp ipv6 community *communities* [**exact-match**]

- *communities*—A string of zero or more community values, which may be in either format and may contain the well-known community keywords no-advertise and no-export. The output displays routes that belong to every community specified in the command.
- **exact-match**— Only displays routes that are members of those and only those communities specified in the command.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented.

Status codes	• s—The route is aggregated into an aggregate address configured with the summary-only option • *—Dell EMC Networking BGP never displays invalid routes; so this code is always displayed (to maintain consistency with the industry standard) • >—Indicates that BGP has selected this path as the best path to the destination • i—If the route is learned from an internal peer
Network	IPv6 Destination prefix
Next Hop	The route's BGP next hop
Metric	Multi-Exit Discriminator
LocPrf	The local preference
Path	The AS path

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console(config)#show bgp ipv6 community

BGP table version is 0, local router ID is 65.1.1.1
Status Codes: s suppressed, * valid, > best, i - internal
Origin Codes: i - IGP, e - EGP, ? - incomplete

Network              Next Hop        Metric     LocPref    Path
------------------ --------------- ---------- ---------- --------
```

show bgp ipv6 community-list

Use this command to display the IPv6 routes that match a specified community list.

Syntax

show bgp ipv6 community-list *name* [**exact-match**]

- *name*—A standard community list name.

- **exact-match**—Displays only routes that are an exact match for the set of communities in the matching community list statement.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented.
Status codes	• s—The route is aggregated into an aggregate address configured with the summary-only option • *—Dell EMC Networking BGP never displays invalid routes; so this code is always displayed (to maintain consistency with the industry standard) • >—Indicates that BGP has selected this path as the best path to the destination • i—If the route is learned from an internal peer
Network	IPv6 Destination prefix
Next Hop	The route's BGP next hop
Metric	Multi-Exit Discriminator
LocPrf	The local preference
Path	The AS path

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
BGP table version is 0, local router ID is 65.1.1.1
Status Codes: s suppressed, * valid, > best, i - internal
Origin Codes: i - IGP, e - EGP, ? - incomplete

Network             Next Hop         Metric     LocPref    Path
------------------ --------------- --------- ---------- ----------
```

show bgp ipv6 listen range

Use the **show bgp ipv6 listen range** command to display information about IPv6 BGP listen ranges.

Syntax

show bgp ipv6 [**vrf** *vrf-name*] **listen range** [*network/length*]

- *network/length* — Displays information about the specified listen range.
- *vrf-name*—The name of a previously configured VRF.

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

There are no usage guidelines.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show bgp ipv6 listen range

Listen Range................................. 2001::1/64
Inherited Template........................... template_2001

  Member                                    ASN       State
  --------------------------------------- ----- -----------
  2001::10                                65001 OPENCONFIRM
```

```
  2001::20                                   0      ACTIVE


Listen Range................................. 2002::1/64
Inherited Template........................... template_2002

  Member                                  ASN       State
  --------------------------------------- ----- -----------
```

show bgp ipv6 neighbors

Use this command to display neighbors with IPv4 or IPv6 peer addresses that are enabled for the exchange of IPv6 prefixes. This command deprecates and replaces the **show ipv6 bgp neighbors** command.

Syntax

show bgp ipv6 neighbors [**ipv4-address | ipv6-address** [**interface** *interface-id*] **| autodetect interface** *interface-id*]

- **ipv4-address | ipv6-address**—(Optional) If a peer address is specified, the output is limited to an individual peer.
- *interface-id*—(Optional) If the peer address is an IPv6 link local address, the interface that defines the scope of the link local address must be given. This must be a VLAN routing interface.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

- "RFC 5549 Support" is displayed only if the BGP neighbor is peered over IPv6 network.

- If the peer is configured as “autodetect”, the “Remote Address” shows detected IPv6 address or “Unresolved” in case if the peer is not detected by the autodetect feature.
- “Autodetect status” is displayed only if the peer is configured as “autodetect”. The field shows one of the following statuses:
  - Peer is detected
  - Peer is not detected
  - Multiple peers are detected

The following fields are displayed.

Field	**Description**
Remote Address	The neighbor’s IPv6 address. If this is a link local address, the next line indicates the scope of the address.
Remote AS	The neighbor’s autonomous system number
Peer ID	The neighbor’s BGP router ID
Peer Admin Status	START or STOP
Peer State	The adjacency state of this neighbor
Peer Type	The type of peer
Listen Range	The ports that are being listened to.
Local Port	TCP port number on the local end of the connection
Remote Port	TCP port number on the remote end of the connection
Connection Retry Interval	How long BGP waits between connection retries
Neighbor Capabilities	Optional capabilities reported by the neighbor, recognized and accepted by this router. Codes listed in the show output are as follows: • MP: Multiprotocol • RF: Route Refresh This version of Dell EMC Networking does not support any multiprotocol AFI/SAFI pairs other than IPv4 unicast. The presence of this capability does not imply otherwise.

IPv4 Unicast Support	Indicates whether IPv4 unicast routes can be exchanged with this peer. **Both** indicates that IPv4 is active locally and the neighbor indicated support for IPv4 unicast in its OPEN message. **Sent** indicates that IPv4 unicast is active locally, but the neighbor did not include this AFI/SAFI pair in its OPEN message. IPv4 unicast is always enabled locally and cannot be disabled.
IPv6 Unicast Support	Indicates whether IPv6 unicast routes can be exchanged with this peer. **Both** and **Sent** have the same meaning as for IPv4. **None** indicates that neither the local router nor the peer has IPv6 enabled for this adjacency. **Received** indicates that the peer advertised the IPv6 unicast capability, but it is not enabled locally. IPv6 unicast is enabled locally using the **neighbor activate** command in address-family IPv6 configuration mode.
RFC 5549 Support	Shown if support for RFC 5549 is enabled and the BGP neighbor is peered over IPv6 network.
Update Source	The configured value for the source IP address of packets sent to this peer. This field is only included in the output if the update source is configured.
Local Interface Address	The IPv6 address used as the source IP address in packets sent to this neighbor.
Configured Hold Time	The time, in seconds, that this router proposes to this neighbor as the hold time
Configured Keep Alive Time	The configured KEEPALIVE interval for this neighbor.
Negotiated Hold Time	The minimum configured hold time and the hold time in the OPEN message received from this neighbor. If the local router does not receive a KEEPALIVE or UPDATE message from this neighbor within this interval of time, the local router drops the adjacency. This field is only shown if the adjacency state is OPEN CONFIRM or greater.
Keep Alive Time	The number of seconds between KEEPALIVE messages sent to this neighbor. This field is only shown if the adjacency state is OPEN CONFIRM or greater.

Prefix Limit	The maximum number of prefixes this router is willing to accept from this neighbor.
Prefix Warning Threshold	Percentage of the prefix limit that causes a warning message to be logged.
Warning Only on Prefix Limit	Whether to shutdown a neighbor that exceeds the prefix limit. TRUE if the event is logged without shutting down the neighbor.
Minimum Advertisement Interval	The minimum time between UPDATE messages sent to this neighbor.
MD5 Password	The TCP MD5 password, if one is configured, in plain text.
Last Error	The last error that occurred on the connection to this neighbor.
Last SubError	The suberror reported with the last error.
Time Since Last Error	How long since an error has occurred.
Established Transitions	The number of times the adjacency has transitioned into the Established state.
Established Time	How long since the connection last transitioned to or from the Established state.
Time Elapsed Since Last Update	How long since an UPDATE message has been received from this neighbor.
IPv6 Outbound Update Group	The IPv6 outbound update group.
Message Table	The number of BGP messages sent to and received from this neighbor.
Received Update Queue Size	Received UPDATE messages are queued for processing. This section shows the current length of the neighbor's UPDATE queue in bytes, the high water mark, the limit, and the number of UPDATEs that have been dropped because the queue reached the limit.
The following fields are displayed for IPv4 and for IPv6.	
Prefixes Advertised	A running count of the number of prefixes advertised to or received from this neighbor.

Prefixes Withdrawn	A running count of the number of prefixes included in the Withdrawn Routes portion of UPDATE messages, to and from this neighbor.
Prefixes Current	The number of prefixes currently advertised to or received from this neighbor. For inbound prefixes, this count only includes prefixes that passed inbound policy.
Prefixes Accepted	The number of prefixes from this neighbor that are eligible to become active in the local RIB. Received prefixes are ineligible if their BGP Next Hop is not resolvable or if the AS Path contains a loop. A prefix is only considered accepted if it passes inbound policy.
Prefixes Rejected	The number of prefixes currently received from this neighbor that fail inbound policy.
Max NLFI per Update	The maximum number of prefixes included in a single UPDATE message, to and from this neighbor.
Min NLRI per Update	The minimum number of prefixes included in a single UPDATE message, to and from this neighbor.

Command History

Introduced in version 6.2.0.1 firmware. Modified in version 6.3.0.1 firmware.

Example

```
console# show bgp ipv6 neighbors fe80::2

Description: spine 1 router 1

Remote Address................................ fe80::2
Interface..................................... 0/1
Remote AS..................................... 100
Peer ID....................................... 14.3.0.1
Peer Admin Status............................. START
Peer State.................................... ESTABLISHED
Peer Type..................................... DYNAMIC
Local Port.................................... 179
Remote Port................................... 58265
Connection Retry Interval..................... 120 sec
Neighbor Capabilities......................... None
IPv4 Unicast Support.......................... None
IPv6 Unicast Support.......................... Both
RFC 5549 Support.............................. Enable
Update Source................................. None
Local Interface Address....................... fe80::2
```

```
Configured Hold Time......................... 90 sec
Configured Keep Alive Time................... 30 sec
Negotiated Hold Time......................... 30 sec
Keep Alive Time.............................. 10 sec
MD5 Password................................. password

Last Error (Sent)............................. Hold Timer Expired
Last SubError................................. None
Time Since Last Error......................... 0 day 0 hr 4 min 27 sec
Established Transitions....................... 1
Established Time.............................. 0 day 0 hr 4 min 25 sec
Time Since Last Update........................ 0 day 0 hr 4 min 24 sec
IPv6 Outbound Update Group.................... 7


             Open   Update   Keepalive   Notification   Refresh   Total
Msgs Sent       1        0          10              0         0      11
Msgs Rcvd       1        1          11              0         0      12

Received UPDATE Queue Size:  0 bytes. High: 355. Limit 196096. Drops 0.

IPv6 Prefix Statistics:
                           Inbound       Outbound
Prefixes Advertised              1              0
Prefixes Withdrawn               0              0
Prefixes Current                 1              0
Prefixes Accepted1 N/A
Prefixes Rejected                1            N/A
Max NLRI per Update              1              0
Min NLRI per Update              1              0
```

show bgp ipv6 neighbors advertised-routes

Use this command to display IPv6 routes advertised to a specific neighbor. The format and field descriptions are the same as for **show ip bgp neighbors advertised-routes**, except that the Network and Next Hop fields show IPv6 addresses. This command deprecates and replaces the **show ipv6 bgp neighbors advertised-routes** command.

Syntax

show bgp ipv6 neighbors { *ipv4-address* | *ipv6-address* [**interface** *interface-id*] } **advertised-routes**

- *ipv4-address*—The IPv4 address of a BGP peer.

- *ipv6-address* [**interface** *interface-id*]—The IPv6 address of a BGP peer. If the peer address is an IPv6 link local address, the interface that defines the scope of the link local address must be given.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface ID must be a VLAN routing interface.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented
Local router ID	The IP address of the local router.
Status Codes	p – The route has been updated in Adj-RIB-Out since the last UPDATE message was sent. Transmission of an UPDATE message is pending.
Network	The Destination prefix.
Next Hop	The BGP Next Hop as advertised to the peer.
Metric	The value of the Multi Exit Discriminator (MED), if the MED is advertised to the peer.
LocPref	The local preference. Local preference is never advertised to external peers.
Path	The AS path. The AS path does not include the local AS number, which is added to the beginning of the AS path when a route is advertised to an external peer.

Origin	The value of the origin attribute. • i—IGP • e—EGP • ?—Incomplete

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console#show bgp ipv6 neighbors fe80::211:12ff:fe06:4 interface vl10
advertised-routes

BGP table version is 10, local router ID is 0.0.0.100
Status codes: p - advertisement pending
Origin codes: i - IGP, e - EGP, ? - incomplete

  Network             Next Hop         Metric     LocPref Path         Origin
  ------------------ ---------------- ---------- ------- ------------- ------
  1010:10::/64                          0                                i
  2020:20::/64                          0                                i
```

show bgp ipv6 neighbors policy

Use this command to display the inbound and outbound IPv6 policies configured for a specific peer. The output distinguishes policies that are configured on the peer itself and policies that the peer inherits from a peer template. This command deprecates and replaces the **show ipv6 bgp neighbors policy** command.

Syntax

show bgp ipv6 neighbors [*ipv4-address* **|** *ipv6-address* [**interface** *interface-id*]] **policy**

- *ipv4-address*—The IPv4 address of a neighbor may optionally be specified to limit the output to a single neighbor.
- *ipv6-address* [**interface** *interface-id*]—The IPv6 address of a neighbor. If specified, the output shows only this neighbor. If the neighbor's address is a link local address, the interface must be specified.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
Neighbor	The peer address of a neighbor.
Policy	A neighbor-specific BGP policy.
Template	If the policy is inherited from a peer template, this field lists the template name.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console#show bgp ipv6 neighbors fe80::1 vlan 10 policy


Neighbor        Policy                                                Template
--------------- ----------------------------------------------------- -----------
fe80::1%Vl0010
                 activate
                 prefix-list jupiter in
                 prefix-list saturn out
                 maximum-prefix 2000
                 send-community
```

show bgp ipv6 neighbors received-routes

Use this command to display a list of IPv6 routes received from a specific neighbor. The list includes either all routes received from the neighbor, received routes that passed inbound policy, or routes rejected by inbound policy. The output and format as the same as for **show IP bgp neighbors received-routes**, except that they list IPv6 routes. Also, the command displays a list of IPv4 routes received from a specific neighbor with RFC5549.

This command deprecates and replaces the **show ipv6 bgp neighbors received-routes** command.

Syntax

show bgp ipv6 neighbors { *ipv4-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id* } { **received-routes** | **routes** | **rejected-routes** }

- *ipv4-address*—The IPv4 address of a BGP peer
- *ipv6-address* **interface** *interface-id*—The IPv6 address of a BGP peer. If the peer address is an IPv6 link local address, the interface that defines the scope of the link local address must be given.
- **autodetect interface** *interface-id* —(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec and all show modes

User Guidelines

The following fields are displayed.

Field	Description
Network	The destination prefix.
Next Hop	The BGP Next Hop as advertised by the peer.
Metric	The value of the MED, if a MED is received from the peer.
Local Pref	The local preference received from the peer.
Path	The AS path as received from the peer.

Origin	The value of the Origin attribute as received from the peer.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console#show bgp ipv6 neighbors  1010:10::103 routes

Local router ID is 0.0.0.101
Origin codes: i - IGP, e - EGP, ? - incomplete

Network             Next Hop         Metric     LocPref Path          Origin
------------------- ---------------- ---------- ------- ------------- ------
1010:10::/64        1010:10::103     0                  65001         i
2020:20::/64        1010:10::103     0                  65001         i

console#show bgp ipv6 neighbors fe80::21e:c9ff:fede:b51a interface vlan 10
received-routes

Local router ID is 0.0.0.101
Origin codes: i - IGP, e - EGP, ? - incomplete

Network             Next Hop         Metric     LocPref Path          Origin
------------------- ---------------- ---------- ------- ------------- ------
1010:10::/64        1010:10::103     0                  65001         i
2020:20::/64        1010:10::103     0                  65001         i
```

show bgp ipv6 statistics

Use this command to display statistics for the IPv6 decision process. This command deprecates and replaces the **show ipv6 bgp statistics** command.

Syntax

show bgp ipv6 statistics

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes.

User Guidelines

The following fields are displayed.

Field	Description
Delta T	How long since the decision process was run. hours:minutes:seconds if the elapsed time is less than 24 hours. Otherwise, days:hours.
Phase	The phase of the decision process that was run.
Upd Grp	Outbound update group ID. Only applies when phase 3 is run.
GenId	Generation ID of BGP routing table when decision process was run. The generation ID is incremented each time phase 2 of the decision process is run and when there is a change to the status of aggregate addresses.
Reason	The event that triggered the decision process to run
Peer	Phase 1 of the decision process can be triggered for a specific peer when a peer’s inbound routing policy changes or the peer is reset. When phase 1 is run for a single peer, the peer’s IP address is given.
Duration	How long the decision process took, in milliseconds
Adds	The number of routes added. For phase 1, this is the number of prefixes that pass inbound policy and are added to the Accept-RIB-In. For phase 2, this is the number of routes added to the BGP routing table. For phase 3, this is the number of prefixes added to the update group’s Adj-RIB-Out.
Mods	The number of routes modified. Always 0 for phase 1
Dels	The number of routes deleted. Always 0 for phase 1.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console # show bgp ipv6 statistics

Delta T  Phase  Upd Grp   GenId          Reason Peer  Duration  Adds  Mods
Dels
29:33:49      3        0    2041  Fwd status chng      34   750     0   500
29:33:40      2             2042   Accept-RIB-In-      59   750     0   500
29:33:28      2             2043   Accept-RIB-In-      10     0     0   250
29:23:40      2             2044   Accept-RIB-In-      32     0     0  1000
29:13:40      3        1    2044     Phase 2 done      48   500  2500  1750
29:02:01      3        0    2044     Phase 2 done      41   750     0  1250
28:33:40      2             2045     Phase 1 done      32   500     0       0
28:14:40      2             2046     Phase 1 done      16   250     0       0
```

show bgp ipv6 summary

Use this command to display a summary of BGP configuration and status. This command deprecates and replaces the **show ipv6 bgp summary** command.

Syntax

show bgp ipv6 summary

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes.

User Guidelines

The following fields are displayed.

Field	Description
Admin Mode	Whether BGP is globally enabled.
BGP Router ID	The configured router ID.
Local AS Number	The router’s AS number.

Traps	Whether BGP traps are enabled.
Maximum Paths	The maximum number of next hops in an external BGP route.
Maximum Paths iBGP	The maximum number of next hops in an internal BGP route.
Default Keep Alive Time	The configured keepalive time used by all peers that have not been configured with a peer-specific keepalive time.
Default Hold Time	The configured hold time used by all peers that have not been configured with a peer-specific hold time.
Number of Network Entries	The number of distinct IPv6 prefixes in the local RIB.
Number of AS Paths	The number of IPv6 AS paths in the local RIB.
Dynamic Neighbors	The number of dynamically discovered neighbors (current number, maximum number discovered, upper limit allowed).
Default Metric	The default value for the MED for redistributed routes.
Default Route Advertise	Whether BGP is configured to advertise a default route. Corresponds to default-information originate.
Redistributing	
Source	A source of routes that BGP is configured to redistribute.
Metric	The metric configured with the redistribute command.
Match Value	For routes redistributed from OSPF, the types of OSPF routes being redistributed.
Distribute List	The name of the prefix list used to filter redistributed routes, if one is configured with the **distribute-list out** command.
Route Map	The name of the route map used to filter redistributed routes.
Neighbor	The IP address of a neighbor
ASN	The neighbor’s ASN
MsgRcvd	The number of BGP messages received from this neighbor

MsgSent	The number of BGP messages sent to this neighbor
State	The adjacency state. One of IDLE, CONNECT, ACTIVE, OPEN SENT, OPEN CNFRM, EST
Up/Down Time	How long the adjacency has been in the ESTABLISHED state, or, if the adjacency is down, how long it has been down. In days:hours:minutes:seconds
Pfx Rcvd	The number of IPv6 prefixes received from the neighbor

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console#show bgp ipv6 summary

IPv6 Routing .................................. Enable
BGP Admin Mode ................................ Enable
BGP Router ID ................................. 1.1.1.1
Local AS Number ............................... 65001
Traps ......................................... Disable
Maximum Paths ................................. 1
Maximum Paths iBGP ............................ 1
Default Keep Alive Time ....................... 30
Default Hold Time ............................. 90
Number of Network Entries ..................... 0
Number of AS Paths ............................ 0
Dynamic Neighbors Current/High/Limit .......... 1/1/20
Default Metric ................................ Not Configured
Default Route Advertise ....................... No

Redistributing:
Source    Metric     Dist List                        Route Map
--------- ---------- -------------------------------- ----------------------


Neighbor         ASN   MsgRcvd  MsgSent  State         Up/Down Time   Pfx Rcvd
---------------- ----- -------- -------- ------------- -------------- ------
fe80::21e:c9ff:fede:b13a%Vl10
                  65000 137      136      ESTABLISHED                  0
```

show bgp ipv6 update-group

Use this command to report the status of IPv6 outbound groups and their members. Output and format are the same as for **show ip bgp update-group**. This command deprecates and replaces the **show ipv6 bgp update-group** command.

Syntax

show bgp ipv6 update-group [*group-index* | *ipv4-address* | *ipv6-address* [**interface** *interface-id*] | **autodetect interface** *interface-id*]

- *group-index*—If specified, this option restricts the output to a single update group.
- *ipv4-address*—The IPv4 address of a peer enabled for exchange of IPv6 prefixes. If specified, this option restricts the output to the update group containing the peer with the given address.
- *ipv6-address* [**interface** *interface-id*]—The IPv6 address of a peer. If the peer address is a link local address, the interface that defines the scope of the address must also be given. If a peer address is specified, this option restricts the output to the update group containing the peer with the given address.
- **autodetect interface** *interface-id*—(Optional) The routing interface on which the neighbor's link local IPv6 address is auto detected. The interface-id must be a VLAN routing interface.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The update send history table show statistics on as many as the fifteen most recent executions of the update send process for the update group. Items in the history table are as follows:

Fields	Description
Version	The update version.
Delta T	The amount of time elapsed since the update send process executed. hours::minutes::seconds.
Duration	How long the update send process took, in milliseconds
UPD Built	The number of UPDATE messages built.
UPD Sent	The number of UPDATE messages successfully transmitted to group members. Normally a copy of each UPDATE message built is sent to each group member.
Paths Sent	The number of paths advertised.
Pfxs Adv	The number of prefixes advertised.
Pfxs Wd	The number of prefixes withdrawn.

The following information is displayed.

Fields	Description
Update Group ID	Unique identifier for outbound update group.
Peer Type	Whether peers in this update group are internal or external.
Minimum Advertisement Interval	The minimum time, in seconds, between sets of UPDATE messages sent to the group.
Send Community	Whether BGP communities are included in route advertisements to members of the group. Yes or No.
Neighbor AS Path Access List Out	The AS path access list used to filter UPDATE messages sent to peers in the update group.
Neighbor Prefix List Out	Name of the prefix list used to filter prefixes advertised to the peers in the update group.
Neighbor Route Map Out	Name of the route map used to filter and modify routes advertised to the peers in the update group.
Members Added	The number of peers added to the group since the group was formed.
Members Removed	The number of peers removed from the group.

Update Version	The number of times phase 3 of the BGP decision process has run for this group to determine which routes should be advertised to the group.
Number of UPDATEs Sent	The number of UPDATE messages that have been sent to this group. Incremented once for each UPDATE regardless of the number of group members.
Time Since Last UPDATE	Time since an UPDATE message was last sent to the group. If no UPDATE has been sent to the group, the status is “Never.”
Current Prefixes	The number of prefixes currently advertised to the group.
Current Paths	The number of paths currently advertised to the group.
Prefixes Advertised	The total number of prefixes advertised to the group since the group was formed.
Prefixes Withdrawn	The total number of prefixes included in the Withdrawn Routes field of UPDATE messages sent to the group since the group was formed.
UPDATE Send Failures	The number of UPDATE messages that failed to be delivered to all members of the group.
Current Members	The IPv4 address of all current members of the group.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

show bgp ipv6 route-reflection

Use this command to display a summary of BGP route reflection. This command deprecates and replaces the **show ipv6 bgp route-reflection** command.

Syntax

show bgp ipv6 route-reflection

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If a route reflector client is configured with an outbound route map, the output warns that set statements in the route map are ignored when reflecting routes to this client.

The following information is displayed.

Field	Description
Cluster ID	The cluster ID used by this router. The value is tagged as configured when the value is configured with the bgp cluster-id command. When no cluster ID is configured, the local router ID is shown and tagged as default.
Client-to-Client Reflection	Displayed as Enabled when this router reflects routes received from its clients to its other clients. Disabled otherwise.
Clients	A list of this router's internal peers which have been configured as route reflector clients.
Non-client Internal Peers	A list of this router's internal peers that are not configured as route reflector clients. Routes from non-client peers are reflected to clients and vice-versa.

Command History

Introduced in version 6.2.0.1 firmware.

Modified in version 6.3.0.1 firmware.

Example

```
console(config)#show bgp ipv6 route-reflection

Cluster ID .................................. 65.1.1.1 (default)
Client-to-client Reflection .................. Enabled
```

```
Clients:
Non-client Internal Peers:
```

show ip bgp

To view routes in the BGP routing table, use the **show ip bgp** command. The output lists both the best and non-best paths to each destination.

Syntax

show ip bgp [*network/pfx-length* [**longer-prefixes | shorter-prefixes** [*length*]]] **|** [**filter-list** *as-path-list*] **|** [**prefix-list** *list-name*]

- *network/pfx-length*—(Optional) Display a specific route identified by its destination prefix
- **longer-prefixes**—(Optional) Used with the *network/pfx-len* option to show routes whose prefix length is equal to or longer than *pfx-len*. This option may not be given if the **shorter-prefixes** option is given.
- **shorter-prefixes** [*length*]—(Optional) Used with the *network/pfx-len* option to show routes whose prefix length is shorter than *pfx-len*, and, optionally, longer than a specified length. This option may not be given if the **longer-prefixes** option is given.
- **filter-list** *as-path-list*—(Optional) Filter the output to the set of routes that match a given AS Path list. This option may not be given if a *network/pfx-len* option is given.
- **Prefix-list** *list-name* —(Optional) The name of a prefix list indicating the list of matching routes to display.

Default Configuration

There is no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

The following fields are displayed.

Field	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented.
Status codes	• s—The route is aggregated into an aggregate address configured with the summary-only option • *—Dell EMC Networking BGP never displays invalid routes; so this code is always displayed (to maintain consistency with the industry standard) • >—Indicates that BGP has selected this path as the best path to the destination • i—If the route is learned from an internal peer
Network	Destination prefix
Next Hop	The route's BGP next hop
Metric	Multi-Exit Discriminator
LocPrf	The local preference
Path	The AS path
Origin	The value of the Origin attribute

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# show ip bgp

BGP table version is 5, local router ID is 20.1.1.1
Status codes: s suppressed, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network             Next Hop     Metric    LocPrf    Path     Origin
*> 172.20.1.0/24    100.10.1.1         10       100    20 10         i
                    200.10.1.1
*> 172.20.2.0/24    100.10.1.1         10       100    20 10         ?
```

show ip bgp aggregate-address

Use the **show ip bgp aggregate-address** command to list the aggregate addresses that have been configured and indicates whether each is currently active.

Syntax

show ip bgp [**vrf** *vrf-name*] **aggregate-address**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode, and all sub-modes.

User Guidelines

If the vrf argument is specified, information pertaining to that VRF is displayed.

The following fields are displayed.

Field	**Description**
Prefix/Len	Destination prefix and length
AS Set	Indicates whether an empty AS path is advertised with the aggregate address (N) or an AS SET is advertised with the set of AS numbers for the paths contributing to the aggregate (Y).
Summary Only	Indicates whether the individual networks are suppressed (Y) or advertised (N).
Active	Indicates whether the aggregate is currently being advertised.

Command History

Introduced in version 6.2.0.1 firmware. Updated in 6.3.0.1 firmware.

Example

```
console#show ip bgp aggregate-address

Prefix/Len          AS Set Summary Only Active
------------------- ------ ------------ ------
1.2.3.0/24          N      N            N
10.10.10.0/24       N      N            N
```

show ip bgp community

The **show ip bgp** community displays route information for the communities listed in the specified community.

Syntax

show ip bgp [vrf ***vrf-name***] **community** *communities* [**exact-match**]

- **vrf** *vrf-name*—Displays the aggregate address information associated with the named VRF.
- *communities*—A string of zero or more community values, which may be in either format and may contain the community keywords **no-advertise** and **no-export**. The output displays routes that belong to every community specified in the command.
- exact-match—Only displays routes that are members of the communities specified in the command.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec and Global Configuration

User Guidelines

If the vrf argument is specified, the community information for that VRF is displayed.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show ip bgp community

BGP table version is 0, local router ID is 65.1.1.1
Status Codes: s suppressed, * valid, > best, i - internal
Origin Codes: i - IGP, e - EGP, ? - incomplete

Network            Next Hop        Metric     LocPref    Path         Origin
------------------ --------------- ---------- ---------- ------------- ---
```

show ip bgp community-list

The **show ip bgp community-list** command lists the routes that are allowed by the specified community list.

Syntax

show ip bgp [vrf ***vrf-name***] **community-list** { *name* [**exact-match**]}

- **vrf** *vrf-name*—Displays the route information associated with the named VRF.
- *name*—A standard community list name.
- **exact-match**—(Optional) Only displays routes that are members of those and only those communities specified in the command.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec and Global Config modes

User Guidelines

If the vrf argument is specified, the community list information pertaining to that VRF is displayed.

Command History

Introduced in version 6.2.0.1 firmware. Updated in the version 6.3.0.1 firmware.

Example

```
console(config)#show ip bgp community-list test

BGP table version is 0, local router ID is 65.1.1.1
Status Codes: s suppressed, * valid, > best, i - internal
Origin Codes: i - IGP, e - EGP, ? - incomplete

Network            Next Hop        Metric     LocPref    Path          Origin
------------------ --------------- ---------- --------- ------------- ------
```

show ip bgp extcommunity-list

Use the **show ip bgp extcommunity-list** command to display all the permit and deny attributes of the given extended community list. If the *list-number* is specified, the output is displayed that matches the given *list-number*; else all the lists are displayed.

Syntax

show ip bgp extcommunity-list *list-number*

- *list-number* — A standard extended community list number (0 to 99).

Default Configuration

No extended community lists are configured by default.

Command Mode

Privileged Exec and Global Config modes

User Guidelines

The following fields are displayed.

Field	Description
Standard extended community-list	The standard named extended community list.
permit	Permits access for a matching condition. Once a permit value has been configured to match a given set of extended communities the extended community list defaults to an implicit deny for all other values.

RT	The route target extended community attribute.
deny	Denies access for a matching condition.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show ip bgp extcommunity-list 1

Standard extended community-list list1
permit RT:1:100 RT:2:100
deny RT:6:600
permit RT:5:200
permit SOO:9:900
```

show ip bgp listen range

Use the **show ip bgp listen range** command to display information about IPv4 BGP listen ranges.

Syntax

show ip bgp [**vrf** *vrf-name*] **listen range** [*network/length*]

- *network/length* — Displays information about the specified listen range.
- *vrf-name*—The name of a previously configured VRF.

Default Configuration

By default, all listen ranges are shown.

Command Mode

Privileged Exec and global configuration mode

User Guidelines

There are no user guidelines.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config-router)#show ip bgp listen range

Listen Range ................................ 10.27.0.0/16
Inherited Template ........................... template_10_27

  Member              ASN       State
  ---------------- ----- -----------
  10.27.8.189      65001 OPENCONFIRM
  10.27.128.235        0      ACTIVE


Listen Range ................................ 15.15.0.0/24
Inherited Template ........................... template_15_15

       Member        ASN    State
  ---------------- ----- -----------
```

show ip bgp neighbors

The **show ip bgp neighbors** command shows details about BGP neighbor configuration and status.

Syntax

show ip bgp [**vrf** *vrf-name*] **neighbors** [*neighbor-address*]

- *neighbor-address*—(Optional) The IPv4 address of a neighbor. Used to limit the output to a single neighbor.
- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

Since IPv4 prefixes can only be exchanged over IPv4 peering, the neighbor-address parameter must be an IPv4 peer address. This option limits the output to show a single neighbor. If no neighbor address is specified, the command shows all neighbors enabled for IPv4 prefix exchange.

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following fields are displayed.

Field	**Description**
Remote Address	The neighbor's IP address
Remote AS	The neighbor's autonomous system number
Peer ID	The neighbor's BGP router ID
Peer Admin Status	START or STOP
Peer State	The adjacency state of this neighbor
Local Port	TCP port number on the local end of the connection
Remote Port	TCP port number on the remote end of the connection
Connection Retry Interval	How long BGP waits between connection retries
Neighbor Capabilities	Optional capabilities reported by the neighbor, recognized and accepted by this router. Codes listed in the show output are as follows: • MP: Multiprotocol • RF: Route Refresh This version of Dell EMC Networking does not support any multiprotocol AFI/SAFI pairs other than IPv4 unicast. The presence of this capability does not imply otherwise.
Next Hop Self	If the local router is configured to advertise one of its own IP addresses as the BGP Next Hop when advertising a path learned from an external peer.
Update Source	The configured value for the source IP address of packets sent to this peer. This field is only included in the output if the update source is configured.

Local Interface Address	The IPv4 address used as the source IP address in packets sent to this neighbor.
Configured Hold Time	The time, in seconds, that this router proposes to this neighbor as the hold time
Configured Keep Alive Time	The configured KEEPALIVE interval for this neighbor.
Negotiated Hold Time	The minimum configured hold time and the hold time in the OPEN message received from this neighbor. If the local router does not receive a KEEPALIVE or UPDATE message from this neighbor within this interval of time, the local router drops the adjacency. This field is only shown if the adjacency state is OPEN CONFIRM or greater.
Keep Alive Time	The number of seconds between KEEPALIVE messages sent to this neighbor. This field is only shown if the adjacency state is OPEN CONFIRM or greater.
Prefix Limit	The maximum number of prefixes this router is willing to accept from this neighbor.
Prefix Warning Threshold	Percentage of the prefix limit that causes a warning message to be logged.
Warning Only on Prefix Limit	Whether to shutdown a neighbor that exceeds the prefix limit. TRUE if the event is logged without shutting down the neighbor.
Minimum Advertisement Interval	The minimum time between UPDATE messages sent to this neighbor.
MD5 Password	The TCP MD5 password, if one is configured, in plain text.
Last Error	The last error that occurred on the connection to this neighbor.
Last SubError	The suberror reported with the last error.
Established Transitions	The number of times the adjacency has transitioned into the Established state.
Established Time	How long since the connection last transitioned to or from the Established state.

Time Elapsed Since Last Update	How long since an UPDATE message has been received from this neighbor.
Message Table	The number of BGP messages sent to and received from this neighbor
Prefixes Advertised	A running count of the number of prefixes advertised to or received from this neighbor
Prefixes Withdrawn	A running count of the number of prefixes included in the Withdrawn Routes portion of UPDATE messages, to and from this neighbor
Prefixes Current	The number of prefixes currently advertised to or received from this neighbor
Max NLRI per Update	The maximum number of prefixes included in a single UPDATE message, to and from this neighbor
Min NLRI per Update	The minimum number of prefixes included in a single UPDATE message, to and from this neighbor

If the router receives an UPDATE message with an invalid path attribute, the router will in most cases send a NOTIFICATION message and reset the adjacency. BGP maintains a per-neighbor counter for each type of path attribute error. This show command lists each non-zero counter, just after the LastSubError. The counters that may be listed are as follows:

Counters	**Description**
Path with duplicate attribute	The peer sent an UPDATE message containing the same path attribute more than once.
Path with well-known/optional conflict	A received path attribute was flagged as both well-known and optional or neither well-known nor optional.
Transitive flag not set on transitive attr	A received path attribute is known to be transitive, but the transitive flag is not set.
Mandatory attribute non-transitive or partial	A mandatory path attribute was received with either the transitive or partial flag set.
Optional attribute non-transitive and partial	An optional path attribute has the transitive flag clear and the partial flag set.
Path attribute too long	A received path attribute was longer than the expected length.

Path attribute length error	A received path attribute has a length value that exceeds the remaining length of the path attributes field.
Invalid ORIGIN code	A received UPDATE message included an invalid ORIGIN code.
Unexpected first ASN in AS path	The AS Path attribute from an external peer did not include the peer's AS number as the first AS.
Invalid AS path segment type	The AS Path includes a segment with an invalid segment type.
Invalid BGP NEXT HOP	The BGP NEXT HOP is not a valid unicast address.
Bad BGP NEXT HOP	The BGP NEXT HOP was either the receiver's IP address or an IP address outside the subnet to the peer.
Invalid AGGREGATOR attribute	The AGGREGATOR attribute was invalid.
Unrecognized well-known path attribute	An UPDATE message contained a path attribute with the Optional flag clear, but this router does not recognize the attribute.
Missing mandatory path attribute	An UPDATE message was received without a mandatory path attribute.
Missing LOCAL PREF attribute	An UPDATE message was received from an internal peer without the LOCAL PREF attribute.
Invalid prefix in UPDATE NLRI	An UPDATE message received from this peer contained a syntactically incorrect prefix.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#show ip bgp neighbors

Remote Address ................................ 10.10.10.10
Remote AS ..................................... 65000
Peer ID ....................................... 0.0.0.0
Peer Admin Status ............................. START
Peer State .................................... IDLE
Local Interface Address ....................... 10.10.10.3
Local Port .................................... 179
Remote Port ................................... 54474
```

```
Connection Retry Interval ..................... 2 sec
Neighbor Capabilities ......................... None
Next Hop Self ................................. Disable
IPv4 Unicast Support .......................... Sent
IPv6 Unicast Support .......................... None
Template Name ................................. None
Update Source ................................. None
Configured Hold Time .......................... None
Configured Keep Alive Time .................... None
Prefix Limit .................................. 8160
Prefix Warning Threshold ...................... 75
Warning Only On Prefix Limit .................. False
MD5 Password .................................. None
Originate Default ............................. False

Last Error (Sent) ............................. OPEN Message Error
Last SubError ................................. Bad Peer AS
Time Since Last Error ........................ 0 days 00 hrs 00 mins 02 secs
Established Transitions ....................... 0
Established Time ............................. 0 days 01 hrs 45 mins 20 secs
Time Since Last Update ........................ No UPDATE received
IPv4 Outbound Update Group .................... None


             Open    Update    Keepalive    Notification    Refresh    Total
Msgs Sent    2287         0            0            2122          0     4409
Msgs Rcvd    2122         0            0               0          0     2122

Received UPDATE Queue Size: 0 bytes. High: 0  Limit: 392192 Drops: 0

IPv4 Prefix Statistics:
                           Inbound       Outbound
Prefixes Advertised             0              0
Prefixes Withdrawn              0              0
Prefixes Current                0              0
Prefixes Accepted               0            N/A
Prefixes Rejected               0            N/A
Max NLRI per Update             0              0
Min NLRI per Update             0              0



console # show ip bgp neighbors 172.20.1.100

Remote Address ................................ 172.20.1.100
Remote AS ..................................... 100
Peer ID ....................................... 14.3.0.1
Peer Admin Status ............................. START
Peer State .................................... ESTABLISHED
Local Port .................................... 179
Remote Port ................................... 58265
Connection Retry Interval ..................... 120 sec
```

```
Neighbor Capabilities ........................ None
Next Hop Self ................................ Disable
Update Source.................................
Local Interface Address ...................... 172.20.1.2
Configured Hold Time ......................... 90 sec
Configured Keep Alive Time.................... 30 sec
Negotiated Hold Time ......................... 30 sec
Keep Alive Time .............................. 10 sec
Prefix Limit.................................. None
Prefix Warning Threshold...................... 75%
Warning Only On Prefix Limit.................. TRUE
Minimum Advertisement Interval................ 30 sec
MD5 Password.................................. password
Originate Default............................. TRUE

Last Error (Sent)............................. Hold Timer Expired
Last SubError................................. None
Time Since Last Error......................... 0 day 0 hr 4 min 27 sec
Established Transitions ...................... 1
Established Time ............................. 0 day 0 hr 4 min 25 sec
Time Since Last Update ....................... 0 day 0 hr 4 min 25 sec
Outbound Update Group......................... 3


             Open   Update   Keepalive   Notification   Refresh   Total
Msgs Sent       1        0          10              0         0      11
Msgs Rcvd       1        1          11              0         0      12

                           Inbound       Outbound
Prefixes Advertised              1              0
Prefixes Withdrawn               0              0
Prefixes Current                 1              0
Max NLRI per Update              1              0
Min NLRI per Update              1              0
```

In this example, BGP has received an UPDATE message from an external peer 172.20.101.100 with something other than the peer's ASN as the first ASN in the AS Path. The additional counter shows that this occurred one time.

```
console #show ip bgp neighbors 172.20.101.100

Remote Address ............................... 172.20.101.100
Remote AS .................................... 101
...

Last Error ................................... UPDATE Message Error
Last SubError ................................ Malformed AS_PATH
Unexpected first ASN in AS path .............. 1

Established Transitions ...................... 1
```

```
Established Time ............................   0 days 00 hrs 00 mins 10
secs
```

show ip bgp neighbors advertised-routes

The **show ip bgp neighbors advertised-routes** command displays the list of routes advertised to a specific neighbor. These are the routes in the adjacent RIB out for the neighbor's outbound update group

Syntax

show ip bgp [**vrf** *vrf-name*] **neighbors** *ip-address* **advertised-routes**

- *ip-address*—The IPv4 address of a neighbor.
- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode, and all sub-modes

User Guidelines

Note that this output differs slightly from the output in **show ip bgp**. Suppressed routes and non-best routes are not advertised; so these status codes are not relevant here. Advertised routes always have a single next hop, the BGP NEXT HOP advertised to the peer. Local preference is never sent to external peers.

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The output indicates whether BGP is configured to originate a default route to this peer (**neighbor default-originate**).

Counters	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented.

Status codes	p—The route has been updated in Adj-RIB-Out since the last UPDATE message was sent. Transmission of an UPDATE message is pending.
Network	Destination prefix
Next Hop	The BGP NEXT HOP as advertised to the peer.
Local Pref	The local preference. Local preference is never advertised to external peers.
Metric	The value of the Multi Exit Discriminator, if the MED is advertised to the peer.
Path	The AS path. The AS path does not include the local AS number, which is added to the beginning of the AS path when a route is advertised to an external peer.
Origin	The value of the Origin attribute.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#show ip bgp neighbors 10.10.10.10 advertised-routes

BGP table version is 5, local router ID is 0.0.0.100
Status codes: p - advertisement pending
Origin codes: i - IGP, e - EGP, ? - incomplete


  Network             Next Hop         Metric     LocPref Path          Origin
  ------------------- ---------------- ---------- ------- ------------- -----
  172.20.1.0/24        172.20.101.1     10         100     20 10         i
p 20.1.1.0/24          172.20.101.1                100     20            ?
```

show ip bgp neighbors received-routes

This command displays the list of routes received from a specific neighbor. The list includes both the accepted and rejected routes.

Syntax

show ip bgp [**vrf** *vrf-name*]**neighbors** *ip-address* {**received-routes|routes|rejected-routes**}

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.
- *ip-address*—The IPv4 address of a BGP neighbor.
- Received-routes—Display the routes received by a particular neighbor prior to filtering.
- Routes—Display both the received and advertised routes.
- Rejected-routes—Display the routes rejected from the specified neighbor.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following fields are displayed.

Fields	Description
Network	Destination prefix
Next Hop	The BGP NEXT HOP as advertised by the peer.
Metric	The value of the Multi Exit Discriminator, if a MED is received from the peer.
Local Pref	The local preference received from the peer.
Path	The AS path as received from the peer
Origin	The value of the Origin attribute as received from the peer follows immediately after the AS PATH.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console #show ip bgp neighbors 172.20.101.100 received-routes

local router ID is 20.1.1.1
Origin codes: i - IGP, e - EGP, ? - incomplete


Network         Next Hop         Metric   Local Pref  Path  Origin
172.20.1.0/24  172.20.101.1         10          100 20 10       i
20.1.1.0/24    172.20.101.1                     100    20       ?


console#show ip bgp neighbors 10.10.10.3 routes

Local router ID is 0.0.0.101
Origin codes: i - IGP, e - EGP, ? - incomplete

Network             Next Hop         Metric     LocPref Path          Origin
------------------- ---------------- ---------- ------- ------------- ------
1.1.1.0/24          10.10.10.3       1                  65001         i
1.2.0.0/16          10.10.10.3       0                  65001         i
1.2.3.0/24          10.10.10.3       0                  65001         i
```

show ip bgp neighbors policy

This command displays the inbound and outbound IPv4 policies configured for a specific peer. The output distinguishes policies that are configured on the peer itself and policies that the peer inherits from a peer template.

Syntax

show ip bgp [**vrf** *vrf-name*] **neighbors** *ip-address* **policy**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.
- *ip-address*—The IPv4 address of a neighbor can optionally be specified to limit the output to a single neighbor.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following fields are displayed.

Fields	Description
Neighbor	The peer address of a neighbor.
Policy	A neighbor-specific BGP policy.
Template	If the policy is inherited from a peer template, this field lists the template name.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console #show ip bgp neighbors 172.20.101.100 policy

Neighbor        Policy                         Template
--------------- ------------------------------ -----------------------
172.20.101.100  advertisement-interval 600
                default-originate
                filter-list 500 in
                filter-list 500 out
                prefix-list barney in
                prefix-list wilma out
                maximum-prefix unlimited 100 warning-only   torPeers
                route-map fred in                           torPeers
                route-map dino out                          torPeers
                send-community                              torPeers
                advertisement-interval 600                  torPeers
                default-originate                           torPeers
```

show ip bgp route-reflection

This command displays all global configuration related to IPv4 route reflection, including the cluster ID and whether client-to-client route reflection is enabled, and lists all the neighbors that are configured as route reflector clients.

Syntax

show ip bgp [**vrf** *vrf-name*] **route-reflection**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

If a route reflector client is configured with an outbound route map, the output warns that set statements in the route map are ignored when reflecting routes to this client.

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following information is displayed:

Fields	Description
Cluster ID	The cluster ID used by this router. The value is tagged as configured when the value is configured with the **bgp cluster-id** command. When no cluster ID is configured, the local router ID is shown and tagged as default.
Client-to-client reflection	Displayed as Enabled when this router reflects routes received from its clients to its other clients. Otherwise, disabled.

Clients	A list of this router's internal peers which have been configured as route reflector clients.
Non-client Internal Peers	A list of this router's internal peers that are not configured as route reflector clients. Routes from non-client peers are reflected to clients and vice-versa.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console # show ip bgp route-reflection

Cluster ID....................... 1.1.1.1 (configured)
Client-to-client Reflection....... Enabled
Clients:  172.20.1.2, 172.20.3.2, 172.20.5.2
Non-client Internal Peers:  192.168.1.2, 192.168.2.2

Skipping set statements in outbound route map gandolf when reflecting to
internal peer 172.20.1.2.
```

show ip bgp statistics

This command displays recent decision process history. Phase 1 of the decision process reacts to UPDATE messages received from peers, determining what new routes are accepted and deleting withdrawn routes from the Adj-RIB-In. Phase 2 determines the best path for each destination, updates the BGP route table, and updates the common RIB. Phase 3 is run independently for each outbound update group and determines which routes should be advertised to neighbors in each group. Each entry in the table shows statistics for one phase of the decision process. The table shows the 20 most recent decision process runs, with the most recent information at the end of the table.

Syntax

show ip bgp [**vrf** *vrf-name*] **statistics**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Config mode and all sub-modes.

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following information is displayed.

Fields	Description
Delta T	How long since the decision process was run. hours:minutes:seconds if the elapsed time is less than 24 hours. Otherwise, days:hours.
Phase	The phase of the decision process that was run.
Upd Grp	Outbound update group ID. Only applies when phase 3 is run.
GenId	Generation ID of BGP routing table when decision process was run. The generation ID is incremented each time phase 2 of the decision process is run and when there is a change to the status of aggregate addresses.
Reason	The event that triggered the decision process to run.
Peer	Phase 1 of the decision process can be triggered for a specific peer when a peer's inbound routing policy changes or the peer is reset. When phase 1 is run for a single peer, the peer's IP address is given.
Duration	How long the decision process took, in milliseconds.
Adds	The number of routes added. For phase 1, this is the number of prefixes that pass inbound policy and are added to the Accept-RIB-In. For phase 2, this is the number of routes added to the BGP routing table. For phase 3, this is the number of prefixes added to the update group's Adj-RIB-Out.

Mods	The number of routes modified. Always 0 for phase 1.
Dels	The number of routes deleted. Always 0 for phase 1.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#show ip bgp statistics

Delta T  Phase UpdGrp GenId Reason         Peer    Duration Adds  Mods  Dels
-------- ----- ------ ----- -------------- ------- -------- ----- ----- -----
02:01:07 2             3 Local route add     0        3     0     0
00:10:38 3     0       3 New update grp     0        3     0     0
00:05:51 2             4 Local route add    0        1     0     0
00:05:51 3     0       4 Phase 2 done    0        1     0     0
00:05:30 2             5 Local route del    0        0     0     1
00:05:20 3     0       5 Phase 2 done    0        0     0     1
```

show ip bgp summary

This command displays a summary of BGP configuration and status.

Syntax

show ip bgp [**vrf** *vrf-name*] **summary**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Config mode and all sub-modes.

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The following information is displayed.

Fields	Description
Admin Mode	Whether BGP is globally enabled.
BGP Router ID	The configured router ID
Local AS Number	The router's AS number
Traps	Whether BGP traps are enabled.
Maximum Paths	The maximum number of next hops in an external BGP route.
Maximum Paths iBGP	The maximum number of next hops in an internal BGP route.
Default Keep Alive Time	The configured keepalive time used by all peers that have not been configured with a peer-specific keepalive time.
Default Hold Time	The configured hold time used by all peers that have not been configured with a peer-specific hold time.
Number of Network Entries	The number of distinct prefixes in the local RIB.
Number of AS Paths	The number of AS paths in the local RIB.
Dynamic Neighbors	The number of dynamically discovered neighbors (current number, maximum number discovered, upper limit allowed).
Default Metric	The default value for the MED for redistributed routes.
Default Route Advertise	Whether BGP is configured to advertise a default route. Corresponds to default-information originate.
Redistributing	
Source	A source of routes that BGP is configured to redistribute.
Metric	The metric configured with the redistribute command.
Match Value	For routes redistributed from OSPF, the types of OSPF routes being redistributed.
Distribute List	The name of the prefix list used to filter redistributed routes, if one is configured with the distribute-list out command.

Route Map	The name of the route map used to filter redistributed routes.
Neighbor	The IP address of a neighbor.
ASN	The neighbor's ASN.
MsgRcvd	The number of BGP messages received from this neighbor.
MsgSent	The number of BGP messages sent to this neighbor.
State	The adjacency state. One of IDLE, CONNECT, ACTIVE, OPEN SENT, OPEN CNFRM, EST.
Up/Down Time	How long the adjacency has been in the ESTABLISHED state, or, if the adjacency is down, how long it has been down. In days:hours:minutes:seconds.
Pfx Rcvd	The number of prefixes received from the neighbor.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#show ip bgp summary

IPv4 Routing .................................. Enable
BGP Admin Mode ................................ Enable
BGP Router ID ................................. 0.0.0.100
Local AS Number ............................... 65001
Traps ......................................... Disable
Maximum Paths ................................. 1
Maximum Paths iBGP ............................ 1
Default Keep Alive Time ....................... 30
Default Hold Time ............................. 90
Number of Network Entries ..................... 3
Number of AS Paths ............................ 0
Dynamic Neighbors Current/High/Limit .......... 1/1/20
Default Metric ................................ Not Configured
Default Route Advertise ....................... No

Redistributing:
Source    Metric     Dist List                        Route Map
--------- ---------- -------------------------------- ---------------------
static
ospf            300
```

```
  ospf match: int

Neighbor         ASN   MsgRcvd  MsgSent  State        Up/Down Time   Pfx Rcvd
---------------- ----- -------- -------- ------------- -------------- ------
10.10.10.10      65000 2269     4666     ESTABLISHED   0:00:17:15     0
```

show ip bgp template

The **show ip bgp template** command lists the routes that are allowed by the specified community list.

Syntax

show ip bgp template [*template-name*]

- *template-name*—(Optional) Limits the output to a single template

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

The following information is displayed.

Fields	Description
Template Name	The name of a BGP peer template.
AF	The address family to which the configuration command applies. This field is blank for session parameters, which apply to all address families.
Configuration	Configuration commands that are included in the template.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ip bgp template

Template Name   AF    Configuration
-------------  ----   -----------------------------
peer-grp1             timers 5 15
                      password rivendell
               IPv4   advertisement-interval 15


peer-grp2      IPv4   prefix-list strider in
               IPv4   maximum-prefix 100
               IPv6   prefix-list gandolf in
               IPv6   maximum-prefix 200

peer-grp3      IPv6   send-community

peer-grp4             update-source loopback 0
               IPv4   next-hop-self
```

show ip bgp traffic

The **show ip bgp traffic** command list the routes that are allowed by the specified community list.

Syntax

show ip bgp [**vrf** *vrf-name*] **traffic**

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The output shows when BGP counters were last cleared (using **clear ip bgp counters**). Clearing counters resets all values in this output to 0 except for the high water mark for the work queues.

The first table lists the number of BGP messages of each type that this router has sent and received. Following the table is a maximum send and receive UPDATE message rate. These rates report the busiest one-second interval.

The queue statistics table reports information for BGP work queues. Items placed on each of these work queues are as follows:

- The Events queue includes most timer events and configuration changes.
- The Keepalive Tx queue includes timer events to send a KEEPALIVE message to a peer. The Dec Proc queue includes events that cause the decision process to be run.
- The Rx Data queue holds incoming BGP messages.
- The RTO Notifications queue includes best route change and next hop resolution change notifications from the routing table.
- The MIB Queries queue includes pending SNMP queries for BGP status.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#show ip bgp traffic

Time Since Counters Cleared: 55223 Seconds
BGP Message Statistics
               Open     Update  Notification   Keepalive    Refresh      Total
Recd:             6         11             0        7888          0       7905
Sent:             8         56             3        8465          0       8532

Max Received UPDATE rate: 1 pps
Max Send UPDATE rate: 5 pps

BGP Queue Statistics
             Current         Max       Drops        Limit
Events             0           2           0          800
Keepalive Tx       0           3           0          128
Dec Proc           0           3           0          133
Rx Data            0           3           0          500
RTO Notifications  0           4           0         1222
```

```
MIB Queries         0            0            0            5
```

show ip bgp update-group

This command reports the status of IPv4 outbound update groups and their members.

Syntax

show ip bgp [**vrf** *vrf-name*] **update-group** [*group-index* | *peer-address*]

- **vrf** *vrf-name* — Displays the aggregate address information associated with the named VRF.
- *group-index*—(Optional) If specified, this option restricts the output to a single update group.
- *peer-address*—(Optional) If specified, this option restricts the output to the update group containing the peer with the given IPv4 address.

Default Configuration

By default, information about the global VRF is shown.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

If the *vrf-name* argument is specified, information pertaining to that VRF is displayed.

The update send history table show statistics on as many as the fifteen most recent executions of the update send process for the update group. Items in the history table are as follows:

Fields	Description
Version	The update version.
Delta T	The amount of time elapsed since the update send process executed. hours::minutes::seconds.
Duration	How long the update send process took, in milliseconds

UPD Built	The number of UPDATE messages built.
UPD Sent	The number of UPDATE messages successfully transmitted to group members. Normally a copy of each UPDATE message built is sent to each group member.
Paths Sent	The number of paths advertised.
Pfxs Adv	The number of prefixes advertised.
Pfxs Wd	The number of prefixes withdrawn.

The following information is displayed.

Fields	**Description**
Update Group ID	Unique identifier for outbound update group.
Peer Type	Whether peers in this update group are internal or external.
Minimum Advertisement Interval	The minimum time, in seconds, between sets of UPDATE messages sent to the group.
Send Community	Whether BGP communities are included in route advertisements to members of the group. Yes or No.
Neighbor AS Path Access List Out	The AS path access list used to filter UPDATE messages sent to peers in the update group.
Neighbor Prefix List Out	Name of the prefix list used to filter prefixes advertised to the peers in the update group.
Neighbor Route Map Out	Name of the route map used to filter and modify routes advertised to the peers in the update group.
Members Added	The number of peers added to the group since the group was formed.
Members Removed	The number of peers removed from the group.
Update Version	The number of times phase 3 of the BGP decision process has run for this group to determine which routes should be advertised to the group.
Number of UPDATEs Sent	The number of UPDATE messages that have been sent to this group. Incremented once for each UPDATE regardless of the number of group members.

Time Since Last UPDATE	Time since an UPDATE message was last sent to the group. If no UPDATE has been sent to the group, the status is “Never.”
Current Prefixes	The number of prefixes currently advertised to the group.
Current Paths	The number of paths currently advertised to the group.
Prefixes Advertised	The total number of prefixes advertised to the group since the group was formed.
Prefixes Withdrawn	The total number of prefixes included in the Withdrawn Routes field of UPDATE messages sent to the group since the group was formed.
UPDATE Send Failures	The number of UPDATE messages that failed to be delivered to all members of the group.
Current Members	The IPv4 address of all current members of the group.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console# show ip bgp update-group

Update Group ID............................ 0
Peer Type.................................. External
Minimum Advertisement Interval............. 30 seconds
Send Community............................. Yes
Neighbor AS Path Access List Out........... 1
Neighbor Prefix List Out................... pfxList1
Neighbor Route Map Out..................... None
Members Added.............................. 48
Members Removed............................ 0
Update Version............................. 19
Number of UPDATEs Sent..................... 512
Time Since Last Update..................... 5 hrs 3 min 2 sec
Current Prefixes........................... 5500
Current Paths.............................. 22
Prefixes Advertised........................ 191250
Prefixes Withdrawn......................... 186000
UPDATE Send Failures....................... 0

Current Members:  172.20.1.100, 172.20.2.100
```

```
  Version    Delta T Duration UPD Built UPD Sent Paths Sent Pfxs Adv  Pfxs Wd
       10   00:33:49      100         6      288          5     1250      750
       11   00:33:49        0         4      192          3      750      250
       12   00:33:49        0         2       96          1      250     1000
       13   00:33:49        0         2       96          1      250     1018
       14   00:33:49        0         1       48          0        0      482
       15   00:33:49      100         8      384          7     1750      750
       16   00:33:49        0         3      144          2      500      250
       17   00:31:49        0         4      192          3      750      750
       18   00:23:49      100         4      192          3      750     1000
       19   00:03:49      100         6      288          5     1250      500


Update Group ID.......................... 1
Peer Type................................ Internal
Minimum Advertisement Interval............ 5 seconds
Send Community........................... Yes
Neighbor AS Path Access List Out.......... none
Neighbor Prefix List Out.................. none
Members Added............................ 3
Members Removed.......................... 0
Update Version........................... 4
Number of UPDATEs Sent.................... 8
Time Since Last UPDATE.................... 3 hrs 13 min 22 sec
Current Prefixes......................... 84
Current Paths............................ 2
Prefixes Advertised...................... 100
Prefixes Withdrawn....................... 16
UPDATE Send Failures..................... 0

Current Members:  172.24.3.1, 172.25.8.56, 172.28.9.1

Version    Delta T Duration UPD Built UPD Sent Paths Sent Pfxs Adv  Pfxs Wd
     10   00:00:49      100         6      288          5     1250      750
```

show ip bgp vpn4

Use the **show ip bgp vpn4** command to display the VPNv4 address information from the BGP table. If the vrf argument is specified, the address information pertaining to that VRF is displayed.

Syntax

show ip bgp vpnv4 {**all** | **rd** *route-distinguisher* [*ipprefix/length*] | **vrf** *vrf-name* [*ip-prefix/length*] | **statistics** }

- **all**— Displays the complete VPNv4 database.

- **rd** *route-distinguisher*—Displays the NLRI prefixes that match the named route distinguisher.
- **vrf** *vrf-name*—Displays the NLRI prefixes associated with the named VRF instance.
- *ip-prefix/length* — IP address of a network in the routing table and the length of the mask (0 to 32). The slash mark must be included.
- **statistics** — Displays BGP VPNv4 statistics

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec and Global Configuration modes

User Guidelines

The format and field descriptions are the same as for **show ip bgp neighbors** with the following exceptions:

- If the peer address (“Remote Address”) is a link local address, the next line of output indicates the scope of the address.
- No “IPv4 Outbound Update Group” is listed.
- No IPv4 prefix statistics are shown, since this implementation does not support advertisement of IPv4 prefixes over IPv6 transport.
- “RFC 5549 Support” is displayed only if the BGP neighbor is peered over IPv6 network.
- If the peer is configured as “autodetect”, the “Remote Address” shows detected IPv6 address or “Unresolved” if the peer is not detected by the autodetect feature.
- The “Autodetect Status” field is displayed only if the peer is configured as “autodetect”. The field shows one of the following status’: “Peer is detected”, “Peer is not detected” or “Multiple peers are detected”.

The command output provides the following information.

Term	Description
BGP table version	Each time phase 2 of the BGP decision process runs to select new BGP routes, this number is incremented
Status codes	One of the following: • s: The route is aggregated into an aggregate address configured with the summary-only option. • *: BGP never displays invalid routes; so this code is always displayed (to maintain consistency with the industry standard). • >: Indicates that BGP has selected this path as the best path to the destination. • i: If the route is learned from an internal peer.
Route Distinguisher	The RD associated with the VRF.
Network	The destination prefix.
Next Hop	The route's BGP NEXT HOP.
Metric	BGP metric.
LocPrf	The local preference.
Path	The AS path per route.
Prefix/Prefix Length	The destination prefix and prefix length.
Generation ID	The version of the BGP routing table when this route last changed.
Forwarding	If this BGP route is used for forwarding.
Advertised To Update Groups	The outbound update groups to which this route is advertised.
Local Preference	The local preference, either as received from the peer or as set according to local policy.
AS Path	The AS Path. This form of **show ip bgp** displays AS Paths as long as allowed by **bgp maxas-limit.**
Origin	Value of the ORIGIN attribute.
Metric	Value of the MED attribute, if included.

Term	Description
Type	Whether the path is received from an internal or external peer.
IGP Cost	The interior gateway cost (e.g., OSPF cost) to the BGP NEXT HOP.
Peer (Peer ID)	The IP address of the peer that sent this route, and its router ID.
BGP Next Hop	The BGP NEXT HOP attribute.
Atomic Aggregate	If the ATOMIC AGGEGATE attribute is attached to the path.
Aggregator	The AS number and router ID of the speaker that aggregated the route.
Communities	The BGP communities attached to the path.
Originator	If the ORIGINATOR attribute is attached to the path, the value of this attribute.
Cluster List	If the CLUSTER_LIST attribute is attached to the path, the sequence of cluster IDs in the cluster list.
Extended Community	Route target value associated with the specified route

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example shows all available VPNv4 information in a BGP routing table:

```
console#show ip bgp vpnv4 all

BGP table version is 5, local router ID is 20.1.1.1
Status codes: s suppressed, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network             Next Hop      Metric   LocPrf   Path
Route Distinguisher : 1:10 (for VRF red)
*> 172.20.1.0/24    100.10.1.1         10      100   20 10 i
*> 24.95.16.0/24    100.10.1.1         10      100   20 10 i
*> 24.14.8.0/24     100.10.1.1         10      100   20 10 i

Route Distinguisher : 2:20 (for VRF blue)
*> 173.20.1.0/24    120.10.1.1         10      100   20 10 i
```

```
*> 25.95.16.0/24    120.10.1.1         10      100   20 10 i
*> 25.14.8.0/24     120.10.1.1         10      100   20 10 i

Route Distinguisher : 3:30 (for VRF yellow)
*> 174.20.1.0/24    130.10.1.1         10      100   20 10 i
*> 26.95.16.0/24    130.10.1.1         10      100   20 10 i
*> 26.14.8.0/24     130.10.1.1         10      100   20 10 i
```

The following example shows VPNv4 routing entries for VRF named *red*:

```
(R1) # show ip bgp vpnv4 vrf red

BGP table version is 5, local router ID is 20.1.1.1
Status codes: s suppressed, * valid, > best, i - internal
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network            Next Hop     Metric   LocPrf   Path
Route Distinguisher : 1:10 (for VRF red)
*> 172.20.1.0/24    100.10.1.1         10      100   20 10 i
*> 24.95.16.0/24    100.10.1.1         10      100   20 10 i
*> 24.14.8.0/24     100.10.1.1         10      100   20 10 i
```

The following example shows the attributes for network 172.20.1.0 that include multi-paths and best path (Use like any of the below formats):

```
(R1) # show ip bgp vpnv4 vrf red 172.20.1.0/24

Prefix/Prefix Length...................... 1:100:172.20.1.0/24
Generation ID............................. 2056
Forwarding................................ Yes
Advertised to Update Groups............... 1, 5

Best Path:
Imported from............................. 2:200:100.10.1.1
Local Preference.......................... 100
AS Path................................... 20 10
Origin.................................... IGP
Metric.................................... 10
Type...................................... External
IGP Cost.................................. 30
Peer (Peer ID)............................ 100.10.1.1 (32.4.1.1)
BGP Next Hop.............................. 100.10.1.1
Atomic Aggregate.......................... Included
Aggregator (AS, Router ID)................ 300, 14.1.1.1
Communities............................... no-export
Extended Community........................ RT:1:100
                                           RT:2:200
Originator...............................  10.1.1.1

Non-best Paths:
Local Preference.......................... 200
```

```
AS Path.................................... 18 50 27
Origin..................................... Incomplete
Type....................................... External
IGP Cost................................... 10
Peer (Peer ID)............................. 200.1.1.1 (18.24.1.3)
BGP Next Hop............................... 200.1.1.1
Extended Community......................... RT:3:300
```

template peer

Use the **template peer** command in router configuration mode to create a BGP peer template and enter peer template configuration mode. To delete a peer template, use the **no** form of this command.

Syntax

template peer *name*

no template peer *name*

- *name*—The name of the template. The name may be no more than 32 characters.

Default Configuration

No peer templates are configured by default.

Command Mode

BGP Router Configuration mode

User Guidelines

A peer template can be configured with parameters that apply to many peers. Neighbors can then be configured to inherit parameters from the peer template. A peer template can include both session parameters and peer policies. Peer policies are configured within an address family configuration mode and apply only to that address family. You can configure up to 32 peer templates. When changing a template, the change is immediately applied to all neighbors that inherit from the template (though policy changes are subject to a three-minute delay.)

The following commands can be issued in peer template configuration mode and thus added to a peer template:

- **address-family**
- **allowas-in**
- **connect-retry-interval**
- **description**
- **ebgp-multihop**
- **fall-over**
- **local-as**
- **password**
- **remote-as**
- **rfc5549-support**
- **shutdown**
- **timers**
- **update-source**

See the associated **neighbor** commands for a description of parameters and keywords. Note that Dell EMC Networking does not support a **remote-as** *as-number* command in this mode. The neighbor's AS number must be specified when the neighbor is created.

Command History

Introduced in version 6.2.0.1 firmware. Additional command options added in 6.3.0.1 firmware.

Example

```
console(config)# router bgp 65000
console(config-router)# neighbor 172.20.1.2 remote-as 65001
console(config-router)# neighbor 172.20.2.2 remote-as 65001
console(config-router)# template peer AGGR
console(config-rtr-tmplt)# timers 3 9
console(config-rtr-tmplt)# address-family ipv4
console(config-rtr-tmplt-af)# send-community
console(config-rtr-tmplt-af)# route-map RM4-IN in
console(config-rtr-tmplt-af)# route-map RM4-OUT out
console(config-rtr-tmplt-af)# exit
console(config-rtr-tmplt)# address-family ipv6
console(config-rtr-tmplt-af)# send-community
console(config-rtr-tmplt-af)# route-map RM6-IN in
console(config-rtr-tmplt-af)# route-map RM6-OUT out
console(config-rtr-tmplt-af)# exit
```

```
console(config-rtr-tmplt)# exit
console(config-router)# neighbor 172.20.1.2 inherit peer AGGR
console(config-router)# neighbor 172.20.2.2 inherit peer AGGR
console(config-router)# address-family ipv6
console(config-router)# neighbor 172.20.1.2 activate
console(config-router)# neighbor 172.20.2.2 activate
```

timers bgp

The **timers bgp** command configures the default keepalive and hold timers that BGP uses for all neighbors unless specifically overridden by the **neighbor timers** command.

Syntax

timers bgp *keepalive holdtime*

no timers bgp

- *keepalive*—The time, in seconds, between BGP KEEPALIVE packets sent to a neighbor. The range is 0 to 65,535 seconds. An small internal jitter is applied to the keepalive interval timer in order to reduce the CPU load that may occur when multiple timers expire simultaneously.
- *holdtime*—The time, in seconds, that BGP continues to consider a neighbor to be alive without receiving a BGP KEEPALIVE or UPDATE packet from the neighbor. If no KEEPALIVE is received from a neighbor for longer than the hold time, BGP drops the adjacency. If the hold time is set to 0, then BGP does not enforce a hold time and BGP does not send periodic KEEPALIVE messages. The range is 0, 3 to 65,535 seconds.

Default Configuration

The default keepalive time is 30 seconds. The default hold time is 90 seconds.

Command Mode

BGP Router Configuration mode

User Guidelines

When BGP establishes an adjacency, the neighbors agree to use the minimum hold time configured on either neighbor. BGP sends KEEPALIVE messages at either 1/3 of the negotiated hold time or the configured keepalive interval, whichever is more frequent.

The new values are not applied to adjacencies already in the ESTABLISHED state. A new keepalive or hold time is applied the next time an adjacency is formed.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-router)#timers bgp 1000 500
```

timers policy-apply delay

This command configures the delay after which any change to the global or per BGP neighbor inbound/outbound policies are applied.

Syntax

timers policy-apply delay *delay*

no timers policy-apply delay

- *delay*—The time, in seconds, after which the global or per neighbor policies are applied. The range is 0 to 180 seconds

Default Configuration

The default delay time is 180 seconds.

Command Mode

BGP Router Configuration mode

User Guidelines

Whenever policies (*route-maps/prefix-lists/as-path-lists*) or neighbor attributes like *send-community*, *remove-private-asn*, etc. are modified by the user, the policies are scheduled to be applied after the current *delay* timeout. Whenever the *delay* is configured by the user, the pending policy changes if any are re-scheduled with the new *delay* if the previous *delay* timeout is not expired yet. Configuring the *delay* with the value of 0 seconds means, the changes are applied immediately.

For any change in the outbound policies applicable to a neighbor, the WITHDRAW packets are sent followed by the UPDATE packets when they are applied after the delay timeout. In case of changes to other neighbor attributes like *send-community, remove-private-asn*, etc. the WITHDRAW packets are not sent instead, the new UPDATEs are sent after the delay timeout.

Command History

Command introduced in version 6.6 firmware.

graceful-restart

This command enables the graceful restart and the graceful restart helper capability. To disable graceful restart and the graceful restart helper capability, use the **no** form of this command.

Syntax

graceful-restart [**restart-time** *restart-time* | **stalepath-time** *stalepath-time*]

no graceful-restart [**restart-time** | **stalepath-time**]

- *restart-time*—The maximum time in seconds, before which the graceful restart is supposed to be complete by the restarting router. The allowed range is 1 to 3600 seconds. The default value is 120 seconds.
- *stalepath-time*—The maximum time that the helper router keeps the stale routes from the restarting BGP peer. The allowed range is 1 to 3600 seconds. The default value is 300 seconds.

Default Configuration

Graceful restart capability is disabled by default. Graceful restart helper capability is enabled by default.

Command Mode

BGP Router Configuration mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

graceful-restart-helper

This command enables the graceful restart helper capability.

Syntax

graceful-restart-helper

no graceful-restart-helper

Default Configuration

Graceful restart capability is disabled by default. Graceful restart helper capability is enabled by default.

Command Mode

BGP Router Configuration mode

User Guidelines

If BGP graceful restart is disabled, but the router is to behave as a helper peer, this command can be used to enable the helper functionality.

Command History

Command introduced in version 6.6 firmware.

BGP Routing Policy

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Exterior routing protocols like BGP use industry-standard routing policy to filter and modify routing information exchanged with peers. BGP makes use of the following routing policy constructs:

- AS Path Access Lists
- BGP Community Lists

Use the Routing Policy commands to configure routing policies such as:

- Matching on an AS Path
- Modifying the AS Path
- Setting the local preference
- Setting the route metric
- Setting an IPv4 or IPv6 next hop
- Setting or matching on a BGP community

ip as-path access-list

To create an AS path access list, use the **ip as-path access-list**. An AS path access list filters BGP routes on the AS path attribute of a BGP route. To delete an AS path access list, use the **no** form of this command

Syntax

ip as-path access-list *as-path-list-number* { **permit** | **deny** } *regexp*

no ip as-path access-list *as-path-list-number*

- *as-path-list-number*—A number from 1 to 500 uniquely identifying the list. All AS path access list commands with the same as-path-list-number are considered part of the same list.
- **permit**—(Optional) Permit routes whose AS Path attribute matches the regular expression.
- **deny**—(Optional) Deny routes whose AS Path attribute matches the regular expression.

- *regexp*—A regular expression used to match the AS path attribute of a BGP path where the AS path is treated as an ASCII string.

Default Configuration

No AS path lists are configured by default. There are no default values for any of the parameters of this command.

Command Mode

Global Configuration

User Guidelines

The AS path attribute is a list of the autonomous system numbers along the path to the destination. An AS path access list is an ordered sequence of statements. Each statement specifies a regular expression and a permit or deny action. If the regular expression matches the AS path of the route expressed as an ASCII string, the route is considered a match and the statement's action is taken. An AS path list has an implicit deny statement at the end. If a path does not match any of the statements in an AS path list, the action is considered to be deny.

Once you have created an AS path list, you cannot delete an individual statement. If you want to remove an individual statement, you must delete the AS path list and recreate it without the statement to be deleted.

Statements are applied in the order in which they are created. New statements are added to the end of the list. The statement with the first matching regular expression is applied.

N3000-ON/N3100-ON/N3200-ON Series switches allow configuration of up to 128 AS path access lists, with up to 64 statements each.

To enter the question mark within a regular expression, you must first enter CTRL-V to prevent the CLI from interpreting the question mark as a request for help.

Special Character	**Symbol**	**Behavior**
asterisk	*	Matches zero or more sequences of the pattern.
brackets	[]	Designates a range of single-character patterns.

Special Character	Symbol	Behavior
caret	^	Matches the beginning of the input string.
dollar sign	$	Matches the end of the input string.
hyphen	–	Separates the end points of a range.
period	.	Matches any single character, including white space.
plus sign	+	Matches 1 or more sequences of the pattern.
question mark	?	Matches 0 or 1 occurrences of the pattern.
underscore	_	Matches a comma (,), left brace ({), right brace (}), left parenthesis, right parenthesis, the beginning of the input string, the end of the input string, or a space.

Example

In the following example, the router is configured to reject routes received from neighbor 172.20.1.1 with an AS path that indicates the route originates in or passes through AS 100.

```
console(config)# ip as-path access-list 1 deny _100_
console(config)# ip as-path access-list 1 deny ^100$
console(config)# router bgp 1
console(config-router)# neighbor 172.20.1.1 remote-as 200
console(config-router)# neighbor 172.20.1.1 filter-list 1 in
```

ip bgp-community new-format

To display BGP standard communities in AA:NN format, use the **ip bgp-community new-format** command. To display BGP standard communities as 32-bit integers, use the **no** form of this command.

Syntax

ip bgp-community new-format

no ip bgp-community new-format

Default Configuration

Standard communities are displayed in AA:NN format.

Command Mode

Global Configuration

User Guidelines

RFC 1997 specifies that the first two bytes of a community number are considered to be an autonomous system number. The new format displays a community number as the ASN followed by a 16-bit AS-specific number.

Example

```
console(config)#ip bgp-community new-format
```

ip community-list

To create or configure a BGP community list, use the **ip community-list** command in global configuration mode. To delete a community list, use the **no** form of this command.

Syntax

ip community-list standard *list-name* {**permit** | **deny**} [*community-number*] [**no-advertise**] [**no-export**] [**no-export-subconfed**] [**no-peer**]

no ip community-list standard *list-name*

- **standard** *list-name*—Identifies a named standard community list. The name may contain up to 32 characters.
- **permit**—Indicates that matching routes are permitted.
- **deny**—Indicates that matching routes are denied.
- *community-number*—From zero to sixteen community numbers formatted as a 32-bit integers or in AA:NN format, where AA is a 2-byte autonomous system number and NN is a 16 bit integer. The range is 1 to 4,294,967,295 (any 32-bit integer other than 0). Communities are separated by spaces.
- **no-advertise**—The well-known standard community: NO_ADVERTISE (0xFFFFFF02), which indicates the community is not to be advertised.
- **no-export**—The well-known standard community: NO_EXPORT, (0xFFFFFF01), which indicates the routes are not to be advertised outside the community.

- **no-export-subconfed**—The well-know standard community: NO_EXPORT_SUBCONFED (0xFFFFFF03), which indicates the routes are not to be advertised to external BGP peers.

Default Configuration

No community lists are configured by default.

Command Mode

Global Configuration

User Guidelines

A community list statement with no community values is considered a match for all routes, regardless of their community membership. So the statement `ip community-list bullseye permit` is a permit all statement.

A community number may be entered in either format, as a 32-bit integer or a pair of 16-bit integers separated by a colon, regardless of whether the **ip bgp-community new-format** command is active. Up to 16 communities, including the well-known communities, can be listed in a single command. Up to 32 statements may be configured with a given community list name. Up to 128 unique community list names may be configured.

Example

```
console(config)#ip community-list test permit
```

ip prefix-list

To create a prefix list or add a prefix list entry, use the **ip prefix-list** command in global configuration mode. To delete a prefix list or a statement in a prefix list, use the **no** form of this command.

Syntax

ip prefix-list *list-name* {[**seq** *number*] { **permit** | **deny** } *network mask* [**ge** *length*] [le *length*] | **renumber** *renumber-interval first-statement-number* }

no ip prefix-list *list-name* [**seq** *number*] { **permit** | **deny** } *network mask* [**ge** *length*] [**le** *length*]

- *list-name*—The text name of the prefix list. Up to 32 characters.
- **seq** *number*—(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and processed in that order. If a sequence number is not specified, the system automatically selects a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The value ranges from 1 – 4,294,967,294.
- **permit**—Permit routes whose destination prefix matches the statement.
- **deny**—Deny routes whose destination prefix matches the statement.
- *network mask*—Specifies the match criteria for routes being compared to the prefix list statement. The network can be any valid IP prefix. The mask is any IPv4 prefix in dotted-quad notation.
- **ge** *length*—(Optional) If this option is configured, a prefix is only considered a match if its network mask length is greater than or equal to this value. This value must be longer than the network length and less than or equal to 32.
- **le** *length*—(Optional) If this option is configured, a prefix is only considered a match if its network mask length is less than or equal to this value. This value must be longer than the ge length and less than or equal to 32.
- **renumber**—Option to renumber the sequence numbers of the **ip prefix list** statements with a given interval starting from a particular sequence number.

Default Configuration

No prefix lists are configured by default. When neither the **ge** nor the **le** option is configured, the destination prefix must match the network/length exactly. If the **ge** option is configured without the **le** option, any prefix with a network mask greater than or equal to the **ge** value is considered a match. Similarly, if the **le** option is configured without the **ge** option, a prefix with a network mask less than or equal to the **le** value is considered a match.

Command Mode

Global Configuration

User Guidelines

Prefix lists allow matching of route prefixes with those specified in the prefix list. Each prefix list includes of a sequence of prefix list entries ordered by their sequence numbers. A router sequentially examines each prefix list entry to determine if the route's prefix matches that of the entry. An empty or non-existent prefix list permits all prefixes. An implicit deny is assumed if a given prefix does not match any entries of a prefix list. Once a match or deny occurs the router does not go through the rest of the list. A prefix list may be used within a route map to match a route's prefix using the **match ip address** command.

The command **no ip prefix-list** *list-name* deletes the entire prefix list. To remove an individual statement from a prefix list, you must specify the statement exactly, with all its options.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures a prefix list that allows routes with one of two specific destination prefixes, 172.20.0.0 /16 and 192.168.1.0 /24:

```
console(config)# ip prefix-list apple seq 10 permit 172.20.0.0/16
console(config)# ip prefix-list apple seq 20 permit 192.168.10 0.0.0.255

The following example disallows only the default route.

console(config)# ip prefix-list orange deny 0.0.0.0/0
console(config)# ip prefix-list orange permit 0.0.0.0/0 ge 1
```

ip prefix-list description

To apply a text description to a prefix list, use the **ip prefix-list description** command in global configuration mode. To remove the text description, use the **no** form of this command.

Syntax

ip prefix-list *list-name* **description** *text*

no ip prefix-list *list-name* **description**

- *list-name*—The text name of the prefix list.
- *text*—Text description of the prefix list. Up to 80 characters

Default Configuration

No description is configured by default.

Command Mode

Global Configuration

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)#ip prefix-list test description test prefix lists
```

ipv6 prefix-list

To create an IPv6 prefix list or add an IPv6 prefix list entry, use the **ipv6 prefix-list** command in global configuration mode. To delete a prefix list or a statement in a prefix list, use the **no** form of this command.

Syntax

ipv6 prefix-list *list-name* { [**seq** *seq-number*] {**permit|deny**} *ipv6-prefix/prefix-length* [**ge** *ge-value*] [**le** *le-value*] **| description** *text* **| renumber** *renumber-interval first-statement-number* }

no ipv6 prefix-list *list-name*

- *list-name*—The text name of the prefix list. Up to 32 characters.

- **seq** *number*—(Optional) The sequence number for this prefix list statement. Prefix list statements are ordered from lowest sequence number to highest and applied in that order. If you do not specify a sequence number, the system automatically selects a sequence number five larger than the last sequence number in the list. Two statements may not be configured with the same sequence number. The sequence number ranges from 1 – 4,294,967,294.
- **permit**—Permit routes whose destination prefix matches the statement.
- **deny**—Deny routes whose destination prefix matches the statement.
- *ipv6-prefix*—The IPv6 network assigned to the specified prefix list. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between colons.
- *prefix-length*—The length of the IPv6 prefix given as part of the ipv6-prefix. Required if a prefix is specified. A decimal value that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /length format. A slash mark must precede the decimal value in /length format.
- **ge** *length*—(Optional) Specifies a prefix length greater than or equal to the ipv6-prefix /prefix-length arguments. It is the lowest value of a range of the length (the “from” portion of the length range).
- **le** *length*—(Optional) Specifies a prefix length less than or equal to the ipv6-prefix /prefix-length arguments. It is the highest value of a range of the length (the “to” portion of the length range).
- **description** *text*—A description of the prefix list that can be up to 80 characters in length.
- *renumber-interval*—Option to renumber the sequence numbers of the IPv6 prefix list statements with a given interval. The sequence is renumbered with the statements separated by the interval value. The renumber value ranges from 1 – 4,294,967,294.
- *first-statement-number*—Option to renumber the sequence numbers of the IPv6 prefix list statements with a given interval starting from the specified sequence number. The sequence is renumbered with the statements separated by the interval value beginning with the first entry with a sequence number greater than or equal to the specified value. The sequence number ranges from 1 – 4,294,967,294.

Default Configuration

No prefix lists are configured by default.

Command Mode

Global Configuration

User Guidelines

The **ipv6 prefix-list** command is used to create IPv6 prefix lists. These are similar to ip prefix lists except that the lists are IPv6 specific. An IPv6 prefix list can contain only IPv6 addresses.

Prefix lists allow matching of route prefixes against those specified in the prefix list. Each prefix list includes of a sequence of prefix list entries ordered by sequence numbers. A router examines each prefix list entry in sequential order to determine if the route's prefix matches that of the entry. For IPv6 routes, only IPv6 prefix lists are matched. An empty or non-existent prefix list permits all prefixes. An implicit deny is assumed if a given prefix does not match any entries of a prefix list. Once a match occurs the router does not perform matching on the rest of the list.

An IPv6 prefix list may be used within a route map to match a route's prefix using the match ipv6 address command. A route map may contain both IPv4 and IPv4 prefix lists. If the route being matched is an IPv6 route, only the IPv6 prefix lists are matched.

When neither the **ge** nor the **le** option is configured, the destination prefix must match the ipv6-prefix/prefix-length exactly. If the **ge** option is configured without the **le** option, any prefix with a ipv6-prefix greater than or equal to the **ge** value is considered a match. Similarly, if the **le** option is configured without the **ge** option, a prefix with a network mask less than or equal to the **le** value is considered a match. No description is configured by default for an IPv6 prefix list.

The command **no ipv6 prefix-list list-name** deletes the entire prefix list. To remove an individual statement from a prefix list, specify the statement exactly, with all its options.

Up to 128 prefix lists may be configured. The maximum number of statements allowed in prefix list is 64. These numbers indicate only IPv6 prefix lists. IPv4 prefix lists may be configured in appropriate numbers independently.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures a prefix list that allows routes with one of two specific destination prefixes, 2001::/64 and 5F00::/48:

```
console(config)# ipv6 prefix-list apple seq 10 permit 2001:: /64
console(config)# ipv6 prefix-list apple seq 20 permit 5F00:: FFFF:FFFF:FFFF::
```

The following example renumbers the apple prefix list beginning at sequence number 10.

```
console(config)# ipv6 prefix-list apple renumber 10
```

match as-path

Use this command to add criteria that matches BGP autonomous system paths against an AS path access list to a route map. Use the **no** form of the command to remove the matching criteria from the route map

Syntax

match as-path *as-path-list-number*

no match as-path *as-path-list-number*

- **as-path** *as-path-list-number*—An integer from 1 to 500 identifying the AS path access list to use as match criteria.

Default Configuration

No as-path match criteria are configured by default.

Command Mode

Route Map Configuration

User Guidelines

If a new **match as-path** statement is entered in a route map statement that already has a **match as-path** statement, the AS path list numbers in the new statement are added to the existing match term, up to the maximum number of lists in a statement. A route is considered a match if it matches any one or more of the AS path access lists to which the statement refers.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#match as-path 250
```

match community

To configure a route map to match based on a BGP community list, use the **match community** command. To delete a match term from a route map, use the **no** form of this command.

Syntax

match community c*ommunity-list* [*community-list...*] [**exact-match**]

no match community [*community-list* [*community-list...*] [**exact-match**]]

- *community-list*—The name of a standard community list. Up to eight names may be included in a single match term.
- **exact-match**—(Optional) When this option is given, a route is only considered a match if the set of communities on the route is an exact match for the set of communities in one of the statements in the community list.

Default Configuration

No community match criteria are configured by default.

Command Mode

Route Map Configuration

User Guidelines

If the community list returns a permit action, the route is considered a match. If the match statement refers to a community list that is not configured, no routes are considered to match the statement.

no match community *list* **exact-match** removes the match statement from the route map. (It doesn't simply remove the exact-match option.)

The command **no match community** removes the match term and all its community lists.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#match community test
```

match ip address prefix-list

Use this command to configure a route map to match based on a destination prefix. To delete a match statement from a route map, use the **no** form of this command.

Syntax

match ip address prefix-list *prefix-list-name* [*prefix-list-name*...]

no match ip address prefix-list [*prefix-list-name* [*prefix-list-name*...]]

- **prefix-list** *prefix-list-name*—The name of a prefix list used to identify the set of matching routes. Up to eight prefix lists may be specified.

Default Configuration

No match criteria are configured by default.

Command Mode

Route Map Configuration

User Guidelines

If multiple prefix lists are specified in one statement, a match occurs if a prefix matches any one of the prefix lists. If a **match ip address** statement is configured within a route map section that already has a **match ip address** statement, the new prefix lists are added to the existing set of prefix lists, and a match occurs if any prefix list in the combined set matches the prefix.

The command **no match ip address prefix-list** removes the match term and all its prefix lists.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#match ip address prefix-list test
```

match ipv6 address prefix-list

Use this command to configure a route map to match based on an IPv6 destination prefix. To delete a match statement from a route map, use the **no** form of this command.

Syntax

match ip address prefix-list *prefix-list-name* [*prefix-list-name...*]

no match ip address prefix-list [*prefix-list-name* [*prefix-list-name...*]]

- **prefix-list** *prefix-list-name*—The name of an IPv6 prefix list used to identify the set of matching routes. Up to eight prefix lists may be specified.

Default Configuration

No match criteria are configured by default.

Command Mode

Route Map Configuration

User Guidelines

If multiple prefix lists are specified in one statement, a match occurs if a prefix matches any one of the prefix lists. If a **match ipv6 address** statement is configured within a route map section that already has a match ipv6 address statement, the new prefix lists are added to the existing set of prefix lists, and a match occurs if any prefix list in the combined set matches the prefix.

The command **no match ip address prefix-list** removes the match term and all its prefix lists.

Command History

Introduced in version 6.2.0.1 firmware.

Example

In the example below, IPv6 addresses specified by the prefix list apple are matched through the route map abc.

```
Router(config)# route-map abc
Router(config-route-map)# match ipv6 address prefix-list apple
```

show ip as-path-access-list

This command displays the contents of AS path access lists.

Syntax

show ip as-path-access-list [*as-path-list-number*]

- *as-path-list-number*—(Optional) When an AS path list number is specified, the output is limited to the single AS path list specified. Integer from 1 to 500.

Default Configuration

No match criteria are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ip as-path-access-list

AS path access list 1
deny _100_
deny ^100$

AS path access list 2
deny _200_
deny ^200$
```

show ip community-list

This command displays the contents of AS path access lists.

Syntax

show ip community-list [*community-list-name* **|** **detail** [*community-list-name*]]

- *community-list-name*—(Optional) A standard community list name. This option limits the output to a single community.
- **detail**—Display detailed community list information

Default Configuration

No match criteria are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ip community-list

Standard community list buzz
     permit 100:200
     permit 100:300
     permit 100:400
Standard community list woody
    permit 200:1
    permit 200:2
    permit 200:3
```

show ip prefix-list

This command displays the contents of IPv4 prefix lists.

Syntax

show ip prefix-list [**detail** [*prefix-list-name*] **| summary** [*prefix-list-name*] **|** *prefix-list-name* [*network mask* [**longer**] [**first-match**] **| seq** *sequence-number*]] [**detail** **| summary**] *prefix-list-name* [*network network-mask*] [**seq** *sequence-number*] [**longer**] [**first-match**]

- **detail | summary**—(Optional) Displays detailed or summarized information about all prefix lists.
- *prefix-list-name*—(Optional) The name of a specific prefix list.
- network—(Optional) The network number
- *mask*—Required if a network is specified. The network mask dotted-quad notation. In dotted-quad notation, the 1 bits must be contiguous and left justified.
- **seq** *sequence-number*—(Optional) Applies the sequence number to the prefix list entry. The sequence number of the prefix list entry.
- **longer**—(Optional) Displays all entries of a prefix list that are more specific than the given network/length.
- **first-match**—(Optional) Displays the entry of a prefix list that matches the given network.

Default Configuration

No prefix lists are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

The following combinations of parameters are acceptable:

show ip prefix-list *prefix-list-name network /length* **first-match**

show ip prefix-list *prefix-list-name network /length* **longer**

show ip prefix-list *prefix-list-name network /length*

show ip prefix-list *prefix-list-name* **seq** *sequence-number*

show ip prefix-list *prefix-list-name*

show ip prefix-list summary

show ip prefix-list summary *prefix-list-name*

show ip prefix-list detail

show ip prefix-list detail *prefix-list-name*

show ip prefix-list

The following information is displayed.

Fields	Description
count	Number of entries in the prefix list.
range entries	Number of entries that match the input range.
ref count	Number of entries referencing the given prefix list.
seq	Sequence number of the entry in the list.
permit/deny	Actions.
sequences	Range of sequence numbers for the entries in the list.
hit count	Number of times the prefix was matched in the routing decision process.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ip prefix-list fred
ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0
   seq 5 permit 10.10.1.1/20 ge 22
   seq 10 permit 10.10.1.2/20 le 30
   seq 15 permit 10.10.1.2/20 ge 29 le 30

console#show ip prefix-list summary fred

ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0

console#show ip prefix-list detail fred

ip prefix-list fred:
   count: 3, range entries: 3, sequences: 5 - 15, refcount: 0
   seq 5 permit 10.10.1.1/20 ge 22 (hitcount: 0)
   seq 10 permit 10.10.1.2/20 le 30 (hitcount: 0)
   seq 15 permit 10.10.1.2/20 ge 29 le 30 (hitcount: 0)
```

show ipv6 prefix-list

This command displays the contents of IPv6 prefix lists.

Syntax

show ipv6 prefix-list [**detail** [*prefix-list-name*] | **summary** [*prefix-list-name*] | *prefix-list-name* [*ipv6-prefix/prefix-length* [**longer**] [**first-match**] | **seq** *sequence-number*]]

- **detail | summary** – (Optional) Displays detailed or summarized information about all prefix lists.
- *prefix-list-name* – (Optional) The name of a specific prefix list. Information is limited to this particular prefix list.
- *ipv6-prefix* - An IPv6 network assigned to the specified prefix list. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons.

- *prefix-length* - The length of the IPv6 prefix given as part of the *ipv6-prefix*. Required if a prefix is specified. A decimal value in the range 0 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in /*length* format. A slash mark must precede the decimal value in /length format.
- **seq** – (Optional) Applies the sequence number to the prefix list entry.
- *sequence-number* – (Optional) The sequence number of the prefix list entry.
- **longer** – (Optional) Displays all entries of a prefix list that are more specific than the given *network/length*.
- **first-match** – (Optional) Displays the entry of a prefix list that matches the given *prefix /prefix-length*.

Default Configuration

No prefix lists are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

The following information is displayed.

Fields	Description
count	Number of entries in the prefix list.
range entries	Number of entries that match the input range.
ref count	Number of entries referencing the given prefix list.
seq	Sequence number of the entry in the list.
permit/deny	Actions.
sequences	Range of sequence numbers for the entries in the list.
hit count	Number of times the prefix was matched in the routing decision process.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ipv6 prefix-list apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31
seq 5 deny 5F00::/8 le 128
seq 10 deny ::/0
seq 15 deny ::/1
seq 20 deny ::/2
seq 25 deny ::/3 ge 4
seq 30 permit ::/0 le 128

console#show ipv6 prefix-list summary apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31

console#show ipv6 prefix-list detail apple
ipv6 prefix-list apple:
count: 6, range entries: 3, sequences: 5 - 30, refcount: 31
seq 5 deny 5F00::/8 le 128 (hit count: 0, refcount: 1)
seq 10 deny ::/0 (hit count: 0, refcount: 1)
seq 15 deny ::/1 (hit count: 0, refcount: 1)
seq 20 deny ::/2 (hit count: 0, refcount: 1)
seq 25 deny ::/3 ge 4 (hit count: 0, refcount: 1)
seq 30 permit ::/0 le 128 (hit count: 240664, refcount: 0)
```

clear ip prefix-list

To reset the IPv4 prefix-list counters, use the **clear ip prefix-list** command.

Syntax

clear ip prefix-list [*list-name* **|** *list-name network mask*]

- *list-name*—(Optional) Name of the prefix list from which the hit count is to be cleared.
- *network*— (Optional) Network number. If this option is specified, hit counters are cleared only for the matching prefixes.
- *mask*—Required if a network is specified. The network mask in dotted-quad notation. In dotted-quad notation, the 1 bits must be contiguous and left justified.

Default Configuration

No prefix lists are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is used to clear prefix-list hit counters. The hit count is a value indicating the number of matches to a specific prefix list entry. The counters are also cleared by the global clear counters command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# clear ip prefix-list orange 20.0.0.0 /8
```

clear ipv6 prefix-list

To reset the IPv6 prefix-list counters, use the **clear ipv6 prefix-list** command.

Syntax

clear ipv6 prefix-list [*list-name* | *list-name ipv6-prefix/prefix-length*]

- *list-name* – (Optional) Name of the IPv6 prefix list from which the hit count is to be cleared.
- *ipv6-prefix* - An IPv6 network assigned to the specified prefix list. This argument must be in the form documented in RFC 2373 where the address is specified in hexadecimal using 16-bit values between 0x00 and 0xff and separated by colons. Counters are cleared only for the matching prefixes.
- *prefix-length* - The length of the IPv6 prefix given as part of the *ipv6-prefix*. Required if a prefix is specified. A decimal value in the range 0 to 128 that indicates how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address) in */length* format. A slash mark must precede the decimal value in /length format.

Default Configuration

No prefix lists are configured by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is used to clear the IPv6 prefix-list hit counters. The hit count is a value indicating the number of matches to a specific prefix list entry. The counters are also cleared by the global clear counters command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The command below clears the counters only for the matching statement in the IPv6 prefix list apple.

```
Router# clear ipv6 prefix-list apple FF05::/35
```

clear ip community-list

To reset the IPv6 community hit counter, use the clear ipv6 community-list command.

Syntax

clear ip community-list [*list-name*]

- *list-name*—(Optional) Name of the community list for which the hit count is to be cleared.

Default Configuration

No community lists are configured by default.

Command Mode

Privileged Exec mode

User Guidelines

This command is used to clear the community list hit counters. The hit count is a value indicating the number of matches to a specific list entry. The counters are also cleared by the global **clear counters** command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The command below clears the counters only for the matching community apple.

```
Router# clear ip community-list apple
```

set as-path

To prepend one or more AS numbers to the AS path in a BGP route, use the **set as-path** command. To remove a set command from a route map, use the **no** form of this command.

Syntax

set as-path prepend *as-path-string*

no set as-path prepend *as-path-string*

- **prepend** *as-path-string*—A list of AS path numbers to insert at the beginning of the AS_PATH attribute of matching BGP routes. To prepend more than one AS number, separate the ASNs with a space and enclose the string in quotes. Up to ten AS numbers may be prepended.

Default Configuration

No AS paths are prepending by default.

Command Mode

Route Configuration

User Guidelines

This command is normally used to insert one or more instances of the local AS number at the beginning of the AS_PATH attribute of a BGP route. Doing so increases the AS path length of the route. The AS path length has a strong influence on BGP route selection. Changing the AS path length can influence route selection on the local router or on routers to which the route is advertised.

When prepending an inbound route, if the first segment in the AS_PATH of the received route is an AS_SEQUENCE, *as-path-string* is inserted at the beginning of the sequence. If the first segment is an AS_SET, *as-path-string* is added as a new segment with type AS_SEQUENCE at the beginning of the AS path. When prepending an outbound route to an external peer, *as-path-string* follows the local AS number, which is always the first ASN.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console# config
console(config)#route-map ppAsPath
console(route-map)#set as-path prepend "2 2 2"
console(route-map)#exit
console(config)#router bgp 1
console(config-rtr)#neighbor 172.20.1.2 remote-as 2
console(config-rtr)#neighbor 172.20.1.2 route-map ppAsPath in
```

set comm-list delete

To remove BGP communities from an inbound or outbound UPDATE message, use the **set comm-list delete** command. To delete the set command from a route map, use the **no** form of this command.

Syntax

set comm-list *community-list-name* **delete**

no set comm-list

- *community-list-name*—A standard community list name.

Default Configuration

No communities are removed from UPDATE messages by default.

Command Mode

Route Map Configuration

User Guidelines

A route map with this set command can be used to remove selected communities from inbound and outbound routes. When a community list is applied to a route for this purpose, each of the route's communities is submitted to the community list one at a time. Communities permitted by the list are removed from the route. Since communities are processed individually, a community list used to remove communities should not include the **exact-match** option on statements with multiple communities. Such statements can never match an individual community.

When a route map statement includes both **set community** and **set comm-list delete** terms, the **set comm-list delete** term is processed first, and then the **set community** term (that is, communities are first removed, and then communities are added).

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#set comm-list test delete
```

set community

To modify the communities attribute of matching routes, use the **set community** command in route-map configuration mode. To remove a set term from a route map, use the **no** form of this command

Syntax

set community {{*community-number* **|** **no-export** **|** **no-advertise**}

no set community

- *community-number*—One to sixteen community numbers, either as a 32-bit integers or in AA:NN format. Communities are separated by spaces. The well-known communities **no-advertise** and **no-export** are also accepted.
- **no-advertise**—The well-known standard community: NO_ADVERTISE (0xFFFFFF02) which indicates the community is not to be advertised.
- **no-export**—The well-known standard community: NO_EXPORT, (0xFFFFFF01), which indicates the routes are not to be advertised outside the community.
- **additive**—(Optional) Communities are added to those already attached to the route.
- **none**—(Optional) Removes all communities from matching routes.

Default Configuration

No communities are set by default.

Command Mode

Route Map Configuration

User Guidelines

The **set community** command can be used to assign communities to routes originated through BGP's **network** and **redistribute** commands and to set communities on routes received from a specific neighbor or advertised to a specific neighbor. It can also be used to remove all communities from a route. To remove a subset of the communities on a route, use the **set comm-list delete** command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#set community no-advertise
```

set ipv6 next-hop (BGP)

To set the IPv6 next hop of a route, use the **set ipv6 next-hop** command in route-map configuration mode. To remove a set command from a route map, use the **no** form of this command.

Syntax

set ipv6 next-hop *ipv6-address*

no set ipv6 next-hop

- *ipv6-address*—The IPv6 address set as the Network Address of Next Hop field in the MP_NLRI attribute of an UPDATE message. This argument must be in the form documented in RFC 2373, where the address is specified in hexadecimal using 16-bit values between colons.

Default Configuration

No next-hops are set by default.

Command Mode

Route Map Configuration

User Guidelines

When used in a route map applied to UPDATE messages received from a neighbor, the command sets the next hop address for matching IPv6 routes received from the neighbor. When used in a route map applied to UPDATE messages sent to a neighbor, the command sets the next hop address for matching IPv6 routes sent to the neighbor. If the address is a link local address, the address is assumed to be on the interface where the UPDATE is sent or received. If the command specifies a global IPv6 address, the address is not required to be on a local subnet.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#set ipv6 next-hop FE80::0202:B3FF:FE1E:8329
```

set local-preference

To set the local preference of specific BGP routes, use the **set local-preference** command in route-map configuration mode. To remove a set command from a route map, use the **no** form of this command.

Syntax

set local-preference *value*

no set local-preference *value*

- *value*—A local preference value, from 0 to 4,294,967,295 (any 32 bit integer).

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map Configuration

User Guidelines

The local preference is the first attribute used to compare BGP routes. Setting the local preference can influence which route BGP selects as the best route. When used in conjunction with a **match as-path** or **match ip-address** command, this command can be used to prefer routes that transit certain ASs or to make the local router a more preferred exit point to certain destinations.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#set local-preference 6432
```

set metric

To set the metric of a route, use the **set metric** command. To remove a set command from a route map, use the **no** form of this command.

Syntax

set metric *value*

no set metric *value*

- *value*—A local preference value, from 0 to 4,294,967,295 (any 32 bit integer).

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map Configuration

User Guidelines

This command sets the Multi Exit Discriminator (MED) when used in a BGP context. When there are multiple peering points between two autonomous systems (AS), setting the MED on routes advertised by one router can influence the other AS to send traffic through a specific peer

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(route-map)#set metric 6432
```

DVMRP Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Distance Vector Multicast Routing Protocol (DVMRP) is a dense mode multicast protocol and is most appropriate for use in networks where bandwidth is relatively plentiful and there is at least one multicast group member in each subnet. DVMRP assumes that all hosts are part of a multicast group until it is informed of multicast group changes. When the dense-mode multicast router is informed of a group membership change, the multicast delivery tree is pruned. DVMRP uses a distributed routing algorithm to build per-source-group multicast trees. It is also called Broadcast and Prune Multicasting protocol. It dynamically generates per-source-group multicast trees using Reverse Path Multicasting. Trees are calculated and updated dynamically to track membership of individual groups.

ip dvmrp

Use the **ip dvmrp** command to set the administrative mode of DVMRP in the router to active. Enabling DVMRP concurrently enables IGMP/MLD. Using the no form of the command sets the administrative mode to inactive and disables IGMP/MLD.

Syntax

ip dvmrp

no ip dvmrp

Default Configuration

Disabled is the default configuration.

Command Mode

Global Configuration

Interface Configuration (VLAN) mode

User Guidelines

PIM must be disabled before DVMRP can be enabled. This command enables IGMP/MLD. Disabling IGMP/MLD may operationally disable multicast routing. Dell EMC Networking switches support IP/IPv6 unnumbered interfaces. DVMRP is capable of operating over unnumbered interfaces.

Example

The following example sets VLAN 15's administrative mode of DVMRP to active.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip dvmrp
```

ip dvmrp metric

Use the **ip dvmrp metric** command in Interface Configuration mode to configure the metric for an interface. This value is used in the DVMRP messages as the cost to reach this network.

Syntax

ip dvmrp metric *metric*

no ip dvmrp metric

- *metric* — Cost to reach the network. (Range: 1-31)

Default Configuration

1 the default value.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures a metric of 5 for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip dvmrp metric 5
```

show ip dvmrp

Use the **show ip dvmrp** command to display the system-wide information for DVMRP.

Syntax

show ip dvmrp

Default Configuration

This command has no default condition.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays system-wide information for DVMRP.

```
console(config)#show ip dvmrp
Admin Mode................................. Enabled
Version.................................... 3
Total Number of Routes..................... 0
Reachable Routes........................... 0
           DVMRP INTERFACE STATUS
Interface  Interface Mode  Operational-Status
---------  --------------  ------------------
```

show ip dvmrp interface

Use the **show ip dvmrp interface** command to display the interface information for DVMRP on the specified interface.

Syntax

show ip dvmrp interface vlan *vlan-id*

- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default condition.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays interface information for VLAN 11 DVMRP.

```
console(config)#show ip dvmrp interface vlan 11
Interface Mode................................ Enabled
Interface Metric.............................. 5
Local Address................................. 10.1.0.2
Received Bad Packets.......................... 0
Received Bad Routes........................... 0
Sent Routes................................... 0
```

show ip dvmrp neighbor

Use the **show ip dvmrp neighbor** command to display the neighbor information for DVMRP.

Syntax

show ip dvmrp neighbor

Default Configuration

This command has no default condition.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the neighbor information for DVMRP.

```
console(config)#show ip dvmrp neighbor
No neighbors available.
```

show ip dvmrp nexthop

Use the **show ip dvmrp nexthop** command to display the next hop information on outgoing interfaces for routing multicast datagrams.

Syntax

show ip dvmrp nexthop

Default Configuration

This command has no default condition.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the next hop information on outgoing interfaces for routing multicast datagrams.

```
console(config)#show ip dvmrp nexthop
                                Next Hop
Source IP       Source Mask     Interface  Type
```

```
-------------- -------------- --------- ------
```

show ip dvmrp prune

Use the **show ip dvmrp prune** command to display the table that lists the router's upstream prune information.

Syntax

show ip dvmrp prune

Default Configuration

This command has no default condition.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the table that lists the router's upstream prune information.

```
console(config)#show ip dvmrp prune

Group IP        Source IP       Source Mask     Expiry Time(secs)
--------------  --------------  --------------  ----------------
239.0.1.43      10.1.0.3        255.255.0.0      237
```

show ip dvmrp route

Use the **show ip dvmrp route** command to display the multicast routing information for DVMRP.

Syntax

show ip dvmrp route

Default Configuration

This command has no default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the multicast routing information for DVMRP.

```
console#show ip dvmrp route
console(config)#show ip dvmrp route
                                Upstream                                  Expiry
Source Address    Source Mask   Neighbor       Intf       Metric  Time
UpTime
```

IGMP Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON/N2200-ON Series switches support limited routing and multicast capabilities. See the Users Configuration Guide section “Feature Limitations and Platform Constants” for supported capabilities.

Internet Group Management Protocol (IGMP) is the multicast group membership discovery protocol used for IPv4 multicast groups. Three versions of IGMP exist. Versions one and two are widely deployed. Since IGMP is used between end systems (often desktops) and the multicast router, the version of IGMP required depends on the end-user operating system being supported. Any implementation of IGMP must support all earlier versions.

The following list describes the basic operation of IGMP, common to all versions. A multicast router can act as both an IGMP host and an IGMP router and as a result can respond to its own IGMP messages. The Dell EMC Networking implementation of IGMPv3 supports the multicast router portion of the protocol (that is, not the host portion). It is backward compatible with IGMPv1 and IGMPv2.

- One router periodically broadcasts IGMP Query messages onto the network.
- Hosts respond to the Query messages by sending IGMP Report messages indicating their group memberships.
- All routers receive the Report messages and note the memberships of hosts on the network.
- If a router does not receive a Report message for a particular group for a period of time, the router assumes there are no more members of the group on the network.

All IGMP messages are raw IP data grams and are sent to multicast group addresses, with a time to leave (TTL) of 1. Since raw IP does not provide reliable transport, some messages are sent multiple times to aid reliability.

IGMPv3 is a major revision of the protocol and provides improved group membership latency. When a host joins a new multicast group on an interface, it immediately sends an unsolicited IGMP Report message for that group.

IGMPv2 introduced a Leave Group message, which is sent by a host when it leaves a multicast group for which it was the last host to send an IGMP Report message. Receipt of this message causes the Querier possibly to reduce the remaining lifetime of its state for the group, and to send a group-specific IGMP Query message to the multicast group.The Leave Group message is not used with IGMPv3, since the source address filtering mechanism provides the same functionality.

IGMPv3 also allows hosts to specify the list of hosts from which they want to receive traffic. Traffic from other hosts is blocked inside the network. It also allows hosts to block packets for all sources sending unwanted traffic. IGMPv3 adds the capability for a multicast router to learn which sources are of interest to neighboring systems for packets sent to any particular multicast address. This information gathered by IGMP is provided to the multicast routing protocol (that is, DVMRP, PIM-DM, and PIM-SM) that is currently active on the router in order to ensure multicast packets are delivered to all networks where there are interested receivers.

IGMP mode is automatically enabled when PIM, DVMRP, or IGMP Proxy is enabled.

ip igmp last-member-query-count

Use the **ip igmp last-member-query-count** command in Interface Configuration mode to set the number of Group-Specific Queries sent before the router assumes that there are no local members on the interface.

Syntax

ip igmp last-member-query-count *lmqc*

no ip igmp last-member-query-count

- *lmqc* — Query count. (Range: 1-20)

Default Configuration

The default last member query count is 2.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets 10 as the number of VLAN 2 Group-Specific Queries.

```
console#configure
console(config)#interface vlan 2
console(config-if-vlan2)#ip igmp last-member-query-count 10
console(config-if-vlan2)#no ip igmp last-member-query-count
```

ip igmp last-member-query-interval

Use the **ip igmp last-member-query-interval** command in Interface Configuration mode to configure the Maximum Response Time inserted in Group-Specific Queries which are sent in response to Leave Group messages.

Syntax

ip igmp last-member-query-interval *tenthsofseconds*

no ip igmp last-member-query-interval

- *tenthsofseconds* — Maximum Response Time in tenths of a second (Range: 0-255)

Default Configuration

The default Maximum Response Time value is ten (in tenths of a second).

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures 2 seconds as the Maximum Response Time inserted in VLAN 15's Group-Specific Queries.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp last-member-query-interval 20
```

ip igmp mroute-proxy

This command configures downstream IGMP proxy on the selected VLAN interface associated with multicast hosts. Use this command to enable the proxying of IGMP messages received on the local interface to the multicast router connected interface enabled with the **ip igmp proxy-service** command.

PIM and DVMRP are not compatible with IGMP proxy. Disable PIM/DVMRP before enabling IGMP proxy.

Multicast routing must be enabled for the IGMP proxy service to become operationally enabled.

IGMP is enabled when **ip pim sparse-mode**, **ip pim dense-mode**, **ip dvmrp**, or **ip igmp-proxy** are enabled. IP multicast routing must be globally enabled and an upstream interfaces must be configured using the the **ip igmp proxy-service** command. If ip pim or ip dvmrp is enabled, this command is not displayed in the **running-config**.

Syntax

ip igmp mroute-proxy

no ip igmp mroute-proxy

Default Configuration

Disabled is the default state.

Command Mode

Interface VLAN Configuration mode

User Guidelines

IGMP is enabled when **ip pim sparse-mode**, **ip pim dense-mode**, **ip dvmrp**, or **ip igmp-proxy** are enabled.

A multicast routing protocol (e.g. PIM) should be enabled whenever IGMP is enabled.

L3 IP multicast must be enabled for IGMP to operate.

Example

The following example globally enables IGMP the IGMP proxy service on VLAN 1.

```
console(config)#ip multicast-routing
console(config)#interface vlan 1
console(config-if-vlan1)#ip igmp mroute-proxy
```

ip igmp query-interval

Use the **ip igmp query-interval** command in Interface Configuration mode to configure the query interval for the specified interface. The query interval determines how fast IGMP Host-Query packets are transmitted on this interface.

Syntax

ip igmp query-interval *seconds*

no ip igmp query-interval

- *seconds* — Query interval. (Range: 1-3600)

Default Configuration

The default query interval value is 125 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures a 10-second query interval for VLAN 15.

```
console(config)#interface vlan 15
```

```
console(config-if-vlan15)#ip igmp query-interval 10
```

ip igmp query-max-response-time

Use the **ip igmp query-max-response-time** command in Internet Configuration mode to configure the maximum response time interval for the specified interface. It is the maximum query response time advertised in IGMPv2 queries on this interface. The time interval is specified in seconds.

Syntax

ip igmp query-max-response-time *seconds*

no ip igmp query-max-response-time

- *seconds* — Maximum response time. (Range: 0-25 seconds)

Default Configuration

The default maximum response time value is 10 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures a maximum response time interval of one second for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp query-max-response-time 10
```

ip igmp robustness

Use the **ip igmp robustness** command in Interface VLAN Configuration mode to configure the robustness that allows tuning of the interface, that is, tuning for the expected packet loss on a subnet. If a subnet is expected to have significant loss, the robustness variable may be increased for the interface.

Syntax

ip igmp robustness *robustness*

no ip igmp robustness

- *robustness* — Robustness variable. (Range: 1-255)

Default Configuration

The default robustness value is 2.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures a robustness value of 10 for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp robustness 10
```

ip igmp startup-query-count

Use the **ip igmp startup-query-count** command in Interface VLAN Configuration mode to set the number of queries sent out on startup—at intervals equal to the startup query interval for the interface.

Syntax

ip igmp startup-query-count *count*

no ip igmp startup-query-count

- *count* — The number of startup queries. (Range: 1-20)

Default Configuration

The default count value is 2.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets for VLAN 15 the number of queries sent out on startup at 10.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp startup-query-count 10
```

ip igmp startup-query-interval

Use the **ip igmp startup-query-interval** command in Interface Configuration mode to set the interval between general queries sent at startup on the interface.

Syntax

ip igmp startup-query-interval *seconds*

no ip igmp startup-query-interval

- *seconds* — Startup query interval. (Range: 1-300 seconds)

Default Configuration

The default interval value is 31 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets at 10 seconds the interval between general queries sent at startup for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp startup-query-interval 10
```

ip igmp version

Use the **ip igmp version** command in Interface Configuration mode to configure the version of IGMP for an interface.

Syntax

ip igmp version *version*

- *version* — IGMP version. (Range: 1-3)

Default Configuration

The default version is 3.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example configures version 2 of IGMP for VLAN 15.

```
console#interface vlan 15
console(config-if-vlan15)#ip igmp version 2
```

show ip igmp

Use the **show ip igmp** command to display system-wide IGMP information.

Syntax

show ip igmp

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays system-wide IGMP information.

```
console#show ip igmp

IGMP Admin Mode............................ Enabled
IGMP Router-Alert check.................... Disabled

IGMP INTERFACE STATUS
Interface Interface-Mode Operational-Status
--------- -------------- ----------------
vlan 3    Enabled        Non-Operational
```

show ip igmp groups

Use the **show ip igmp groups** command in User Exec or Privileged Exec modes to display the registered multicast groups on the interface. If **detail** is specified, this command displays the registered multicast groups on the interface in detail.

Syntax

show ip igmp groups [*interface-type interface-number*] [**detail**]

- *interface-type interface-number*—Interface type of VLAN and a valid VLAN ID

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the registered multicast groups for VLAN 3.

```
console#show ip igmp groups vlan 3 detail

                    REGISTERED MULTICAST GROUP DETAILS
                                                     Version1  Version2  Group
Multicast        Last           Up        Expiry    Host      Host      Compat
IP Address       Reporter        Time       Time      Timer      Timer     Mode
---------------  ------------ ----------  ---------  -------   -------- -----
225.0.0.5        1.1.1.5       00:00:05  00:04:15   ------      00:04:15  v2
```

show ip igmp interface

Use the **show ip igmp interface** command to display the IGMP information for the specified interface.

Syntax

show ip igmp interface [**stats**] [*interface-type interface-number*]

- *interface-type interface-number*—Interface type of VLAN and a valid VLAN ID
- **stats**—Displays IGMP statistics for the specified VLAN.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays IGMP information for VLAN 11.

```
console#show ip igmp interface vlan 11
Interface.................................... 11
IGMP Admin Mode.............................. Enable
Interface Mode............................... Enable
IGMP Version................................. 3
Query Interval (secs)........................ 125
Query Max Response Time (1/10 of a second).... 100
Robustness.................................... 2
Startup Query Interval (secs)................ 31
Startup Query Count........................... 2
Last Member Query Interval (1/10 of a second). 10
Last Member Query Count....................... 2
```

show ip igmp membership

Use the **show ip igmp membership** command to display the list of interfaces that have registered in the multicast group. If **detail** is specified, this command displays detailed information about the listed interfaces.

Syntax

show ip igmp membership [*groupaddr*] [**detail**]

- *groupaddr* — Group IP address

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following examples display the list of interfaces that have registered in the multicast group at IP address 224.5.5.5, the latter in detail mode.

```
console#show ip igmp interface membership 224.5.5.5

console(config)#show ip igmp membership 224.5.5.5 detail
```

show ip igmp interface stats

Use the **show ip igmp interface stats** command in User Exec mode to display the IGMP statistical information for the interface. The statistics are only displayed when the interface is enabled for IGMP.

Syntax

show ip igmp interface stats vlan *vlan-id*

- *vlan-id* — Valid VLAN ID

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following example displays the IGMP statistical information for VLAN 7.

```
console#show ip igmp interface stats vlan 7
Querier Status............................... Querier
Querier IP Address........................... 7.7.7.7
Querier Up Time (secs)...................... 55372
Querier Expiry Time (secs).................. 0
Wrong Version Queries........................ 0
Number of Joins.............................. 7
Number of Groups............................. 1
```

IGMP Proxy Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

IGMP Proxy is used by the router on IPv4 systems to enable the system to issue IGMP host messages on behalf of hosts that the system discovered through standard IGMP router interfaces, thus acting as proxy to all its hosts residing on its router interfaces.

Dell EMC Networking supports IGMP Version 3, Version 2 and Version 1. Version 3 adds support for source filtering [SSM] is interoperable with Versions 1 and 2. Version 2 enhances group membership terminations to be quickly reported to overcome leave latency and is interoperable with IGMP Version 1.

ip igmp proxy-service

Use the ip igmp proxy-service command in Interface Configuration mode to enable the IGMP Proxy on the VLAN interface. Use this command to enable the sending of IGMP messages received on interfaces configured with the ip igmp mroute-proxy command to an attached multicast router.

IGMP is enabled with IGMP proxy. Only one interface can be configured with the IGMP proxy service. This interface forwards IGMP reports to a multicast router on behalf of IGMP clients configured with the **ip igmp mroute-proxy** command.

Syntax

ip igmp proxy-service

no ip igmp proxy-service

Default Configuration

Disabled is the default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command enables IGMP proxy on the VLAN interface. Use this command to enable sending of IGMP messages received on interfaces configured with **the ip igmp mroute-proxy** command to an attached multicast router.

PIM and DVMRP are not compatible with IGMP proxy. Disable PIM/DVMRP before enabling IGMP proxy.

Multicast routing must be enabled for the IGMP proxy service to become operationally enabled. This command enables IGMP/MLD. Disabling IGMP Proxy may operationally disable multicast routing.

Example

The following example enables the IGMP Proxy on the VLAN 15 router.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp-proxy
```

ip igmp proxy-service reset-status

Use the **ip igmp proxy-service reset-status** command in Interface Configuration mode to reset the host interface status parameters of the IGMP Proxy router. This command is valid only when IGMP Proxy is enabled on the interface.

Syntax

ip igmp proxy-service reset-status

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example resets the host interface status parameters of the IGMP Proxy router.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp proxy-service reset-status
```

ip igmp proxy-service unsolicit-rprt-interval

Use the **ip igmp proxy-service unsolicit-rprt-interval** command in Interface Configuration mode to set the unsolicited report interval for the IGMP Proxy router. This command is valid only if IGMP Proxy on the interface is enabled.

Syntax

ip igmp proxy-service unsolicit-rprt-interval *seconds*

- *seconds* — Unsolicited report interval. (Range: 1-260 seconds)

Default Configuration

The default configuration is 1 second.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets 10 seconds as the unsolicited report interval for the IGMP Proxy router.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip igmp proxy-service unsolicit-rpt-interval 10
```

show ip igmp proxy-service

Use the **show ip igmp proxy-service** command to display a summary of the host interface status parameters. It displays status parameters only when IGMP Proxy is enabled.

Syntax

show ip igmp proxy-service

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays a summary of the host interface status parameters.

```
console#show ip igmp proxy-service
Interface Index................................ vlan13
Admin Mode..................................... Enable
Operational Mode............................... Enable
Version........................................ 3
Number of Multicast Groups..................... 0
Unsolicited Report Interval.................... 1
Querier IP Address on Proxy Interface......... 0.0.0.0
Older Version 1 Querier Timeout............... 0
Older Version 2 Querier Timeout............... 0
Proxy Start Frequency....................... 1
```

show ip igmp proxy-service interface

Use the **show ip igmp proxy-service interface** command to display a detailed list of the host interface status parameters. It displays status parameters only when IGMP Proxy is enabled.

Syntax

show ip igmp proxy-service interface

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example fails to display status parameters because IGMP Proxy is not enabled.

```
console#show ip igmp proxy-service interface
Interface Index............................... vlan13
Ver  Query Rcvd  Report Rcvd  Report Sent  Leave Rcvd  Leave Sent
-----------------------------------------------------------------
1        0            0            0         -----       -----
2        0            0            0           0           0
3        0            0            0         -----       -----
```

show ip igmp-proxy groups

Use the **show ip igmp proxy-service groups** command to display a table of information about multicast groups that IGMP Proxy reported. It displays status parameters only when IGMP Proxy is enabled.

Syntax

show ip igmp proxy-service groups

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example attempts to display a table of information about multicast groups that IGMP Proxy reported.

```
console#show ip igmp proxy-service groups
Interface Index................................ vlan13
Group Address  Last Reporter    Up Time   Member State Filter Mode Sources
-------------  ---------------  -------   ------------ ----------- ------
225.0.1.1        13.13.13.1     7         DELAY-MEMBER Exclude       0
225.0.1.2        13.13.13.1    48         DELAY-MEMBER Exclude       0
```

show ip igmp proxy-service groups detail

Use the **show ip igmp proxy-service groups detai**l command to display complete information about multicast groups that IGMP Proxy has reported.

Syntax

show ip igmp proxy-service groups detail

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays complete information about multicast groups that IGMP Proxy has reported.

```
console#show ip igmp proxy-service groups detail
Interface Index................................ vlan13
Group Address  Last Reporter    Up Time   Member State Filter Mode Sources
```

```
------------- --------------- -------   ------------ ---------- -------
225.0.1.1       13.13.13.1       26      DELAY-MEMBER Exclude      0
225.0.1.2       13.13.13.1       67      DELAY-MEMBER Exclude      0
```

IP Helper/DHCP Relay Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

The IP Helper feature provides the ability for a router to forward configured UDP broadcast packets to a particular IP address over a routed interface. This allows applications to reach servers on non-local subnets. This is possible even when the application is designed to assume a server is always on a local subnet or when the application uses broadcast packets to reach the server (using the broadcast MAC address FF:FF:FF:FF:FF:FF and with the IP broadcast address 255.255.255.255 or a network directed broadcast IP address on the receiving switch interface). IP routing must be enabled for IP Helper to forward properly.

Network administrators can configure relay entries globally and on routing interfaces. Each relay entry maps an ingress interface and destination UDP port number to a single IPv4 address (the helper address). Multiple relay entries may be configured for the same interface and UDP port, in which case the relay agent unicasts matching packets to each server address. Interface configuration takes priority over global configuration. If the destination UDP port for a packet matches any entry on the ingress interface, the packet is handled according to the interface configuration. If the packet does not match any entry on the ingress interface, the packet is handled according to the global IP helper configuration.

Network administrators can configure discard relay entries. Discard entries are used to discard packets received on a specific interface when those packets would otherwise be relayed according to a global relay entry. Discard relay entries may be configured on interfaces, but are not configured globally.

Additionally, administrators can configure which UDP ports are forwarded. Certain UDP port numbers can be specified by name in the UI, but network administrators can configure a relay entry with any UDP port number. Administrators may configure relay entries that do not specify a destination UDP port. The relay agent assumes that these entries match packets with the UDP destination ports listed in Table 6-1.

Table 6-1. UDP Destination Ports

Protocol	UDP Port Number
IEN-116 Name Service	42
DNS	53
NetBIOS Name Server	137
NetBIOS Datagram Server	138
TACACS Server	49
Time Service	37
DHCP	67
Trivial File Transfer Protocol	69
ISAKAMP	500
Mobile IP	434
NTP	123
PIM Auto RP	496
RIP	520

Certain pre-existing DHCP relay options do not apply to relay of other protocols. The administrator may optionally set a DHCP maximum hop count or minimum wait time.

The relay agent relays DHCP packets in both directions. It relays broadcast packets from the client to one or more DHCP servers (as a unicast packet), and relays packets to the client that the DHCP server unicasts back to the relay agent. For other protocols, the relay agent only relays broadcast packets from the client to the server. Packets from the server back to the client are assumed to be unicast directly to the client. Because there is no relay in the return direction for protocols other than DHCP, the relay agent retains the source IP address from the original client packet. The relay agent uses a local IP address as the source IP address of relayed DHCP client packets.

When a switch receives a broadcast UDP packet on a routing interface, the relay agent verifies that the interface is configured to relay to the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise, the relay agent verifies that there is a global configuration for the destination UDP port. If so, the relay agent unicasts the packet to the configured server IP addresses. Otherwise the packet is not relayed.

The relay agent only relays packets that meet the following conditions:

- The destination MAC address must be the all-ones broadcast address (FF:FF:FF:FF:FF:FF).
- The destination IP address must be the IPv4 broadcast address (255.255.255.255) or a directed broadcast address for the receiving interface.
- The IP time-to-live (TTL) must be greater than 1.
- The protocol field in the IP header must be UDP (17).
- The destination UDP port must match a configured relay entry or an entry in Table 6-1.

DHCP relay cannot be independently enabled or disabled globally. Only IP helper can be enabled or disabled globally. Enabling IP helper enables DHCP relay.

ip dhcp relay maxhopcount

Use the **ip dhcp relay maxhopcount** command in Global Configuration mode to configure the maximum allowable relay agent hops for BootP/DHCP Relay on the system. Use the **no** form of the command to set the maximum hop count to the default value.

Syntax

ip dhcp relay maxhopcount *integer*

no ip dhcp relay maxhopcount

- *integer* — Maximum allowable relay agent hops for BootP/DHCP Relay on the system. (Range: 1-16)

Default Configuration

The default *integer* configuration is 4.

Command Mode

Global Configuration mode, Virtual Router Configuration mode.

User Guidelines

Enable DHCP Relay using the ip helper enable command.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example defines a maximum hopcount of 6.

```
console(config)#ip dhcp relay maxhopcount 6
```

Command History

Bootpdhcprelay syntax deprecated in firmware release 6.6.2.

ip dhcp relay minwaittime

Use the **ip dhcp relay minwaittime** command in Global Configuration mode to configure the minimum wait time in seconds for BootP/DHCP Relay packet to be relayed.

Use the no form of the command to set the minimum wait time to the default value.

Syntax

ip dhcp relay minwaittime *integer*

no ip dhcp relay minwaittime

- *integer* — Minimum wait time for BootP/DHCP Relay on the system. (Range: 0-100 seconds)

Default Configuration

0 is the default *integer* configuration.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

Enable DHCP Relay using the **ip helper enable** command.

When the BOOTP relay agent receives a BOOTREQUEST message, it might use the seconds-since-client- began-booting field of the request as a factor in deciding whether to relay the request or not.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000E-ON/N3100-ON/N3200-ON switches.

Example

The following example defines a minimum wait time of 10 seconds.

```
console(config)#ip dhcp relay minwaittime 10
```

clear ip helper statistics

Use the **clear ip helper statistics** command to reset to 0 the statistics displayed in **show ip helper statistics**.

Syntax

clear ip helper statistics [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Example

```
console#clear ip helper statistics
```

ip dhcp relay information check

Use the **ip dhcp relay information check** command to enable DHCP Relay to check that the relay agent information option in forwarded BOOTREPLY messages is valid. If an invalid message is received, the relay agent drops it. This information check will take effect, though enabled, only when the relay agent interface is enabled to insert the suboptions.

Syntax

ip dhcp relay information check

no ip dhcp relay information check

Default Configuration

This is enabled by default for a DHCP relay agent.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

Enable DHCP Relay using the **ip helper enable** command. Interface configuration takes precedence over global configuration. However if there is no interface configuration then global configuration is followed.

This check is enabled by default. The administrator has to ensure that the relay should be configured such that only it should insert option-82 fields and no other device near the client has the facility to insert options.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example enables relay information check globally:

```
console(config)#ip dhcp relay information check
```

ip dhcp relay information check-reply

Use the **ip dhcp relay information check-reply** command to enable DHCP Relay to check that the relay agent information option in forwarded BOOTREPLY messages is valid. If an invalid message is received, the relay agent drops it. This information check will take effect, though enabled, only when the relay agent interface is enabled to insert the suboptions.

Syntax

ip dhcp relay information check-reply [**none**]

no ip dhcp relay information check-reply

- **none**—(Optional) Disables the command function.

Default Configuration

This check is enabled by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Enable DHCP Relay using the **ip helper enable** command. Use the global configuration command **ip dhcp relay information option** command to enable processing of DHCP circuit ID and remote agent ID options. DHCP replies are checked by default. The network administrator should ensure that only one switch in the path between the DHCP client and server processes DHCP information options.

Example

The following example enables relay information check on the interface:

```
console(config)#interface vlan 10
console(config-if-vlan10)#ip dhcp relay information check-reply
```

ip dhcp relay information option

Use the **ip dhcp relay information option** command in Global Configuration mode to globally enable insertion of the circuit ID option and remote agent ID mode for BootP/DHCP Relay on the system (also called option 82). Use the **no** form of the command to globally disable the circuit ID option and remote agent ID mode for BootP/DHCP Relay.

Syntax

ip dhcp relay information option

no ip dhcp relay information option

Default Configuration

Disabled is the default configuration.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

This command globally enables inclusion of DHCP option 82 in DHCP requests forwarded to the DHCP server. This information may also be relayed on a per interface basis using the **ip dhcp relay information option-insert** command.

Enable DHCP Relay using the **ip helper enable** command.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example enables the circuit ID and remote agent ID options.

```
console(config)#ip dhcp relay information option
```

ip dhcp relay information option-insert

Use the **ip dhcp relay information option-insert** command in Interface Configuration mode to enable the circuit ID option and remote agent ID mode for BootP/DHCP Relay on the interface (also called option 82). Use the **no** form of the command to return the configuration to the default.

Syntax

ip dhcp relay information option-insert [none]

no ip dhcp relay information option-insert

- **none**—Use to disable insertion of circuit id and remote agent id options into DHCP requests forwarded to the DHCP server.

Default Configuration

Disabled is the default configuration.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

Enable DHCP Relay using the **ip helper enable** command. The interface configuration always takes precedence over global configuration. However, if there is no interface configuration, then global configuration is followed. Use the **ip dhcp relay information option** command to globally enable inclusion of Option 82 information in DHCP requests forwarded to a DHCP server.

Example

The following example enables the circuit ID and remote agent ID options on VLAN 10.

```
console(config)#interface vlan 10
console(config-if-vlan10)#ip dhcp relay information option-insert
```

ip dhcp relay information option server-override

Use the ip dhcp relay information option server-override command to enable sending sub-option 5 (link-election) and sub-option 11 (server override) in option 82.

Syntax

ip dhcp relay information option server-override

no ip dhcp relay information option server-override

Default Configuration

Sending of sub-option 5 (link-selection) and sub-option 11 (server-override) is not enabled globally, nor or any interface.

Command Mode

Global Configuration mode, Interface Configuration mode

User Guidelines

Configuring **ip dhcp relay information option server-override** enables the insertion of sub-option 5 and sub-option 11 in relayed DHCPDISCOVER messages. The server override and link-selection sub-options contain the incoming interface IP address of the DCHPREQUEST. The relay agent sets the gateway IP address (giaddr) to an IP address reachable by the DHCP server (outgoing interface IP address or the address configured by the **ip dhcp relay source–interface** command) and sets the Server Identifier Override sub-option to an IPv4 address reachable by the DHCP host that sent the DHCPDISCOVER.

The DHCP server uses the link selection sub-option to locate the address pool for the DHCP client and sets the server identifier option in the DHCPOFFER to the value of the Server Identifier Override sub-option received from the switch relay agent. The DHCP server sends the response to the IP address received in the giaddr option. This causes the DHCP client to use the Server Identifier Override IP address when unicasting DHCPRENEW messages and support behavior similar to DHCPv6 relay.

Configuring the command globally enables server-override globally (on all routing interfaces). Any DHCP packet received from a DHCP Client will have sub-option 5 and sub-option 11 for option 82 added to the packet.

When this command is issued in interface config mode, server-override is enabled for that interface only. Configure this option on the DHCPDISCOVER incoming interface, that is, the DHCP host facing interface.

Refer to RFC 5107 *DHCP Server Identifier Override Suboption* for further information.

Example #1

The following example enables server-override globally.

```
console#configure
console(config)#bootpdhcprelay server-override
```

Example #2

The following example enables server-override on interface gi1/0/26.

```
console#configure
console(config)#interface gi1/0/26
console(config-if-Gi1/0/26)#bootpdhcprelay server-
override
```

Command History

Command introduced in version 6.7.0 firmware.

ip dhcp relay source-interface

Use the **ip dhcp relay source-interface** command to configure a DHCP Relay source interface IP address.

Syntax

ip dhcp relay source-interface interface { *interface-id* **| vlan** <*vlanId*> **| loopback** <*loopbackId*> }

no ip dhcp relay source interface

- interface-id—A physical or port-channel interface with an IPv4 address.
- vlanID—A configured routing VLAN interface identifier.

- IPv4-address—A valid, reachable IPv4 address on the switch.

Default Configuration

No DHCP Relay source interface is configured by default.

Command Mode

Global Configuration mode, Interface Configuration mode

User Guidelines

The ip dhcp relay source-interface command is used to specify an interface whose IP address is passed as relay agent IP address. When the command is used in global configuration mode, the source interface is set globally. When the command is used in interface config mode, the source interface is set for the specified interface only. If the source interface is set in interface config mode, that value overrides the global configuration for the interface.

Command History

Command introduced in version 6.6.2 firmware.

ip helper-address (global configuration)

Use the **ip helper-address (global configuration)** command to configure the relay of certain UDP broadcast packets received on any interface. To delete an IP helper entry, use the no form of this command.

Syntax

ip helper-address *server-address* [*dest-udp-port* | **dhcp** | **domain** | **isakmp** | **mobile-ip** | **nameserver** | **netbios-dgm** | **netbios-ns** | **ntp** | **pim-auto-rp** | **rip** | **tacacs** | **tftp** | **time**]

no ip helper-address [*server-address*] [*dest-udp-port* | **dhcp** | **domain** | **isakmp** | **mobile-ip** | **nameserver** | **netbios-dgm** | **netbios-ns** | **ntp** | **pim-auto-rp** | **rip** | **tacacs** | **tftp** | **time**]

- *server-address* — The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be an IP address configured on any interface of the local router.

- *dest-udp-port* — A destination UDP port number from 1 to 65535. This parameter need not be configured for DHCP. It must be configured for all other protocols which are to be relayed.
- *port-name* — The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: **dhcp** (port 67), **domain** (port 53), **isakmp** (port 500), **mobile-ip** (port 434), **nameserver** (port 42), **netbios-dgm** (port 138), **netbios-ns** (port 137), **ntp** (port 123), **pim-auto-rp** (port 496), **rip** (port 520), **tacacs** (port 49), **tftp** (port 69), and **time** (port 37). Other ports must be specified by number.

Default Configuration

No helper addresses are configured.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

This command can be invoked multiple times, either to specify multiple server addresses for a given port number or to specify multiple port numbers handled by a specific server. Broadcast packets other than DHCP require configuration of a destination UDP port number for IP helper if they are not already listed in Table 6-1. The switch is able to supply the appropriate UDP destination port numbers by examining the DHCP message, so configuration of a UDP destination port is not required for unicast forwarding of DHCP.

The command no ip helper-address with no arguments clears all global IP helper addresses.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

To relay DHCP packets received on any interface to two DHCP servers, 10.1.1.1 and 10.1.2.1, use the following commands:

```
console#config
console(config)#ip helper-address 10.1.1.1 dhcp
console(config)#ip helper-address 10.1.2.1 dhcp
```

To relay UDP packets received on any interface for all default ports (see Table 6-1) to the server at 20.1.1.1, use the following commands:

```
console#config
console(config)#ip helper-address 20.1.1.1
```

Command History

Description revised in 6.3.5 release.

ip helper-address (interface configuration)

Use the **ip helper-address (interface configuration)** command to configure the relay of certain UDP broadcast packets received on a specific interface. To delete a relay entry on an interface, use the no form of this command.

Syntax

ip helper-address {server-address | **discard**} [**vrf** *vrf-name*] [dest-udp-port | **dhcp** | **domain** | **isakmp** | **mobile ip** | **nameserver** | **netbios-dgm** | **netbios-ns** | **ntp** | **pim-auto-rp** | **rip** | **tacacs** | **tftp** | **time**]

no ip helper-address {server-address | **discard**} [**vrf** *vrf-name*] [*dest-udp-port* | **dhcp** | **domain** | **isakmp** | **mobile-ip** | **nameserver** | **netbios-dgm** | **netbios-ns** | **ntp** | **pim-auto-rp** | **rip** | **tacacs** | **tftp** | **time**]

- *server-address* — The IPv4 unicast or directed broadcast address to which relayed UDP broadcast packets are sent. The server address cannot be an IP address configured on any interface of the local router.
- **discard** — Matching packets should be discarded rather than relayed, even if a global ip helper-address configuration matches the packet.
- *vrf-name* — The name of an existing VRF instance.
- *dest-udp-port* — A destination UDP port number from 1 to 65535.
- *port-name* — The destination UDP port may be optionally specified by its name. Whether a port is specified by its number or its name has no effect on behavior. The names recognized are as follows: **dhcp** (port 67), **domain** (port 53), **isakmp** (port 500), **mobile-ip** (port 434), **nameserver** (port 42),

netbios-dgm (port 138), **netbios-ns** (port 137), **ntp** (port 123), **pim-auto-rp** (port 496), **rip** (port 520), **tacacs** (port 49), **tftp** (port 69), and **time** (port 37). Other ports must be specified by number.

Default Configuration

No helper addresses are configured.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command can be invoked multiple times on routing interface, either to specify multiple server addresses for a given port number or to specify multiple port numbers handled by a specific server. Broadcast packets other than DHCP require configuration of a destination UDP port number for IP helper if not listed in Table 6-1. The switch is able to supply the appropriate UDP destination port numbers by examining the DHCP message, so configuration of a UDP destination port is not required for unicast forwarding of DHCP.

The command no ip helper-address with no arguments clears all helper addresses on the interface.

Example

```
To relay DHCP packets received on vlan 5 to two DHCP servers, 192.168.10.1
and 192.168.20.1, use the following commands:
console#config
console(config)#interface vlan 5
console(config-if-vlan5)#ip helper-address 192.168.10.1 dhcp
console(config-if-vlan5)#ip helper-address 192.168.20.1 dhcp
```

To relay both DHCP and DNS packets to 192.168.30.1, use the following commands:

```
console#config
console(config)#interface vlan 5
console(config-if-vlan5)#ip helper-address 192.168.30.1 dhcp
console(config-if-vlan5)#ip helper-address 192.168.30.1 domain
```

This command takes precedence over an ip helper-address command given in global configuration mode. With the following configuration, the relay agent relays DHCP packets received on any interface other than VLAN 5 and VLAN 6 to 192.168.40.1, relays DHCP and DNS packets received on VLAN 5 to 192.168.40.2, relays SNMP traps (port 162) received on interface VLAN 6 to 192.168.23.1, and drops DHCP packets received on VLAN 6:

```
console#config
console(config)#ip helper-address 192.168.40.1 dhcp
console(config)#interface vlan 5
console(config-if-vlan5)#ip helper-address 192.168.40.2 dhcp
console(config-if-vlan5)#ip helper-address 192.168.40.2 domain
console(config-if-vlan5)#exit
console(config)#interface vlan 6
console(config-if-vlan6)#ip helper-address 192.168.23.1 162
console(config-if-vlan6)#ip helper-address discard dhcp
```

Command History

Description revised in 6.3.5 release. Syntax to support VRFs added in version 6.7.0 firmware.

ip helper enable

Use the **ip helper enable** command to enable relay of UDP packets. To disable relay of all UDP packets, use the “no” form of this command.

Syntax

ip helper enable

no ip helper enable

Default Configuration

IP helper is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command can be used to temporarily disable IP helper without deleting all IP helper addresses.

This command replaces the bootpdhcprelay enable command, but affects not only relay of DHCP packets, but also relay of any other protocols for which an IP helper address has been configured.

When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

```
console(config)#ip helper enable
```

show ip helper-address

Use the **show ip helper-address** command to display the IP helper address configuration.

Syntax

show ip helper-address [**vrf** *vrf-name*] [*interface*]

- *interface* — Optionally specify an interface to limit the output to the configuration of a single interface. The interface is identified as vlan *vlan-id*.
- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The following output is shown:

Field	Description
Interface	The relay configuration is applied to packets that arrive on this interface. This field is set to “any” for global IP helper entries.
UDP Port	The relay configuration is applied to packets whose destination UDP port is this port. Entries whose UDP port is identified as “any” are applied to packets with the destination UDP ports listed in Table 6-1.
Discard	If “Yes”, packets arriving on the given interface with the given destination UDP port are discarded rather than relayed. Discard entries are used to override global IP helper address entries which otherwise might apply to a packet.
Hit Count	The number of times the IP helper entry has been used to relay or discard a packet.
Server Address	The IPv4 address of the server to which packets are relayed.

Example

```
show ip helper-address

IP helper is enabled

Interface   UDP Port     Discard   Hit Count   Server Address
--------------- ----------- -------- ---------- ---------------
      vlan  100          dhcp        No          10     10.100.1.254
                                                        10.100.2.254
      vlan  101          any        Yes           2
            any          dhcp        No           0     10.200.1.254
```

show ip dhcp relay

Use the **show ip dhcp relay** command in User Exec mode to display the BootP/DHCP Relay information.

Syntax

show ip dhcp relay [**vrf** *vrf-name*] [**interface vlan** *vlan-id*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *vlan-id*—A valid VLAN identifier.

Default Configuration

The command has no default configuration.

Command Mode

User Exec and Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example defines the Boot/DHCP Relay information.

```
console#show ip dhcp relay

Maximum Hop Count............................ 4
Minimum Wait Time (Seconds).................. 0
Admin Mode................................... Enable
Circuit Id Option Mode....................... Enable
Server Override Mode......................... Enable
Source Interface............................. loopback 2
```

Command History

Command output modified in version 6.6.2 firmware.

show ip helper statistics

Use the **show ip helper statistics** command to display the number of DHCP and other UDP packets processed and relayed by the UDP relay agent.

Syntax

show ip helper statistics [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The following information is displayed.

Field	Description
DHCP client messages received	The number of valid messages received from a DHCP client. The count is only incremented if IP helper is enabled globally, the ingress routing interface is up, and the packet passes a number of validity checks, such as having a TTL > 1 and having valid source and destination IP addresses.
DHCP client messages relayed	The number of DHCP client messages relayed to a server. If a message is relayed to multiple servers, the count is incremented once for each server.
DHCP server messages received	The number of DHCP responses received from the DHCP server. This count only includes messages that the DHCP server unicasts to the relay agent for relay to the client.
DHCP server messages relayed	The number of DHCP server messages relayed to a client.

UDP client messages received	The number of valid UDP packets received. This count includes DHCP messages and all other protocols relayed. Conditions are similar to those for the first statistic in this table.
UDP client messages relayed	The number of UDP packets relayed. This count includes DHCP messages relayed as well as all other protocols. The count is incremented for each server to which a packet is sent.
DHCP message hop count exceeded max	The number of DHCP client messages received whose hop count is larger than the maximum allowed. The maximum hop count is a configurable value listed in show ip dhcp relay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with secs field below min	The number of DHCP client messages received with secs fields that are less than the minimum value. The minimum secs value is a configurable value and is displayed in show ip dhcp relay. A log message is written for each such failure. The DHCP relay agent does not relay these packets.
DHCP message with giaddr set to local address	The number of DHCP client messages received whose gateway address, giaddr, is already set to an IP address configured on one of the relay agent's own IP addresses. In this case, another device is attempting to spoof the relay agent's address. The relay agent does not relay such packets. A log message gives details for each occurrence.
Packets with expired TTL	The number of packets received with TTL of 0 or 1 that might otherwise have been relayed.
Packets that matched a discard entry	The number of packets ignored by the relay agent because they match a discard relay entry.

Example

```
console#show ip helper statistics

DHCP client messages received................... 8
DHCP client messages relayed.................... 2
DHCP server messages received................... 2
DHCP server messages relayed.................... 2
UDP client messages received.................... 8
UDP client messages relayed..................... 2
DHCP message hop count exceeded max............ 0
DHCP message with secs field below min......... 0
DHCP message with giaddr set to local address.. 0
```

```
Packets with expired TTL....................... 0
Packets that matched a discard entry........... 0
```

IP Routing Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON/N2200-ON series supports limited routing and multicast capabilities. See the Users Configuration Guide section “Feature Limitations and Platform Constants” for supported capabilities.

Dell EMC Networking routing provides the base Layer 3 support for Local Area Network (LAN) and Wide Area Network (WAN) environments. The Dell EMC Networking switches allows the network operator to build a complete Layer 3+ configuration with advanced functionality. As the Dell EMC Networking defaults to Layer 2 switching functionality, routing must be explicitly enabled on the Dell EMC Networking to perform Layer 3 forwarding. For Dell EMC Networking switches, routing is only supported on VLAN and Loopback interfaces for in-band ports. It is not possible to route packets to or from the out-of-band interface.

Static Routes/ECMP Static Routes

The operator is able to configure static and default routes with multiple next hops to any given destination. Permitting the additional routes creates several options for the Dell EMC Networking switch operator.

1 The operator configures multiple next hops to a given destination, intending for the router to load share across the next hops.

2 The operator configures multiple next hops to a given destination, intending for the router to use the primary next hops and only use the other next hops if the primary next hops are unusable.

The operator distinguishes static routes by specifying a route preference value. A static route with a lower preference value is a more preferred static route. Next hops with the same preference are grouped into a single ECMP route. A less preferred static route is used if the more preferred static route is unusable. (The link is down or the next hop IP address cannot be resolved to a MAC address.)

In Dell EMC Networking, the operator deletes an individual next hop from a static route or deletes an entire static route at once. The cost of a static route is always 1 unless configured otherwise by the operator.

The addition of a preference option has a side benefit. The preference option allows the operator to control the preference of individual static routes relative to routes learned from other sources (such as OSPF). When routes from different sources have the same preference, Dell EMC Networking routing prefers a static route over a dynamic route.

Static Reject Routes

To administratively control the traffic destined to a particular network so that it is not forwarded through the router, Dell EMC Networking enables configuring a static reject route for that network on the router. Such traffic is discarded and an ICMP destination unreachable message is sent back to the source. Static reject routes are typically used to prevent routing loops.

Default Routes

Dell EMC Networking routing provides a preference option for the configuration of default routes. A configured default route is treated exactly like a static route. Therefore, default routes and static routes have the same default preference (1).

encapsulation

Use the **encapsulation** command in Interface Configuration (VLAN) mode to configure the Link Layer encapsulation type for the packet. Routed frames are always Ethernet-encapsulated when a frame is routed to a VLAN.

Syntax

encapsulation {**ethernet** | **snap**}

- **ethernet** — Specifies Ethernet encapsulation.
- **snap** — Specifies SNAP encapsulation.

Default Configuration

Ethernet encapsulation is the default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example applies SNAP encapsulation for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#encapsulation snap
```

ip icmp echo-reply

Use the **ip icmp echo-reply** command to enable or disable the generation of ICMP Echo Reply messages. Use the **no** form of this command to prevent the generation of ICMP Echo Replies.

Syntax

ip icmp echo-reply

no ip icmp echo-reply

Default Configuration

ICMP Echo Reply messages are enabled by default.

Command Mode

Global Configuration mode

User Guidelines

The command operates on the global router instance and the same configuration applies to any virtual routers created on the system.

Example

```
console(config)#ip icmp echo-reply
```

Command History

Command mode changed in version 6.7.0 firmware.

ip icmp error-interval

Use the **ip icmp error-interval** command to limit the rate at which IPv4 ICMP error messages are sent. The rate limit is configured as a token bucket with two configurable parameters: Burst-size and burst-interval.

To disable ICMP rate limiting, set burst-interval to zero. Use the **no** form of this command to return burst-interval and burst-size to their default values.

Syntax

ip icmp error-interval *burst-interval* [*burst-size*]

no ip icmp error-interval

- *burst-interval* — How often the token bucket is initialized (Range: 0–2147483647 milliseconds).
- *burst-size* — The maximum number of messages that can be sent during a burst interval (Range: 1–200).

Default Configuration

Rate limiting is enabled by default.

The default burst-interval is 1000 milliseconds.

The default burst-size is 100 messages.

Command Mode

Global Configuration mode

User Guidelines

The command operates on the global router instance and the same configuration applies to any virtual routers created on the system.

Example

```
console(config)#ip icmp error-interval 1000 20
```

Command History

Command mode changed in version 6.7.0 firmware.

ip load-sharing

Use the **ip load-sharing** command to configure the hash algorithm for ECMP routes.

Syntax

ip load-sharing *mode* {**inner**|**outer**}

no ip load-sharing

- *mode*—Load sharing mode (range 1 to 6)

The possible hashing modes are:

1. Source IP address.
2. Destination IP address.
3. Source and destination IP address.
4. Source IP address and source TCP/UDP port number.
5. Destination IP address and destination TCP/UDP port number.
6. Source and destination IP address and source and destination TCP/UDP port number.

- Inner—Use the inner IP header for tunneled packets.
- Outer—Use the outer IP header for tunneled packets.

Default Configuration

The default load-sharing mode is 6 using the outer IP header.

Command Mode

Global Configuration mode

User Guidelines

The choice of hashing mode should be based on the particular traffic type. Use the **show interfaces utilization** command to examine the traffic load and buffering.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, the load sharing mode is configured to use the destination IP addresses. This might be appropriate for distributing traffic destined to be a set of servers with different IP addresses but deploying identical services as determined by the destination port number.

```
console(config)# ip load-sharing 2
```

ip directed-broadcast

Use the **ip directed-broadcast** command in Interface Configuration mode to enable the forwarding of network-directed broadcast packets on an interface or range of interfaces. When enabled, network directed broadcasts are forwarded. When disabled they are dropped. Use the **no** form of the command to disable the broadcasts.

This command deprecates and replaces the **ip netdirbcast** command.

Syntax

ip directed-broadcast

no ip directed-broadcast

Default Configuration

Forwarding of network directed broadcast packets is disabled by default.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

Enabling this command may make a network vulnerable to flooding or ARP table poisoning man-in-the-middle attacks. It is recommended that ACLs be deployed on uplinks to limit the originating addresses of network-directed broadcast packets to known hosts.

Example

The following example defines the IP address and subnet mask for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip directed-broadcast
```

Command History

Command syntax updated in version 6.7.0 firmware.

ip policy route-map

Use this command to apply a route map on an interface. Use the **no** form of this command to delete a route map from the interface.

Syntax

ip policy route-map *map-tag*

no ip policy route-map *map-tag*

- *map-tag*—Name of the route map to use for policy based routing. It must match a map tag specified by the route-map command.

Default Configuration

No route maps are configured by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Policy-based routing must be configured on the VLAN interface that receives the packets, not on the VLAN interface from which the packets are sent. Packets matching a deny route map are routed using the routing table. Policy maps with no **set** clause are ignored.

When a route-map applied on an interface is changed, i.e. new statements are added to route-map or match or set terms are added/removed from the route-map statement, or if any route-map that is applied on an interface is removed, the entire sequence of route-maps needs to be removed from the interface and added back again in order to have the changed route-map configuration be effective.

If the administrator removes match or set terms in a route-map intermittently, the counters corresponding to the removed match term are reset to zero.

A route-map statement must contain eligible match/set conditions for policy based routing in order to be applied to hardware

Valid match conditions are:

match ip address <acl>, match mac-list, match length

Valid set conditions are:

set ip next-hop, set ip default next-hop, set ip precedence

A route-map statement must contain at least one of the match and one of the set conditions specified above in order it to be eligible to be applied to hardware. If not, the route-map is not applied to hardware.

An ACL referenced in a route-map may not be edited. Instead, create a new ACL with the desired changes and update the route-map with the edited ACL.

Route-maps and DiffServ cannot operate on the same interface due to allocation of conflicting resources. An error is thrown to user if when configuring a route-map on an interface on which DiffServ has been previously configured.

When a route map is configured on a VLAN interface and a DiffServ policy is applied on any individual member port of the same VLAN interface, the port policy (DiffServ) takes priority over the VLAN (route map) policy.

Example

Considering equal-access as a route-map configured earlier, the following sequence is an example of how a route map is applied to a VLAN.

```
console(config)#interface vlan 10
console(config-if-vlan10)#ip policy route-map equal-access
```

ip redirects

Use the **ip redirects** command to enable the generation of ICMP Redirect messages. Use the **no** form of this command to prevent the sending of ICMP Redirect Messages. In global configuration mode, this command affects all interfaces. In interface configuration mode, it only affects that interface.

Syntax

ip redirects

no ip redirects

Default Configuration

ICMP Redirect messages are enabled by default.

Command Mode

Global Configuration mode, Virtual Router Configuration mode, Interface Configuration (VLAN) mode

User Guidelines

When in virtual router configuration mode, this command operates within the context of the virtual router instance. When in global config mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

```
console(config-if-vlan10)#ip redirects
```

ip route

Use the **ip route** command in Global Configuration mode to configure a static route. Use the **no** form of the command to delete the static route.

Syntax

ip route [**vrf** *vrf-name*] *networkaddr* {*subnetmask* | *prefix-length*} {**Null0** | *nexthopip* | **vlan** *vlan-id* [nexthopip]} [*preference*] [**name** *text*] [**track** *object-number*]

no ip route [**vrf** *vrf-name*] *networkaddr* {*subnetmask* | *prefix-length*} {**Null0** | *nexthopip* | **vlan** *vlan-id* [nexthopip]}

- *vrf-name*—The name of the VRF if which the route is to be installed. If no vrf is specified, the route is created in the global routing table.
- *networkaddr* — IP address of destination interface. The address must contain 0's for the address bits corresponding to 0's in the subnetmask.

- *subnetmask*—A 32 bit dotted-quad subnet mask. Enabled bits in the mask indicate the corresponding bits of the network address are significant. Enabled bits in the mask must be contiguous.
- *prefix-length*—A forward slash followed by an integer number ranging from 1-32 (e.g., /24). The integer number indicates the number of significant bits in the address beginning with the leftmost (most significant) bit.
- *nexthopip*—The next-hop IPv4 address is specified in the argument *nexthopip*. Packets matching the destination route are forwarded to the next hop IP address. The next hop may be a numbered or unnumbered interface.
- *vlan-id*—A configured VLAN routing interface identifier for a VRF or an IP unnumbered interface. If a VLAN routing interface for a VRF is specified, it imports the associated subnet into the default routing instance from the VRF associated with the VLAN.
- **Null0**—The optional Null0 keyword indicates that packets matching the route are dropped. This capability allows the administrator to purposefully implement a black hole for selected traffic.
- *text*—A textual name for the route as configured by the administrator. May be up to 32 characters in length.
- **track** *object-number*—The IP SLA tracking object identifier

Default Configuration

Default value of preference is 1. The router will prefer a route with a smaller administrative distance that a route with a higher administrative distance.

Command Mode

Global Configuration mode

User Guidelines

The IP route command sets a value for the route preference. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database. Specifying the preference of a static route controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.

The ip route command optionally configures a route in the selected VRF. The IP route command can set a value for the route preference. Among routes to the same destination, the route with the lowest preference value is the route entered into the forwarding database.

Specifying the preference of a static route controls whether a static route is more or less preferred than routes from dynamic routing protocols. The preference also controls whether a static route is more or less preferred than other static routes to the same destination.

This command creates a static route in a specified virtual router instance referred to by name 'vrf-name' by taking an optional vrf argument. If the next-hop interface argument is given without specifying a nexthopip, it is added as a static interface route. If the next-hop interface is in the default routing domain, they routes are identified as leaked routes in the virtual router table.

The VRF identified in the parameter must have been previously created or an error is returned.

Route leaking in VRFs is only supported to or from the default routing instance and only for static routes. Configuring a leaked route from a non-default VRF to another non-default VRF results in undefined behavior.

Only IPv4 routes are supported with the vrf parameter.

Adding a static route with a Null 0 next hop specified configures a routing black hole (a static reject route). Packets destined to that prefix are dropped.

If an interface for the next hop is specified, it may be a numbered or unnumbered interface.

A static route entry is only installed if the next hop IP address matches one of the local subnets (i.e., the next hop is reachable). In case of unnumbered interfaces, static routes entries created for an unnumbered-peer do not match with any of the local subnets. By specifying the interface explicitly in the static route command along with the next hop IP address, the switch can correctly install static route entries for unnumbered-peers. It is also possible to configure 'unnumbered interface routes' where the next hop IP address is not specified and only the unnumbered nexthop interface is configured.

Enter a **track** *track-number* in the **ip route** command to specify that the static route is installed only if the configured SLA tracking object is up. When the track object is down, the route is removed from the Route Table. Only one tracking object can be associated with a static route. Configuring a different tracking object replaces the previously configured tracking object.

To display the tracked IPv4 static routes, use the **show ip route track-table** command.

Command History

Command updated in version 6.6 firmware.

Examples

Route Leaking Example 1

The following shows the configuration for VRF red-1 configured in VLAN 10. A static global route for the 172.16.0.0 with a next hop of 172.16.0.2 is injected into VRF red-1.

```
configure
vlan 10
exit
ip vrf red-1
ip routing
exit
ip routing
ip route vrf red-1 172.16.0.0 255.240.0.0 172.16.0.2
interface vlan 1
ip address 172.16.0.1 255.240.0.0
exit
interface vlan 10
ip vrf forwarding red-1
ip address 192.168.0.1 255.255.255.0
ip ospf area 0
exit
router ospf vrf "red-1"
router-id 1.1.1.1
network 192.168.0.0 0.0.0.255 area 0
exit
!
interface Gi1/0/1
switchport mode trunk
switchport access vlan 10
exit
!
interface loopback 0
```

```
ip vrf forwarding red-1
ip address 1.1.1.1 255.255.255.255
exit
```

Route Leaking Example 2

Subnetwork 9.0.0.0/24 is a directly connected subnetwork on VLAN 10 in the default routing table.

Subnet 8.0.0.0/24 is a directly connected subnetwork in VLAN 30 in virtual router *Red*.

Subnet 66.6.6.x is reachable via VLAN 30 in vrf Red.

The first ip route command below leaks the 66.6.6.x subnet from vrf Red into the default routing table.

The second ip route command configures a gateway for the default routing table.

The next ip route commands leak the 9.0.0.x route from the default route table into the virtual router *Red*.

The last ip route command configures the 66.6.6.x subnet as reachable via next hop 8.0.0.2 in Vrf Red.

```
configure
vlan 10,30
exit
ip vrf Red
ip routing
exit
ip routing
interface vlan 10
ip address 9.0.0.1 255.255.255.0
exit
interface vlan 30
ip vrf forwarding Red
ip address 8.0.0.1 255.255.255.0
exit
ip route 66.6.6.0 255.255.255.0 Vl30
ip route 0.0.0.0 0.0.0.0 9.0.0.2 253
ip route vrf Red 9.0.0.0 255.255.255.0 Vl10
ip route vrf Red 66.6.6.0 255.255.255.0 8.0.0.2
!
interface Gi1/0/1
switchport access vlan 10
exit
!
```

```
interface Gi1/0/3
switchport access vlan 30
exit

console(config)#show ip route

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, E - Externally Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route

 * Indicates the best (lowest metric) route for the subnet.

Default Gateway is 9.0.0.2
S      *0.0.0.0/0 [253/0] via 9.0.0.2,   Vl10
C      *9.0.0.0/24 [0/1] directly connected,   Vl10
L      *66.6.6.0/24 [1/0] via 0.0.0.0,   Vl30


console(config)#show ip route vrf Red

Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, E - Externally Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route

 * Indicates the best (lowest metric) route for the subnet.

No default gateway is configured.
C      *8.0.0.0/24 [0/1] directly connected,   Vl30
L      *9.0.0.0/24 [1/0] via 0.0.0.0,   Vl10
S      *66.6.6.0/24 [1/0] via 8.0.0.2,   Vl30
```

ip route default

Use the **ip route default** command in Global Configuration mode to configure the next hop address of the default route. Use the no form of the command to delete the default route.

Use of the optional VRF parameter executes the command within the context of the VRF specific routing table.

Syntax

ip route default [**vrf** *vrf-name*] *next-hop-ip* [*preference*]

no ip route default *next-hop-ip* [*preference*]

- *vrf-name*—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.
- *next-hop-ip* — IP address of the next hop router.
- *preference* — Specifies the preference value, a.k.a administrative distance, of an individual static route. (Range: 1-255)

Default Configuration

Default value of preference is 1.

Command Mode

Global Configuration mode

User Guidelines

For routed management traffic:

1. Router entries are checked for applicable destinations.
2. The globally assigned default-gateway is consulted.

If DHCP is enabled on multiple in-band interfaces and the system learns a different default gateway on each, the system retains the first default gateway it learns and ignores any others. If the first default gateway is lost, the system does not revert to an alternate default gateway until it renews its IP address.

Using this command, the administrator may manually configure a single, global default gateway. The switch installs a default route for a configured default gateway with a preference of 253, making it more preferred than the default gateways learned via DHCP, but less preferred than a static default route. The preference of these routes is not configurable.

The switch installs a default route for the default gateway whether or not routing is globally enabled. When the user displays the routing table (e.g. show ip route), the display identifies the default gateway, if one is known.

Use the **show ip route static all** command to display the configured static routes and preferences.

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the **vrf** parameter.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example identifies the *next-hop-ip* and a preference value of 200.

```
console(config)#ip route default 192.168.10.1.200
```

ip route distance

Use the **ip route distance** command in Global Configuration mode to set the default distance (preference) for static routes. Lower route preference values are preferred when determining the best route. The **ip route** and **ip route default** commands allow optional setting of the distance of an individual static route. The default distance is used when no distance is specified in these commands. Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance are applied to static routes created after invoking the **ip route distance** command.

Use of the optional **vrf** parameter executes the command within the context of the VRF specific routing table.

Syntax

ip route distance [**vrf** *vrf-name*] *integer*

no ip route distance *integer*

- *vrf-name*—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.
- *integer* — Specifies the distance (preference) of an individual static route. (Range 1-255)

Default Configuration

Default value of distance is 1.

Command Mode

Global Configuration mode

User Guidelines

Lower route distance values are preferred when determining the best route.

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the vrf parameter.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example sets the default route metric to 80.

```
console(config)#ip route distance 80
```

ip routing

Use the **ip routing** command in Global Configuration mode to globally enable IPv4 routing on the router. To disable IPv4 routing globally, use the `no` form of the command.

Syntax

ip routing

no ip routing

Default Configuration

Disabled is the default configuration.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

Use the show ip brief command to determine if routing is enabled or disabled. When in virtual router configuration mode, this command operates within the context of the virtual router instance. When in global config mode, the command operates on the global router instance.

Enable IPv4 routing on a VLAN by entering **interface vlan mode** for the desired VLAN and assigning an IP address to the VLAN. Use the **no interface vlan** command to disable routing on an interface. Ensure that statically assigned addresses do not conflict with any configured subnets. Subnet overlap is not allowed.

Virtual Router Configuration mode is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

The following example enables IPv4 routing for VLAN 15

```
console(config)#vlan 15
console(config-vlan15)#interface vlan 15
console(config-if-vlan15)#ip address 10.0.3.2 /8
console(config-if-vlan15)#exit
console(config)#ip routing
```

ip unnumbered

This command is used to identify an interface as an unnumbered interface and specify the numbered interface providing the borrowed address. The numbered interface must be a loopback interface. To stop borrowing an address, use the **no** form of the command.

Syntax

ip unnumbered loopback *loopback-id*

no ip unnumbered

- *loopback-id*—The loopback identifier (Range 0–7)

Default Configuration

The are no ip unnumbered interfaces by default.

Command Mode

Interface (VLAN) Configuration

User Guidelines

IP unnumbered interfaces are supported in the default VRF only.

The interface should be configured as able to borrow an IP address, i.e. a routing interface with no IP address.

The loopback interface is the numbered interface providing the borrowed address. The providing loopback interface cannot be unnumbered. The loopback interface is identified by its loopback interface number.

It is a misconfiguration for two routers, R1 and R2, to be connected by a link where R1's interface is unnumbered and R2's interface is numbered. If a static route is configured on R2 using R1's IP address as next hop, the static route will never be installed in the routing table because the next hop is not in a local subnet. If a static route is configured on R1 using R2's IP address as next hop, the static route will be installed in the routing table. R1 will ARP for the next hop address. R2 will ignore the ARP Request because the source IP address is not in a local subnet.

It is a misconfiguration to enable OSPF on both ends of an unnumbered interface without setting the OSPF network type to point-to-point. Each router will reject its neighbor's HELLOs because the source IP address is not in a local subnet. Adjacencies never progress beyond the INIT state.

If three or more routers are connected to the same subnet/broadcast domain and all are configured to treat the Ethernet interface as a point-to-point link, adjacencies may not form. The OSPF database description packets intended for a specific neighbor will be processed by all neighbors, causing errors that reset adjacencies.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-if-vlan1)#ip unnumbered 10.130.14.55
```

ip unnumbered gratuitous-arp accept

This command enables installation of a static interface route to the unnumbered peer upon receiving a gratuitous ARP.

Syntax

ip unnumbered gratuitous-arp accept

no ip unnumbered gratuitous-arp accept

Default Configuration

The default mode is accept.

Command Mode

Interface (VLAN) Configuration

User Guidelines

IP unnumbered interfaces are supported in the default VRF only.

The interface should be configured as able to borrow an IP address, i.e. a routing interface with no IP address.

Normally, the static ARP entry is only installed if the IP address matches one of the local subnets. In case of unnumbered interfaces, static ARP entries created for the unnumbered-peer do not match any of the local subnets. By specifying the interface explicitly in the static ARP command, static ARP entries for unnumbered-peers can be installed in the ARP table.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-if-vlan1)#ip unnumbered gratuitous-arp accept
```

ip unreachables

Use the **ip unreachables** command to enable the generation of ICMP Destination Unreachable messages. Use the **no** form of this command to prevent the generation of ICMP Destination Unreachable messages.

Syntax

ip unreachables

no ip unreachables

Default Configuration

ICMP Destination Unreachable messages are enabled.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan10)#ip unreachables
```

match ip address

Use this command to specify IP address match criteria for a route map. Use the *no* form of this command to delete a match statement from a route map.

Syntax

match ip address *access-list-name* [*access-list-name*]

no match ip address [*access-list-name*]

- *access-list-name*—The access-list name that identifies the named IP ACLs. The name can be up to 31 characters in length.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map Configuration mode

User Guidelines

The IP ACL must be configured before it can be linked to a route-map. Specifying an unconfigured IP ACL causes an error. Actions present in an IP ACL configuration are applied along with other actions present in route-map. When an IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected.

Actions in the IP ACL configuration are applied with other actions present in the route-map. If an IP ACL referenced by a route-map is removed or rules are added or deleted from the ACL, the configuration is rejected.

If a list of IP access lists is specified in this command and a packet matches at least one of these access list match criteria, the corresponding set of actions in the route map are applied to the packet. Duplicate IP access list names are ignored.

It is strongly recommended that access lists used in a route map not be re-used for normal access list processing. This is because:

- ACLs inherit the priority of the route map. This overrides the priority of the including access group.
- Route maps do not have a implicit deny all at the end of the list. Instead, non-matching packets for a permit route map use the routing table.

Example

The example below creates two access lists (R1 and R2) and two route-maps with IP address match clauses and that associate the route-map to an interface.

In the example, the ip policy route-map equal-access command is applied to interface VLAN 11. All packets ingressing VLAN 11 are policy-routed.

Route map sequence 10 in route map *equal-access* is used to match all packets sourced from any host in subnet 10.1.0.0. If there is a match, and if the router has no explicit route for the packet's destination, it is sent to next-hop address 192.168.6.6.

Route map sequence 20 in route map *equal-access* is used to match all packets sourced from any host in subnet 10.2.0.0. If there is a match, and if the router has no explicit route for the packet's destination, it is sent to next-hop address 172.16.7.7.

All other packets are forwarded as per normal L3 destination-based routing.

```
console(config-if-vlan3)#ip policy route-map equal-access

console(config)#ip access-list R1
console(config-ip-acl)#permit ip 10.1.0.0 0.0.255.255 any
console(config-ip-acl)#exit
console(config)#ip access-list R2
console(config-ip-acl)#permit ip 10.2.0.0 0.0.255.255 any
console(config-ip-acl)#exit
```

```
console(config)#route-map equal-access permit 10
console(config-route-map)#match ip address R1
console(config-route-map)#set ip default next-hop 192.168.6.6
console(config-route-map)#exit

console(config)#route-map equal-access permit 20
console(config-route-map)#match ip address R2
console(config-route-map)#set ip default next-hop 172.16.7.7
console(config-route-map)#exit

console(config)#interface vlan 11
console(config-if-vlan11)#ip address 10.1.1.1 255.255.255.0
console(config-if-vlan11)#ip policy route-map equal-access

console(config)#interface vlan 12
console(config-if-vlan12)#ip address 10.1.1.1 255.255.255.0
console(config-if-vlan12)#ip policy route-map equal-access

console(config)#interface vlan 13
console(config-if-vlan13)#ip address 192.168.6.5 255.255.255.0

console(config)#interface vlan 16

console(config-if-vlan16)#ip address 172.16.7.6 255.255.255.0
```

This example illustrates the scenario where IP ACL referenced by a route-map is removed or rules are added or deleted from that ACL, this is how configuration is rejected:

```
console#show ip access-lists

Current number of ACLs: 9  Maximum number of ACLs: 100

ACL ID/Name                       Rules  Interface(s) Direction   Count
-------------------------------  -----  ----------- ---------- ----------
1                                 1
2                                 1
3                                 1
4                                 1
5                                 1
madan                             1

console#show mac access-lists

Current number of all ACLs: 9  Maximum number of all ACLs: 100

MAC ACL Name                      Rules  Interface(s) Direction   Count
-------------------------------  -----  ------------ --------- ----------
madan                             1
mohan                             1
goud                              1
```

```
console#configure
console(config)#route-map madan
console(route-map)#match ip address 1 2 3 4 5 madan
console(route-map)#match mac-list madan mohan goud
console(route-map)#exit
console(config)#exit
console #show route-map

route-map madan permit 10
     Match clauses:
       ip address (access-lists) : 1 2 3 4 5 madan
       mac-list (access-lists) : madan mohan goud
     Set clauses:

console(config)#access-list 2 permit every

Request denied. Another application using this ACL restricts the number of
rules allowed.


console(config)#ip access-list madan

console(config-ipv4-acl)#permit udp any any

Request denied. Another application using this ACL restricts the number of
rules allowed.
```

match length

Use this command to configure packet length matching criteria for a route map. Use the no form of this command to delete a match statement from a route map.

Syntax

match length *min max*

no match length

- *min*—Specifies the minimum Layer 3 length for the packet, inclusive, allowing for a match.
- *max*—Specifies the maximum Layer 3 length for the packet, inclusive, allowing for a match.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

The match criteria specified by this command acts on the packet length as it appears in the IP header and is not necessarily correlated with the frame length as it appears on the wire.

Example

```
console(config-route-map)#match length 64 1500
```

match mac-list

Use this command to configure MAC ACL match criteria for a route map. Use the no form of this command to delete the match statement from a route map.

Syntax

match mac-list *mac-list-name* [*mac-list-name*]

no match mac-list [*mac-list-name*]

- *mac-list-name*—The MAC ACL name that identifies the MAC ACLs. The name can be between 0 and 31 characters.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

The MAC ACL must be configured before it is linked to a route map. Trying to link to an unconfigured MAC ACL causes an error.

Actions in the MAC ACL configuration are applied with other actions configured in the route map. When a MAC ACL referenced by a route map is removed, the route map rule is also removed.

Example

```
console(config-route-map)#match mac-list mac-test
```

route-map

Use this command to create a policy based route map. Use the **no** form of this command to delete a route map or one of its statements.

Syntax

route-map *map-tag* [**permit | deny**] [*sequence-number*]

no route-map *map-tag* [**permit | deny**] [*sequence-number*]

- *map-tag*—Text name of the route map. Route maps with the same name are grouped together in order of their sequence numbers. A route map name may be up to 32 characters long and comprised of any printable character except a question mark. Enclose the map-tag in quotes to embed blanks in the name.
- *permit*—(Optional) Permit routes that match all of the match conditions in the route map.
- *deny*—(Optional) Deny routes that match all of the match conditions in the route map. Packets matching deny routes use the routing table.
- *sequence-number*—(Optional) An integer used to order the set of route maps. Route maps are ordered from lowest to greatest sequence number, with lower sequence numbers being considered first. If no sequence number is specified, the system assigns a value ten greater than the last statement in the route map. The range is 0 to 65,535.

Default Configuration

No route maps are configured by default. If no permit or deny tag is specified, **permit** is the default.

Command Mode

Global Configuration mode

User Guidelines

Apply an ACL rule on the VLAN interface to perform policy based routing based on the VLAN ID as a matching criteria for incoming packets. Packets matching a deny rule or a deny route-map are routed using the routing table.

There is no implicit deny all at the end of a route map. Packets not matching any clause are routed using the routing table.

Route maps with no set clause are ignored. One use of a route map is to limit the redistribution of routes to a specified range of route prefixes. The redistribution command specifies a route map which refers to a prefix list. The prefix list identifies the prefixes that may be redistributed.

Route maps are ordered from lowest to greatest sequence number, with lower sequence numbers being considered first. If no sequence number is specified, the system assigns a value ten greater than the last statement in the route map. The range is 0 to 65,535.

One use of a route map is to limit the redistribution of routes to a specified range of route prefixes. The redistribution command specifies a route map which refers to a prefix list. The prefix list identifies the prefixes that may be redistributed.

Examples

The following example creates (or edits) the route map *equal-access* as the first route map in the system for allowing matching packets into the system. Route-map mode is also entered.

```
console(config)#route-map equal-access permit 0
```

In the following example, BGP is configured to redistribute all prefixes within 172.20.0.0 and reject all others.

```
console(config)# ip prefix-list redist-pl permit 172.20.0.0/16 le 32
console(config)# route-map redist-rm permit
console(config-route-map)# match ip address prefix-list redist-pl
console(config-route-map)# exit
console(config) router bgp 1
console(Config-router) redistribute ospf route-map redist-rm
```

set interface null0

Use this command to drop a packet instead of reverting to normal routing for packets that do not match the route map criteria. This command should be configured as the last entry in the route-map as no further set clauses will operate on a dropped packet. Use the **no** form of this command to remove the set clause from a route map.

Syntax

set interface *null0*

no set interface *null0*

- *null0*—Specifies the null0 interface used to drop packets.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

A route-map statement used for policy based routing is configured as permit or deny. If the statement is marked as deny, traditional destination-based routing is performed on the packet meeting the match criteria. If the statement is marked as permit and the packet meets all the match criteria, the set clauses in the route-map statement are applied. If no match is found in the route-map, the packet is forwarded using the routing decision resulting from traditional destination-based routing. If the network administrator does not want to revert to normal forwarding but instead want to drop packets that do not match the specified criteria, a set clause routing the packets to interface null0 may be configured as the last (highest numbered) route-map.

Example

```
console(config-route-map)#set interface null0
```

set ip default next-hop

Use this route map clause to override default entries in the routing table. Packets that can routed by an active explicit route in the routing table are not affected by this clause. Use this command to set a list of default next-hop IP addresses to be used if no explicit route for the packet's destination address appears in the routing table. If more than one IP address is specified, the reachable address in the list is used. Use the **no** form of this command to remove a set command from a route map.

Syntax

set ip default next-hop *ip-address* [*ip-address*]

no set ip default next-hop *ip-address* [*ip-address*]

ip-address—The IP address of the next hop to which packets are routed. It must be the address of an adjacent router.

- *ip-address*—A maximum of 16 next-hop IP addresses can be specified.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

A packet is routed to the next hop specified by this command only if there is no active explicit route for the packet's destination address in the routing table. A default route in the routing table is not considered an explicit route for an unknown destination address.

Only one of **set ip next-hop**, **set ip default next-hop**, or **set interface null0** may be specified in a route map.

Example

```
console(config-route-map)#set ip default next-hop 192.0.2.2
```

set ip next-hop

Use this command to specify an adjacent next-hop router in the path toward the destination to which the packets should be forwarded. Use the **no** form of this command to remove a set command from a route map.

Syntax

set ip next-hop *ip-address* [*ip-address*]

no set ip next-hop *ip-address* [*ip-address*]

- *ip-address*—The IP address of the next hop to which packets are routed. It must be the address of an adjacent router (i.e., the next hop must be in a subnet configured on the local router). A maximum of 16 next-hop IP addresses can be specified.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

Use this route map clause to override active routes in the routing table. This command affects all matching packet types and is used if an active route for the next hop exists in the routing table. The next hop IP address must be associated with a directly connected subnet on the router. If no resolvable active interface is present in the route table, the packet is routed using the default routing table. If more than one IP address is specified, the first IP address associated with a link up interface is used to route the packets.

Only one of **set ip next-hop**, **set ip default next-hop**, or **set interface null0** may be specified in a route map.

Example

```
console(config-route-map)#set ip next-hop 192.0.2.1
```

set ip precedence

Use this command to set the three IP precedence bits in the IP packet header on ingress. Values 0 through 7 are supported. This precedence value may be used by other QoS services in the network such as weighted fair queuing (WFQ) or weighted random early detection (WRED). Use the **no** form of this command to remove a set clause from a route map.

Syntax

set ip precedence *0-7*

no set ip precedence

- *0*—Sets the routine precedence.
- *1*—Sets the priority precedence.
- *2*—Sets the immediate precedence.
- *3*—Sets the Flash precedence.
- *4*—Sets the Flash override precedence.
- *5*—Sets the critical precedence.
- *6*—Sets the internetwork control precedence.
- *7*—Sets the network control precedence.

Default Configuration

There is no default configuration for this command.

Command Mode

Route Map mode

User Guidelines

The set ip precedence clause may be combined with set ip next-hop or set ip default next-hop clause in a route map.

Example

```
console(config-route-map)#set ip precedence 5
```

show ip brief

Use the **show ip brief** command to display all the summary information of the IP.

Syntax

show ip brief [vrf ***vrf-name***]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example displays IP summary information.

```
console#show ip brief
Default Time to Live........................... 64
Routing Mode................................... Enabled
ICMP Rate Limit Interval....................... 1000 msec
ICMP Rate Limit Burst Size..................... 100 messages
ICMP Echo Replies.............................. Enabled
ICMP Redirect Mode............................. Enabled
Maximum Next Hops.............................. 16
```

show ip interface

Use the **show ip interface** command to display information about one or more IP interfaces. The output shows how each IP address was assigned.

Syntax

show ip interface [**vrf** *vrf-name*] [*type number*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *type*—Interface type (loopback, out-of-band, or VLAN)
- *number*—Interface number. Valid only for loopback and VLAN types.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The Method field contains one of the following values.

Field	Description
DHCP	The address is leased from a DHCP server.
Manual	The address is manually configured.

Command History

Command output updated in version 6.6 firmware.

Example

```
console#show ip interface

Default Gateway................................ 0.0.0.0
L3 MAC Address................................. 001E.C9DE.B546

Routing Interfaces:

Interface    State   IP Address          IP Mask         Method
----------       -----   ---------------     ---------------   -------
Vl1              Down    0.0.0.0             0.0.0.0           None
Vl2              Up      unnumbered
                           -->loopback 2                         N/A

console#

console#show ip interface vlan 1

Routing interface status....................... Up
Unnumbered - numbered interface................ Loopback 1
Unnumbered - gratuitous ARP accept............. Enable
Method......................................... None
Routing Mode................................... Enable
Administrative Mode............................ Enable
Forward Net Directed Broadcasts................ Disable
Proxy ARP...................................... Enable
Local Proxy ARP................................ Disable
Active State................................... Inactive
Link Speed Data Rate........................... 1000 Full
MAC Address.................................... 001E.C9DE.B546
Encapsulation Type............................. Ethernet
IP MTU......................................... 1500
Bandwidth...................................... 10000 Kbps
Destination Unreachables....................... Enabled
ICMP Redirects................................. Enabled
Interface Suppress Status...................... Unsuppressed
Interface Name................................. rt1_0_7
Unicast Reverse Path Forwarding Mode........... Strict
Unicast Reverse Path Forwarding Allow-Default.. False
```

show ip policy

Use the **show ip policy** command to display the route maps used for policy based routing on the router interfaces.

Syntax

show ip policy *map-name*

- *map-name*—The name of a specific route map.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip policy
Interface                      Route map
Vl10                           pbr-map
```

show ip protocols

Use the **show ip protocols** command to display a summary of the configuration and status for each unicast routing protocol. The command lists all supported routing protocols, regardless of whether they are currently configured or enabled.

Syntax

show ip protocols [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The command displays the following information.

Parameter	Description
BGP Section:	
Routing Protocol	BGP.
Router ID	The router ID configured for BGP.
Local AS Number	The AS number that the local router is in.
BGP Admin Mode	Whether BGP is globally enabled or disabled.
Maximum Paths	The maximum number of next hops in an internal or external BGP route.
Distance	The default administrative distance (or route preference) for external, internal, and locally-originated BGP routes. The table that follows lists ranges of neighbor addresses that have been configured to override the default distance with a neighbor-specific distance. If a neighbor's address falls within one of these ranges, routes from that neighbor are assigned the configured distance. If a prefix list is configured, then the distance is only assigned to prefixes from the neighbor that are permitted by the prefix list.
Prefix List In	The global prefix list used to filter inbound routes from all neighbors.
Prefix List Out	The global prefix list used to filter outbound routes to all neighbors.
Neighbors	A list of configured neighbors and the inbound and outbound policies configured for each.
OSPFv2 Section	
Routing Protocol	OSPFv2.
Router ID	The router ID configured for OSPFv2.

Parameter	Description
OSPF Admin Mode	Whether OSPF is enabled or disabled globally.
Maximum Paths	The maximum number of next hops in an OSPF route.
Routing for Networks	The address ranges configured with an OSPF network command.
Distance	The administrative distance (or “route preference”) for intra-area, inter-area, and external routes.
Default Route Advertise	Whether OSPF is configured to originate a default route.
Always	Whether default advertisement depends on having a default route in the common routing table.
Metric	The metric configured to be advertised with the default route.
Metric Type	The metric type to advertise for redistributed routes of this type.
Redist Source	The type of routes OSPF is redistributing.
Metric	The metric to advertise for redistributed routes of this type.
Metric Type	The metric type to advertise for redistributed routes of this type.
Subnets	Whether OSPF redistributes subnets of classful addresses, or only classful prefixes.
Dist List	A distribute list used to filter routes of this type. Only routes that pass the distribute list are redistributed.
Number of Active Areas	The number of OSPF areas with at least one interface running on this router. Also broken down by area type.
ABR Status	The number of OSPF areas with at least one interface running on this router. Also broken down by area type.
ASBR Status	Whether the router is an autonomous system boundary router. The router is an ASBR if it is redistributing any routes or originating a default route.
RIP Section	
RIP Admin Mode	Whether RIP is globally enabled.
Split Horizon Mode	Whether RIP advertises routes on the interface where they were received.

Parameter	Description
Default Metric	The metric assigned to redistributed routes.
Default Route Advertise	Whether this router is originating a default route.
Distance	The administrative distance for RIP routes.
Interface	The interfaces where RIP is enabled and the version sent and accepted on each interface.

Example

The following shows example CLI display output for the command.

```
console# show ip protocols

Routing Protocol.......................... BGP
Router ID................................. 6.6.6.6
Local AS Number........................... 65001
BGP Admin Mode............................ Enable
Maximum Paths............................. Internal 32, External 32

Distance.................................. Ext 20 Int 200 Local 200
  Address         Wildcard        Distance    Pfx List
  -------         --------        --------    --------
  172.20.0.0      0.0.255.255           40        None
  172.21.0.0      0.0.255.255           45           1

Prefix List In............................ PfxList1
Prefix List Out........................... None

Neighbors:
172.20.1.100
   Filter List In......................... 1
   Filter List Out........................ 2
   Prefix List In......................... PfxList2
   Prefix List Out........................ PfxList3
   Route Map In........................... rmapUp
   Route Map Out.......................... rmapDown
172.20.5.1
   Prefix List Out........................ PfxList12


Routing Protocol.......................... OSPFv2
Router ID................................. 6.6.6.6
OSPF Admin Mode........................... Enable
Maximum Paths............................. 32
Routing for Networks...................... 172.24.0.0 0.0.255.255 area 0
                                           10.0.0.0 0.255.255.255 area 1
```

```
                                           192.168.75.0 0.0.0.255 area 2
Distance.................................. Intra 110 Inter 110 Ext 110

Default Route Advertise................... Disabled
Always.................................... FALSE
Metric.................................... Not configured
Metric Type............................... External Type 2

Redist
Source      Metric       Metric Type     Subnets    Dist List
---------  -------       -----------     -------    ---------
static     default                 2         Yes         None
connected       10                 2         Yes            1

Number of Active Areas.................... 3 (3 normal, 0 stub, 0 nssa)
ABR Status................................ Yes
ASBR Status............................... Yes


Routing Protocol.......................... RIP
RIP Admin Mode............................ Enable
Split Horizon Mode........................ Simple
Default Metric............................ Not configured
Default Route Advertise................... Disable
Distance.................................. 120

Interface              Send         Recv
---------              ----         ----
0/25                   RIPv2        RIPv2
```

show ip route

Use the **show ip route** command to display the current state of the routing table. The output of the command also displays the IPv4 address of the default gateway and the default route associated with the gateway.

This command deprecates the **show ip route connected** command.

Syntax

show ip route [[*ip-address* [*mask* **|** *prefix-length*] [**longer-prefixes**] [**vrf** *vrf-name*] [**static**] **|** [**ecmp-groups**] **|** [**hw-failure**] **|** [[**vrf** *vrfname*] **track-table**] **|** [**net-prototype**]

- **ip-address**—Specifies the network for which the route is to be displayed and displays the best matching route for the address.
- **mask**—Subnet mask of the IPv4 address in dotted quad notation.

- *prefix-length*—Length of prefix, in bits. Must be preceded with a forward slash (/). (Range: 0-32 bits.)
- **longer-prefixes**—Indicates that the *ip-address* and *subnet-mask* pair becomes the prefix, and the command displays the routes to the addresses that match that prefix.
- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- **static**—Display statically configured routes.
- **ecmp-groups**—Display the ECMP groups in the routing table.
- **hw-failure**—Display the routes that failed to be added to the hardware forwarding table due to hash collisions or a table full condition.
- **track-table**—Display the tracked static routes for the selected VRF or the global routing instance.
- **net-prototype**—Display the tracked static routes for the selected VRF or the global routing instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

If the subnet mask is specified, then only routes with an exact match are displayed. For example:

```
show ip route 192.168.2.0 /24
```

If only an IP address is specified, the best route for the IP address is displayed. For example:

```
show ip route 192.168.2.0
```

If the **longer-prefixes** option is specified, then the subnets within an aggregate are displayed. For example:

```
show ip route 192.168.2.0 /23 longer-prefixes
```

The numbers in the brackets indicate the route preference (administrative distance) and metric respectively. The metric is specific to the originating protocol. Connected routes have a preference of 0 and static routes have a preference of 1.

Command History

Command updated in version 6.6 firmware.

Example

The following example displays the IPv4 address of the default gateway and the default route associated with the gateway.

```
console#show ip route
Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
       B - BGP Derived, E - Externally Derived, IA - OSPF Inter Area
       E1 - OSPF External Type 1, E2 - OSPF External Type 2
       N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
       S U - Unnumbered Peer, L - Leaked Route, T - Truncated ECMP Route
* Indicates the best (lowest metric) route for the subnet.

C        3.0.0.0/24 [0/0] directly connected, Vl10
S U    6.1.0.6/32 [0/0] via Vl20
S U    6.2.0.6/32 [0/0] via Vl20
```

The following example shows an ECMP route with only one path.

```
console#show ip route summary

Connected Routes.............................. 4
Static Routes................................. 0
Kernel Routes................................. 0
Unnumbered Peer Routes........................ 0
RIP Routes.................................... 0
BGP Routes.................................... 0
  External.................................... 0
  Internal.................................... 0
  Local....................................... 0
OSPF Routes................................... 320
  Intra Area Routes........................... 0
  Inter Area Routes........................... 320
  External Type-1 Routes...................... 0
  External Type-2 Routes...................... 0
```

```
Reject Routes.................................. 0
Total routes................................... 324

Best Routes (High)............................. 324 (644)
Alternate Routes............................... 0
Leaked Routes.................................. 0
RFC5549 Routes - IPv4 with IPv6 nexthop........ 0
Route Adds..................................... 1629
Route Modifies................................. 1144
Route Deletes.................................. 1305
Unresolved Route Adds.......................... 0
Invalid Route Adds............................. 0
Failed Route Adds.............................. 0
Failed Kernel Route Adds....................... 0
Hardware Failed Route Adds..................... 0
Reserved Locals................................ 0

Unique Next Hops (High)........................ 68 (132)
Next Hop Groups (High)......................... 299 (599)
ECMP Groups (High)............................. 290 (585)
ECMP Routes.................................... 256
Truncated ECMP Routes.......................... 34
ECMP Retries................................... 26400
Routes with 1 Next Hop......................... 34
Routes with 2 Next Hops........................ 285
Routes with 3 Next Hops........................ 5

console#show ip route static
Route Codes: R - RIP Derived, O - OSPF Derived, C - Connected, S - Static
B - BGP Derived, E - Externally Derived, IA - OSPF Inter Area
E1 - OSPF External Type 1, E2 - OSPF External Type 2
N1 - OSPF NSSA External Type 1, N2 - OSPF NSSA External Type 2
S U - Unnumbered Peer, L - Leaked Route
No default gateway is configured.
S 10.0.0.0/8 [1/0] via Vl10
S U 6.1.0.6/32 [0/0] via Vl20
S U 6.2.0.6/32 [0/0] via Vl20
```

The following example shows a tracked route.

```
console#show ip route track-table

ipv6 route 0.0.0.0 0.0.0.0 10.130.167.129 track 10 state is [up]
```

show ip route preferences

Use the **show ip route preferences** command to display the default route preference value for each origin.

Syntax

show ip route preferences

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Route preferences are used in determining the best route. Lower router preference values are preferred over higher router preference values. This command displays the route preferences for each possible route origin.

Example

The following example displays IP route preferences.

```
console#show ip route preferences
Local......................................... 0
Static........................................ 1
OSPF Intra-area routes........................ 110
OSPF Inter-area routes........................ 110
OSPF External routes.......................... 110
RIP........................................... 120
BGP External.................................. 20
BGP Internal.................................. 200
BGP Local..................................... 200
Configured Default Gateway.................... 253
DHCP Default Gateway.......................... 254
```

show ip route summary

Use the **show ip route summary** command to display the routing table summary, including best and non-best routes.

Syntax

show ip route summary [**best**]

- **best**—Shows the number of best routes. To include the count of all routes, do not use this optional parameter.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the IP route summary.

```
console#show ip route summary

Connected Routes............................... 4
Static Routes.................................. 0
Kernel Routes.................................. 0
Unnumbered Peer Routes......................... 0
RIP Routes..................................... 0
BGP Routes..................................... 0
  External..................................... 0
  Internal..................................... 0
  Local........................................ 0
OSPF Routes.................................... 320
  Intra Area Routes............................ 0
  Inter Area Routes............................ 320
  External Type-1 Routes....................... 0
  External Type-2 Routes....................... 0
Reject Routes.................................. 0
Total routes................................... 324

Best Routes (High)............................. 324 (644)
Alternate Routes............................... 0
Leaked Routes.................................. 0
RFC5549 Routes - IPv4 with IPv6 nexthop........ 0
Route Adds..................................... 1629
Route Modifies................................. 1144
Route Deletes.................................. 1305
Unresolved Route Adds.......................... 0
Invalid Route Adds............................. 0
Failed Route Adds.............................. 0
Failed Kernel Route Adds....................... 0
Hardware Failed Route Adds..................... 0
Reserved Locals................................ 0
```

```
Unique Next Hops (High)....................... 68 (132)
Next Hop Groups (High)........................ 299 (599)
ECMP Groups (High)............................ 290 (585)
ECMP Routes................................... 256
Truncated ECMP Routes......................... 34
ECMP Retries.................................. 26400
Routes with 1 Next Hop........................ 34
Routes with 2 Next Hops....................... 285
Routes with 3 Next Hops....................... 5
```

show ip traffic

Use the **show ip traffic** command to display IP statistical information of the software IP stack. Refer to RFC 1213 for more information about the fields that are displayed.

Syntax

show ip traffic [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays statistics for the software IP stack, not the hardware routing information.

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example displays IP route preferences.

```
console>show ip traffic
IpInReceives................................. 24002
IpInHdrErrors................................ 1
IpInAddrErrors............................... 925
IpForwDatagrams.............................. 0
IpInUnknownProtos............................ 0
IpInDiscards................................. 0
IpInDelivers................................. 18467
IpOutRequests................................ 295
IpOutDiscards................................ 0
IpOutNoRoutes................................ 0
IpReasmTimeout............................... 0
IpReasmReqds................................. 0
IpReasmOKs................................... 0
IpReasmFails................................. 0
IpFragOKs.................................... 0
IpFragFails.................................. 0
IpFragCreates................................ 0
IpRoutingDiscards............................ 0
IcmpInMsgs................................... 3
IcmpInErrors................................. 0
IcmpInDestUnreachs........................... 0
IcmpInTimeExcds.............................. 0
IcmpInParmProbs.............................. 0
IcmpInSrcQuenchs............................. 0
IcmpInRedirects.............................. 0
IcmpInEchos.................................. 3
IcmpInEchoReps............................... 0
IcmpInTimestamps............................. 0
IcmpInTimestampReps.......................... 0
IcmpInAddrMasks.............................. 0
IcmpInAddrMaskReps........................... 0
IcmpOutMsgs.................................. 3
IcmpOutErrors................................ 0
IcmpOutDestUnreachs.......................... 0
IcmpOutTimeExcds............................. 0
IcmpOutParmProbs............................. 0
IcmpOutSrcQuenchs............................ 0
IcmpOutRedirects............................. 0
IcmpOutEchos................................. 3
IcmpOutEchoReps.............................. 3
IcmpOutTimestamps............................ 0
IcmpOutTimestampReps......................... 0
IcmpOutAddrMasks............................. 0
```

show ip vlan

Use the **show ip vlan** command to display the VLAN routing information for all VLANs with routing enabled.

Syntax

show ip vlan

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays VLAN routing information.

```
console#show ip vlan
MAC Address used by Routing VLANs: 00:00:00:01:00:02
VLAN ID IP Address      Subnet Mask
------- --------------- ---------------
10      0.0.0.0         0.0.0.0
20      0.0.0.0         0.0.0.0
```

show route-map

Use this command to display the route maps.

Syntax

show route-map *map-name*

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

For each route map, the match count is shown in terms of number of packets and number of bytes. This counter displays the match count in packets and bytes when a route map is applied. When a route map is created/removed from interface, this count is shown as zero. The following is an example of the behavior of counters as well as how they are displayed when a route-map is applied and removed from interface:

```
console# show route-map test
route-map test, permit, sequence 10
     Match clauses:
       ip address prefix-lists: orange
     Set clauses:
       set metric 50

console #show ip policy

Interface            Route-Map
------------  -----------------------------------------

console #show route-map simplest

route-map simplest permit 10
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip next-hop 3.3.3.3
      ip precedence 3
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 20
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip default next-hop 4.4.4.4
      ip precedence 4
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
    Match clauses:
    Set clauses:
      interface null0
Policy routing matches: 0 packets, 0 bytes
```

```
console #configure
console (Config)#interface Te1/0/2
console (config-if-Te1/0/2)#ip policy simplest
console (config-if-Te1/0/2)#show route-map simplest

route-map simplest permit 10
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip next-hop 3.3.3.3
      ip precedence 3
Policy routing matches: 5387983 packets, 344831232 bytes
route-map simplest permit 20
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip default next-hop 4.4.4.4
      ip precedence 4
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
    Match clauses:
    Set clauses:
      interface null0
Policy routing matches: 0 packets, 0 bytes

console (config-if-Te1/0/2)# no ip policy simplest
console (config-if-Te1/0/2)# exit
console (config)# exit
console # show route-map simplest

route-map simplest permit 10
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip next-hop 3.3.3.3
      ip precedence 3
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 20
    Match clauses:
      ip address (access-lists) : 1
    Set clauses:
      ip default next-hop 4.4.4.4
      ip precedence 4
Policy routing matches: 0 packets, 0 bytes
route-map simplest permit 30
    Match clauses:
    Set clauses:
      interface null0
Policy routing matches: 0 packets, 0 bytes
console #show ip policy

Interface            Route-Map
------------  -----------------------------------------
console #
console(route-map)#show route-map

route-map “d3” permit 10
     Match clauses:
```

```
        ip address prefix-list a1
        as-path 1
        community s1 exact-match
      Set clauses:
        metric 23
        local-preference 34
        as-path prepend 2 3 4 5 6
        comm-list d1 delete
        community no-export
        ipv6 next-hop aa::bb
Policy routed: 0 packets, 0 bytes
```

The following example shows a route map test1 that is configured with extended community attributes:

```
console# show route-map test
route-map test1, permit, sequence 10
      Match clauses:
        extended community list1
      Set clauses:
        extended community RT:1:100 RT:2:200
```

show routing heap summary

Use the **show routing heap summary** command to display a summary of the memory allocation from the routing heap. The routing heap is a section of memory set aside when the system boots for use by the routing applications.

Syntax

show routing heap summary

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The command displays the following information.

Parameter	Description
Heap Size	The amount of memory, in bytes, allocated at startup for the routing heap.
Memory In Use	The number of bytes currently allocated.
Memory on Free List	The number of bytes currently on the free list. When a chunk of memory from the routing heap is freed, it is placed on a free list for future reuse.
Memory Available in Heap	The number of bytes in the original heap that have never been allocated.
In Use High Water Mark	The maximum memory in use since the system last rebooted.

Examples

The following shows example CLI display output for the command.

```
console# show routing heap summary

Heap Size.......................  92594000 bytes
Memory In Use...................    149598 bytes (0%)
Memory on Free List.............     78721 bytes (0%)
Memory Available in Heap........ 92365249 bytes (99%)
In Use High Water Mark..........    210788 bytes (0%)
```

IPv6 Routing Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON/N2200-ON series supports limited routing and multicast capabilities. See the Users Configuration Guide section "Feature Limitations and Platform Constants" for supported capabilities.

The IPv6 version of the routing table manager provides a repository for IPv6 routes learned by dynamic routing protocols or static configuration. RTO6 manages dynamic and static IPv6 routes, redistributes routes to registered protocols, supports ECMP routes, and supports multiple routes to the same destination, sorted by preference. IPv6 routing only operates over VLAN interfaces.

IPv6 Limitations & Restrictions

The following limitations apply:

- IPSec support is not available.
- The DHCPv6 server does not support stateful address configuration.
- Automated router renumbering is not supported.

clear ipv6 neighbors

Use the **clear ipv6 neighbors** command to clear all entries in the IPv6 neighbor table or an entry on a specific interface.

Syntax

clear ipv6 neighbors [**vrf** *vrf-name* | **vlan** *vlan-id*]

- *vrf-name* — The name of an existing VRF instance.
- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example clears all entries in the IPv6 neighbor table.

```
console(config)#clear ipv6 neighbors
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf

Use this command to disable and reenable OSPF.

Syntax

clear ipv6 ospf [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf configuration

Use this command to reset the OSPF configuration to factory defaults.

Syntax

clear ipv6 ospf configuration [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf counters

Use this command to reset global and interface statistics.

Syntax

clear ipv6 ospf counters [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf neighbor

Use this command to drop the adjacency with all OSPF neighbors. On each neighbor's interface, send a one-way hello. Adjacencies may then be re-established.

Syntax

clear ipv6 ospf neighbor [**vrf** *vrf-name*] [*nbr-router-id* **|** interface vlan *vlan-id* [nbr-router-id]]

- *vrf-name* — The name of an existing VRF instance.
- *nbr-router-id* — Drop adjacency with a specific router ID on a specific interface.
- interface vlan *vlan-id* — Drop adjacency with all neighbors on a specific interface.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf redistribution

Use this command to flush all self-originated external LSAs. Re-apply the redistribution configuration and re-originate prefixes as necessary.

Syntax

clear ipv6 ospf redistribution [**vrf** *vrf-name*]

- *vrf-name* —The name of an existing VRF instance.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 ospf stub-router

Use the **clear ipv6 ospf stub-router** command to force OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation.

Syntax

clear ipv6 ospf stub-router [**vrf** *vrf-name*]

- *vrf-name* —The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or if it is in stub router mode at startup. This command has no effect if OSPF is configured to be in stub router mode permanently.

The VRF identified in the parameter must have been previously created or an error is returned.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ipv6 statistics

Use the **clear ipv6 statistics** command to clear IPv6 statistics for all interfaces or for a specific interface, including loopback and tunnel interfaces. IPv6 statistics display in the output of the **show ipv6 traffic** command.

Syntax

clear ipv6 statistics [**vlan** *vlan-id* | **tunnel** *tunnel-id* | **loopback** *loopback-id*]

- *vlan-id* — Valid VLAN ID.
- *tunnel-id* — Tunnel identifier. (Range: 0-7)
- *loopback-id* — Loopback identifier. (Range: 0-7)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode.

User Guidelines

This command has no user guidelines.

Example

The following example clears IPv6 statistics for VLAN 11.

```
console(config)#clear ipv6 statistics vlan 11
```

ipv6 address

Use the **ipv6 address** command in Interface Configuration mode to configure an IPv6 address on an interface (including VLAN, tunnel and loopback interfaces) and to enable IPv6 processing on this interface. Multiple globally reachable addresses can be assigned to an interface by using this command. There is no need to assign a link-local address by using this command since one is automatically created. IPv6 addresses can be expressed in eight blocks. Also of note is that instead of a period, a colon separates each block. For simplification, leading zeros of each 16-bit block can be omitted. One sequence of 16-bit blocks containing only zeros can be replaced with a double colon "::", but not more than one at a time (otherwise it is no longer a unique representation).

Dropping zeros: 3ffe:ffff:100:f101:0:0:0:1 becomes 3ffe:ffff:100:f101::1

Local host: 0000:0000:0000:0000:0000:0000:0000:0001 becomes ::1

Any host: 0000:0000:0000:0000:0000:0000:0000:0000 becomes ::

The hexadecimal letters in the IPv6 addresses are not case-sensitive. An example of an IPv6 prefix and prefix length is 3ffe:1::1234/64.

Syntax

ipv6 address *prefix/prefix-length* [**link-local**] [**eui64**]

no ipv6 address [*prefix/prefix-length*] [**link-local**] [**eui64**]

- *prefix* — Consists of the bits of the address to be configured.
- *prefix-length* — Designates how many of the high-order contiguous bits of the address make up the prefix.
- **link-local** — Manually configure a link-local address on an interface.
- **eui64** — The optional eui-64 field designates that IPv6 processing on the interfaces is enabled using an EUI-64 interface ID in the low order 64 bits of the address. If this option is used, the value of *prefix_length* must be 64 bits. On Dell EMC Networking switches, all Layer 3 interfaces share the same MAC address.

Default Configuration

By default, a link-local address is assigned by SLAAC or DHCPv6. No static link-local address is configured.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

Configuring a static link local address replaces any previously configured address, including the automatically generated address.

Command History

Command updated in version 6.6 firmware.

Example

The following example configures an IPv6 address and enables IPv6 processing.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 address 2020:1::1/64
```

ipv6 enable

Use the **ipv6 enable** command in to globally enable IPv6 routing. Use the **no** form of the command to disable IPv6 routing.

Syntax

ipv6 enable

no ipv6 enable

Default Configuration

IPv6 routing is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enables IPv6 routing, which has not been configured with an explicit IPv6 address.

```
console(config)#vlan 15
console(config-vlan)#interface vlan 15
console(config-if-vlan15)#ipv6 enable
```

ipv6 hop-limit

Use the **ipv6 hop-limit** command to configure the hop limit used in IPv6 PDUs originated by the router. Use the **no** form of the command to return the hop limit to the default setting.

Syntax

ipv6 hop-limit *count*

no ipv6 hop-limit

- *count*—The number of hops before the PDU expires (Range 1-255).

Default Configuration

The default count is "not configured."

Command Mode

Global Configuration, Virtual Router Configuration

User Guidelines

The default "not configured" sends a value of 0 in router advertisements and a value of 64 in packets originated by the router. This is not the same as configuring a hop limit of 64.

Command History

Syntax updated to include Virtual Router Configuration mode in version 6.7.0 firmware.

ipv6 host

The **ipv6 host** command is used to define static host name-to- ipv6 address mapping in the host cache.

Syntax

ipv6 host *name ipv6-address*

no ipv6 host *name*

- *name* — Host name.
- *ipv6-address* — IPv6 address of the host.

Default Configuration

No IPv6 hosts are defined.

Command Mode

Global Configuration mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config)#ipv6 host Dell 2001::DB8:0
```

ipv6 icmp error-interval

Use the **icmp error-interval** command to limit the rate at which ICMP error messages are sent. The rate limit is configured as a token bucket with two configurable parameters: Burst-size and burst interval. Use the **no** form of this command to return burst-interval and burst-size to their default values. To disable ICMP rate limiting, set burst-interval to zero.

Syntax

ipv6 icmp error-interval *burst-interval* [*burst-size*]

no ipv6 icmp error-interval

- *burst-interval* — How often the token bucket is initialized (Range: 0–2147483647 milliseconds).
- *burst-size* — The maximum number of messages that can be sent during a burst interval (Range: 1–200).

Default Configuration

Rate limiting is enabled by default.

The default burst-interval is 1000 milliseconds.

The default burst-size is 100 messages.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 icmp error-interval 2000 20
```

ipv6 mld last-member-query-count

The **ipv6 mld last-member-query-count** command sets the number of listener-specific queries sent before the router assumes that there are no local members on the interface. Use the “no” form of this command to set the last member query count to the default.

Syntax

ipv6 mld last-member-query-count *last-member-query-count*

no ipv6 mld last-member-query-count

- *last-member-query-count* — Query count (Range: 1–20).

Default Configuration

The default last member query count is 2.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld last-member-query-count 5
```

ipv6 mld last-member-query-interval

The **ipv6 mld last-member-query-interval** command sets the last member query interval for the MLD interface, which is the value of the maximum response time parameter in the group-specific queries sent out of this interface. Use the “no” form of this command to set the last member query interval to the default.

Syntax

ipv6 mld last-member-query-interval *last-member-query-interval*

no ipv6 mld last-member-query-interval

- *last-member-query-interval* — The last member query interval (Range: 0–65535 milliseconds).

Default Configuration

The default last member query interval is 1 second.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld last-member-query-interval 5000
```

ipv6 mld host-proxy

This command enables MLD and MLD Proxy on the specified interface.

PIM and DVMRP are not compatible with MLD proxy. Disable PIM/DVMRP before enabling MLD proxy.

Multicast routing must be enabled for the MLD proxy service to become operationally enabled

Also, ensure that there are no other multicast routing protocols enabled on the router and that IP multicast routing is globally enabled. Use the “no” form of this command to disable MLD Proxy globally.

Syntax

ipv6 mld host-proxy [**interface** *vlan-id*]

no ipv6 mld host-proxy [**interface** *vlan-id*]

Default Configuration

MLD Proxy is disabled by default.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld host-proxy
```

ipv6 mld host-proxy reset-status

Use the **ipv6 mld host-proxy reset-status** command to reset the host interface status parameters of the MLD Proxy router. This command is only valid when MLD Proxy is enabled on the interface.

Syntax

ipv6 mld host-proxy reset-status

Command Mode

Interface Configuration (VLAN) mode.

Default Configuration

There is no default configuration for this command.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld host-proxy reset-status
```

ipv6 mld host-proxy unsolicit-rprt-interval

Use the **ipv6 mld host-proxy unsolicit-rprt-interval** command to set the unsolicited report interval for the MLD Proxy router. This command is only valid when MLD Proxy is enabled on the interface. Use the “no” form of this command to reset the MLD Proxy router's unsolicited report interval to the default value.

Syntax

ipv6 mld host-proxy unsolicited-report-interval *interval*

no ipv6 mld host-proxy unsolicited-report-interval

- *interval*—The interval between unsolicited reports (Range: 1–260 seconds).

Default Configuration

The unsolicited report interval is 1 second by default.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines

Example

```
console(config-if-vlan3)#ipv6 mld host-proxy unsolicit-rprt-interval 10
```

ipv6 mld query-interval

The **ipv6 mld query-interval** command sets the MLD router's query interval for the interface. The query-interval is the amount of time between the general queries sent when the router is querying on that interface. Use the "no" form of this command to set the query interval to the default.

Syntax

ipv6 mld query-interval *query-interval*

no ipv6 mld query-interval

- *query-interval* — Query interval (Range: 1–3600).

Default Configuration

The default query interval is 125 seconds.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld query-interval 130
```

ipv6 mld query-max-response-time

The **ipv6 mld query-max-response-time** command sets MLD query maximum response time for the interface. This value is used in assigning the maximum response time in the query messages that are sent on that interface. Use the "no" form of this command to set the maximum query response time to the default.

Syntax

ipv6 mld query-max-response-time *query-max-response-time*

no ipv6 mld query-max-response-time

- *query-max-response-time* — Maximum query response time (Range: 1–65535 milliseconds).

Default Configuration

The default query maximum response time is 10 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 mld query-max-response-time 4500
```

ipv6 nd dad attempts

Use the **ipv6 nd dad attempts** command in Interface Configuration mode to set the number of duplicate address detection probes transmitted while doing neighbor discovery. Duplicate address detection verifies that an IPv6 address on an interface is unique.

Syntax

ipv6 nd dad attempts *value*

no ipv6 nd dad attempts

- *value*—Probes transmitted. (Range: 0-600)

Default Configuration

The default value for attempts is 1.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets at 10 the number of duplicate address detection probes transmitted while doing neighbor discovery.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd dad attempts 10
```

ipv6 nd ra hop-limit unspecified

Use the **ipv6 nd ra hop-limit unspecified** command to configure the hop limit sent in router alert messages. Use the **no** form of the command to send the default hop limit of 64.

Syntax

ipv6 nd ra hop-limit unspecified

no ipv6 nd ra hop-limit unspecified

Default Configuration

The default TTL is 64.

Command Mode

Interface (VLAN) Configuration

User Guidelines

The TTL sent in router advertisements and neighbor discovery packets may be configured using the Global Configuration command **ipv6 hop-limit**.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd ra hop-limit unspecified
```

ipv6 nd managed-config-flag

Use the **ipv6 nd managed-config-flag** command in Interface Configuration mode to set the “managed address configuration” flag in router advertisements. When the value is true,

end nodes use DHCPv6. When the value is false, end nodes automatically configure addresses.

Syntax

ipv6 nd managed-config-flag

no ipv6 nd managed-config-flag

Default Configuration

False is the default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

In the following example, the end node uses DHCPv6.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd managed-config-flag
```

ipv6 nd ns-interval

Use the **ipv6 nd ns-interval** command in Interface Configuration mode to set the interval between router advertisements for advertised neighbor solicitations. An advertised value of 0 means the interval is unspecified.

Syntax

ipv6 nd ns-interval *milliseconds*

no ipv6 nd ns-interval

- *milliseconds* — Interval duration. (Range: 0, 1000–4294967295)

Default Configuration

0 is the default value for *milliseconds*.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the interval between router advertisements for advertised neighbor solicitations at 5000 ms.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd ns-interval 5000
```

ipv6 nud max-multicast-solicits

Configures the maximum number of multicast neighbor solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection). Use the **no** form of the command to reset the value to the default.

Syntax

ipv6 nud max-multicast-solicits *num-solicits*

no ipv6 nud max-multicast-solicits

- *num-solicits*—The maximum number of multicast Neighbor Solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection). The value ranges from 3 to 255. The default value is 3.

Default Configuration

The default number of multicast solicits is 3.

Command Mode

Global Configuration, Virtual Router Configuration

User Guidelines

Increase this value when neighbors are not being discovered or large numbers of neighbors are present.

Command History

Introduced in version 6.2.0.1 firmware. Syntax updated to include Virtual Router Configuration mode in version 6.7.0 firmware.

Example

```
console (config)#ipv6 nud max-multicast-solicits 5
```

ipv6 nud max-unicast-solicits

Configures the maximum number of unicast neighbor solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection). Use the **no** form of the command to reset the value to the default.

Syntax

ipv6 nud max-unicast-solicits *num-solicits*

no ipv6 nud max-unicast-solicits

num-solicits—The maximum number of unicast Neighbor Solicitations sent during neighbor resolution or during NUD (neighbor unreachability detection). The value ranges from 3 to 10. The default value is 3.

Default Configuration

The default number of solicits is 3.

Command Mode

Global Configuration, Virtual Router Configuration

User Guidelines

Increase this value when neighbors are not being discovered or large numbers of neighbors are present.

Example

```
console (config)#ipv6 nud max-unicast-solicits 5
```

Command History

Introduced in version 6.2.0.1 firmware. Syntax updated to include Virtual Router Configuration mode in version 6.7.0 firmware.

ipv6 nd nud retry

This command configures the exponential backoff multiple to be used in the calculation of the next timeout value for Neighbor Solicitation transmission during NUD (neighbor unreachability detection) following the exponential backoff algorithm. Use the **no** form of the command to return the backoff multiple to the default.

Syntax

ipv6 nd nud retry *retry*

no ipv6 nd nud retry

- *retry*—The value ranges from 1 to 5. The next timeout value is clamped at a maximum value of 60 seconds if the result of the exponential back-off calculation is greater than 60 seconds.

Default Configuration

The default exponent is 1.

Command Mode

Global Configuration

User Guidelines

Once the neighbor is resolved and added in the hardware, traffic is continuously forwarded by the router using neighbor entry. The neighbor entry in the cache transitions to the STALE state after the effective STALE timeout value (a random value between 15 and 45 seconds per RFC 2461).

To bridge the gap between the neighbor discovery state and the neighbor cache state, the application periodically iterates through the STALE entries and triggers NUD on those entries to detect any address/station movements or MAC address changes.

When NUD is triggered, neighbor solicitation PROBE packets (unicast and multicast) are sent periodically, separated by exponential binary values instead of the normal 1 second interval. This ensures that when the network (not just our router but more routers in the network) is congested, the NUD process for the existing STALE entries takes enough time before ultimately removing the cache entry through garbage collection. Without the exponential backoff timing for retransmissions, there is a higher probability that the cache entry is removed resulting in the disruption of the existing traffic.

Another significant benefit of delayed neighbor solicitation retransmission is higher robustness against transient failures, such as spanning tree re-convergence and other layer 2 issues that can take many seconds to resolve.

The exponential back-off calculation is

next retransmission timer = (BACKOFF_MULTIPLE ^ solicit_attempt_num) *$RETRANS_TIMER + jittered value.

The exponential backoff algorithm complies with draft-ietf-6man-impatient-nud-02.

Increase this value when large numbers of neighbors are present or when neighbors are not being discovered due to network events like spanning-tree re-convergence.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console (config)#ipv6 nd nud retry 5
```

ipv6 nd other-config-flag

Use the **ipv6 nd other-config-flag** command in Interface Configuration mode to set the “other stateful configuration” flag in router advertisements sent from the interface.

Syntax

ipv6 nd other-config-flag

no ipv6 nd other-config-flag

Default Configuration

False is the default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets to true the “other stateful configuration” flag in router advertisements

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd other-config-flag
```

ipv6 nd prefix

Use the **ipv6 nd prefix** command to configure parameters associated with prefixes that the router advertises in its router advertisements.

Syntax

ipv6 nd prefix *ipv6-prefix/prefix-length* [{**valid-lifetime | infinite**} {**preferred-lifetime | infinite**}] [**no-autoconfig**] [**off-link**]

no ipv6 nd prefix *ipv6-prefix/prefix-length*

- *ipv6-prefix*—IPv6 prefix.
- *prefix-length*—IPv6 prefix length.
- **valid-lifetime**—Valid lifetime of the router in seconds. (Range: 0–4294967295 seconds.)
- **infinite**—Indicates lifetime value is infinite.
- **preferred-lifetime**—Preferred-lifetime of the router in seconds. (Range: 0–4294967295 seconds.)
- **no-autoconfig**—Do not use Prefix for autoconfiguration.

- **off-link**—Do not use Prefix for onlink determination.

Default Configuration

604800 seconds is the default value for valid-lifetime, 2592000 seconds for preferred lifetime.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

The router advertises its global IPv6 prefixes in its router advertisements (RAs). An RA only includes the prefixes of the IPv6 addresses configured on the interface where the RA is transmitted. Addresses are configured using the ipv6 address interface configuration command. Each prefix advertisement includes information about the prefix, such as its lifetime values and whether hosts should use the prefix for on-link determination or address auto-configuration. Use the **ipv6 nd prefix** command to configure these values.

The ipv6 nd prefix command will allow you to preconfigure RA prefix values before you configure the associated interface address. In order for the prefix to be included in RAs, you must configure an address that matches the prefix using the **ipv6 address** command. Prefixes specified using ipv6 nd prefix without an associated interface address will not be included in RAs and will not be committed to the device configuration.

Example

The following example sets the IPv6 prefixes to include in the router advertisement.

```
console(config)#interface vlan 11
console(config-if-vlan11)#ipv6 nd prefix 2020:1::1/64
```

ipv6 nd raguard attach-policy

Use this command to enable RA Guard policy on an interface. Use the **no** form of the command to disable RA-Guard.

Syntax

ipv6 nd raguard attach-policy

no ipv6 nd raguard attach-policy

Default Configuration

By default, no RA guard policies are applied to any interface.

Command Mode

Interface Configuration (Ethernet, port-channel)

User Guidelines

RA Guard drops all incoming IPv6 router advertisement and router redirect messages.

RA Guard may be configured on L2 or L3 interfaces.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures an unnamed RA Guard policy to drop all RA advertisements and router redirect messages on IPv6 routing enabled interface Gi1/0/1 (VLAN 10).

```
console(config)#vlan 10
console(config-vlan10)#exit
console(config)#interface vlan 10
console(config-if-vlan10)#ipv6 enable
console(config-if-vlan10)#exit
console(config)#ipv6 unicast-routing
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 10
console(config-if-Gi1/0/1)#exit
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#ipv6 nd raguard attach-policy
```

ipv6 nd ra-interval

Use the **ipv6 nd ra-interval** command in Interface Configuration mode to set the transmission interval between router advertisements.

Syntax

ipv6 nd ra-interval *maximum minimum*

no ipv6 nd ra-interval

- *maximum* — The maximum interval duration (Range: 4–1800 seconds).
- *minimum* — The minimum interval duration (Range: 3 – (0.75 * maximum) seconds).

Default Configuration

600 is the default value for *seconds*.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

The minimum interval cannot be larger than 75% of the maximum interval.

Example

The following example sets the transmission interval between router advertisements at 1000 seconds.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd ra-interval 1000
```

ipv6 nd ra-lifetime

Use the **ipv6 nd ra-lifetime** command in Interface Configuration mode to set the value that is placed in the Router Lifetime field of the router advertisements sent from the interface.

Syntax

ipv6 nd ra-lifetime *seconds*

no ipv6 nd ra-lifetime

- *seconds* — Lifetime duration. The value must be zero, or it must be an integer between the value of the router advertisement transmission interval and 9000 seconds. A value of zero means this router is not to be used as the default router. (Range: 0-9000)

Default Configuration

1800 is the default value for *seconds*.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets at 1000 seconds the value that is placed in the Router Lifetime field of the router advertisements.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd ra-lifetime 1000
```

ipv6 nd reachable-time

Use the **ipv6 nd reachable-time** command in Interface Configuration mode to set the router advertisement time to consider a neighbor reachable after neighbor discovery confirmation.

Syntax

ipv6 nd reachable-time *milliseconds*

no ipv6 nd reachable-time

- *milliseconds* — Reachable-time duration. A value of zero means the time is unspecified by the router. (Range: 0-3600000 milliseconds)

Default Configuration

The default value for neighbor discovery reachable times is 0 milliseconds.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the router advertisement time at 5000 milliseconds to consider a neighbor reachable after neighbor discovery confirmation.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd reachable-time 5000
```

ipv6 nd suppress-ra

Use the **ipv6 nd suppress-ra** command in Interface Configuration mode to suppress router advertisement transmission on an interface.

Syntax

ipv6 nd suppress-ra

no ipv6 nd suppress-ra

Default Configuration

Disabled is the default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example suppresses router advertisement transmission.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 nd suppress-ra
```

ipv6 neighbor

Use this command to configure a static IPv6 neighbor with the given IPv6 address and MAC address on a routing interface. The optional argument `vrf` is passed to create the neighbor in the VRF instance.

The **no** version of the command removes a static IPv6 neighbor with the given IPv6 address and MAC address on a routing interface.

Syntax

ipv6 neighbor [**vrf** *vrf-name*] *ipv6address* {**vlan** *1-4093*} *macaddr*

no ipv6 neighbor [**vrf** *vrf-name*] *ipv6address* {**vlan** *1-4093*} *macaddr*

- *vrf-name* — The name of an existing VRF instance.
- *ipv6address* — The IPv6 address of the neighbor.
- *vlan* — The VLAN for the interface. The range is 1 to 4093.
- *macaddr* — The MAC address for the neighbor.

Default Configuration

This command has no default configuration.

Command Mode

Global Config

User Guidelines

This command has no user guidelines.

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

ipv6 redirect

Use the **ipv6 redirect** command to enable sending IPv6 ICMP redirect messages to peers/hosts when a better first-hop node exists on the path to a destination. Use the **no** form of the command to disable IPv6 ICMP redirects.

Syntax

ipv6 redirect

no ipv6 redirect

Default Configuration

IPv6 ICMP redirects are enabled by default.

Command Mode

Interface VLAN Configuration mode

User Guidelines

In general, an IPv6 ICMP redirect is sent if:

- The packet is not addressed to the router.
- The packet will be forwarded over the interface on which it was received.
- The router determines that a better first-hop resides on the same VLAN as the source of the packet.
- The source address of the received packet is a link-local or global IPv6 address of a neighbor on the VLAN.
- Using the **no** form of the command to disable IPv6 ICMP redirects.

Command History

Command introduced in version 6.5 firmware.

Example

This example disables sending of IPv6 ICMP redirects on VLAN 6.

```
console(config-if-vlan6)# no ipv6 redirects
```

ipv6 route

Use the **ipv6 route** command to configure an IPv6 static route. Use the **no** form of the command to remove a preference, an individual next hop, or all next hops for a route. Using the **no ipv6 route distance** form causes the system to use the system default administrative distance.

Syntax

ipv6 route [**vrf** *vrf-name*] {*ipv6-prefix*/*prefix-length* {*next-hop-address* | **Null0** | **vlan** *vlan-id* | **tunnel** *tunnel-id*} [next-hop-address]} [*preference*] [**track** <*object-number*>]

no ipv6 route [**vrf** *vrf-name*] *ipv6-prefix/prefix-length* {*next-hop-address* **| Null0 | vlan** *vlan-id* **| tunnel** *tunnel-id*} [**track** <*object-number*>]

no ipv6 route [**vrf** *vrf-name*] *ipv6-prefix/prefix-length ipv6-address preference*

no ipv6 route [**vrf** *vrf-name*] *ipv6-prefix/prefix-length interface-type ipv6-address*

no ipv6 route [**vrf** *vrf-name*] *ipv6-prefix/prefix-length interface*

- *vrf-name* — The name of an existing VRF instance.
- *ipv6-prefix*—An IPv6 prefix representing the subnet that can be reached via the next-hop neighbor.
- *prefix-length*—The length of the IPv6 prefix — a decimal value (usually 0-64) that shows how many of the high-order contiguous bits of the address comprise the prefix (the network portion of the address). A slash mark must separate the prefix from the prefix-length with no spaces on either side of the slash mark.
- *interface-type*—Distinguishes direct static routes from point-to-point and broadcast interfaces, and must be specified when using a link-local address as the next hop. Interface-type can be Null 0 or vlan plus vlan-id or tunnel plus tunnel-id.
- *ipv6-address*—The IPv6 address of the next hop neighbor.
- *preference*—The administrative distance the router uses to compare this route with routes from other route sources that have the same destination. (Range: 1-255)
- **track** <*object-number*>—The optional IP SLA tracking object identifier (Range 1–128).

Default Configuration

There is no default vlan-id or tunnel-id.

The default routing preference for static routes is 1.

The default VRF is the global routing instance.

There is no default IPv6 SLA tracking object.

Command Mode

Global Configuration mode

User Guidelines

Enter a **track** *track-number* in the **ipv6 route** command to specify that the static route is installed in the routing table only if the configured SLA tracking object is up. When the track object is down, the route is removed from the Route Table. Only one tracking object can be associated with a static route at a time. Configuring a different tracking object replaces the previously configured tracking object.

To display the tracked IPv6 static routes, use the **show ipv6 route track-table** command.

The route created with nexthop belonging to a subnet in another VRF is referred to as a leaked route. The user can create a static leaked route between a default VRF and a non-default VRF, and between non-default VRFs.

Command History

Command updated in version 6.6 firmware. Syntax to support VRFs added in version 6.7.0 firmware.

Example

The following example configure an IPv6 static route.

```
console(config)#ipv6 route 2020:1::1/64 2030:1::2
```

ipv6 route distance

Use the **ipv6 route distance** command in Global Configuration mode to set the default distance (preference) for static routes. Lower route preference values are preferred when determining the best route. The **ipv6 route** and **ipv6 route default** commands allow optional setting of the distance of an individual static route. The default distance is used when no distance is specified in these commands. Changing the default distance does not update the distance of existing static routes, even if they were assigned the original default distance. The new default distance is applied to static routes created after invoking the **ipv6 route distance** command.

Syntax

ipv6 route distance [**vrf** *vrf-name*] *integer*

no ipv6 route distance [**vrf** *vrf-name*] *integer*

- *vrf-name* — The name of an existing VRF instance.
- *integer* — Specifies the distance (preference) of an individual static route. (Range 1-255)

Default Configuration

Default value of *integer* is 1.

Command Mode

Global Configuration mode

User Guidelines

Lower route distance values are preferred when determining the best route.

Example

The following example sets the default distance to 80.

```
console(config)#ipv6 route distance 80
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

ipv6 unicast-routing

Use the **ipv6 unicast-routing** command to enable forwarding of IPv6 unicast datagrams.

Syntax

ipv6 unicast-routing

no ipv6 unicast-routing

Default Configuration

Disabled is the default configuration.

Command Mode

VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example globally enables Ipv6 unicast datagram forwarding.

```
console(config)#ipv6 unicast-routing
console(config)#no ipv6 unicast-routing
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware. Syntax updated to include Virtual Router Configuration mode in version 6.7.0 firmware.

ipv6 unreachables

Use the **ipv6 unreachables** command to enable the generation of ICMPv6 Destination Unreachable messages. Use the **no** form of this command to prevent the generation of ICMPv6 Destination Unreachable messages.

Syntax

ipv6 unreachables

no ipv6 unreachables

Default Configuration

ICMPv6 Destination Unreachable messages are enabled by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan10)#ipv6 unreachables
```

show ipv6 brief

Use the **show ipv6 brief** command to display the IPv6 status of forwarding mode and IPv6 unicast routing mode.

Syntax

show ipv6 brief [vrf ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the IPv6 status of forwarding mode and IPv6 unicast routing mode.

```
console#show ipv6 brief
IPv6 Unicast Routing Mode.................... Enable
IPv6 Hop Limit............................... Unconfigured
ICMPv6 Rate Limit Error Interval............. 1000 msec
ICMPv6 Rate Limit Burst Size................. 100 messages
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 interface

Use the **show ipv6 interface** command to show the usability status of IPv6 interfaces. The output of the command includes the method of assignment for each IPv6 address that is either autoconfigured or leased from a DHCP server. Global addresses with no annotation are assumed to be manually configured.

Syntax

show ipv6 interface [**vrf** ***vrf-name***][**brief**] [**loopback** *loopback-id* **|** **tunnel** *tunnel-id* **|** **vlan** *vlan-id* [**prefix**]]

- interfaces—Displays the interfaces associated with the VRF.
- *vrf-name*—The name of the VRF for which information is displayed. If no VRF is specified, all VRFs are shown. The VRF name must match the configured VRF name exactly, including capitalization.
- *loopback-id*—Valid loopback interface ID
- *tunnel-id*—Valid tunnel interface ID
- *vlan-id*—Valid VLAN ID
- **prefix**—Display IPv6 Interface Prefix Information.

Default Configuration

Displays all IPv6 interfaces. There are no IPv6 VRFs by default.

Command Mode

User Exec, Privileged Exec mode, and all show modes.

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

If no VRF name is given, the global routing instances and all other VRF instances are shown.

This command is only available on the N3000/N3100/N3200 switches.

The Method field contains one of the following values.

Field	Description
Auto	The IPv6 address is automatically generated using IPv6 auto address configuration (RFC 2462).
Config	The IPv6 address is manually configured.
DHCP	The IPv6 address is leased from a DHCP server.
TENT	Tentative address.

The long form of the command includes the same annotations and shows whether address autoconfiguration or DHCP client are enabled on the interface. When the interface acts as a host interface, the output also shows the default gateway on the interface, if one exists.

Examples

The following example shows the method of assignment for each IPv6 address that is either autoconfigured or leased from a DHCP server.

```
console#show ipv6 interface
           Oper.
Interface  Mode     IPv6 Address/Length
---------- -------- ---------------------------------
Vl3        Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2033::211:88FF:FE2A:3E3C/64
Vl5        Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2017::A42A:26DB:1049:43DD/128 [DHCP]
Vl7        Enabled  FE80::211:88FF:FE2A:3E3C/128
                    2001::211:88FF:FE2A:3E3C/64 [AUTO]
Vl9        Disabled FE80::211:88FF:FE2A:3E3C/128 [TENT]
```

The Method column shows one of the following values:

- Auto – The IPv6 address was automatically generated using IPv6 auto address configuration (RFC 2462)
- Config – The IPv6 address was manually configured.
- DHCP – The IPv6 address was leased from a DHCP server.
- TENT – Tentative address.

The following example displays the long form of the command, and indicates whether address autoconfiguration or DHCP client are enabled on the interface. When the interface acts as a host interface, the output also shows the default gateway on the interface, if one exists.

```
console#show ipv6 interface vlan2
IPv6 is enabled
IPv6 Prefix is .............................. FE80::211:88FF:FE2A:3E3C/128
                                             2017::A42A:26DB:1049:43DD/128
[DHCP]
Routing Mode................................. Enabled
Administrative Mode.......................... Enabled
IPv6 Routing Operational Mode................ Enabled
Bandwidth.................................... 100000 Kbps
Interface Maximum Transmit Unit.............. 1500
Router Duplicate Address Detection Transmits... 1
Address Autoconfigure Mode................... Disabled
Address DHCP Mode............................ Enabled
Router Advertisement NS Interval............. 0
Router Advertisement Lifetime................ 1800
Router Advertisement Reachable Time.......... 0
Router Advertisement Interval................ 600
Router Advertisement Managed Config Flag...... Disabled
Router Advertisement Other Config Flag........ Disabled
Router Advertisement Router Preference........ medium
Router Advertisement Suppress Flag............ Disabled
IPv6 Destination Unreachables................ Enabled
IPv6 Default Router.......................... fe80::213:c4ff:fedb:6c42
```

Command History

Command introduced in version 6.7.0 firmware.

show ipv6 mld groups

The **show ipv6 mld groups** command is used to display information about multicast groups that MLD reported. The information is displayed only when MLD is enabled on at least one interface. If MLD was not enabled on any interfaces, there is no group information to be displayed.

Syntax

show ipv6 mld groups {*group-address* | **vlan** *vlan-id*}

- *group-address* — The group address to display.
- *vlan-id* — A valid VLAN id.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed as a table when **vlan** *vlan-id* is specified:

Field	Description
Number of (*, G) entries	Displays the number of groups present in the MLD Table.
Number of (S, G) entries	Displays the number of include and exclude mode sources present in the MLD Table.
Group Address	The address of the multicast group.
Interface	Interface through which the multicast group is reachable.
Uptime	Time elapsed in seconds since the multicast group has been known.
Expiry Time	Time left in seconds before the entry is removed from the MLD membership table.

If **vlan** *vlan-id* is not specified, the following fields are displayed for each multicast group and each interface:

Field	Description
Group Address	The address of the multicast group.
Interface	Interface through which the multicast group is reachable.
Uptime	Time elapsed in seconds since the multicast group has been known.
Expiry Time	Time left in seconds before the entry is removed from the MLD membership table of this interface.
Last Reporter	The IP Address of the source of the last membership report received for this multicast group address on that interface.
Filter Mode	The filter mode of the multicast group on this interface. The values it can take are INCLUDE and EXCLUDE.

Compatibility Mode	The compatibility mode of the multicast group on this interface. The values it can take are MLDv1 and MLDv2.
Version 1 Host Timer	The time remaining until the router assumes there are no longer any MLD version-1 Hosts on the specified interface.

The following table is displayed to indicate all the sources associated with this group:

Field	Description
Source Address	The IP address of the source.
Uptime	Time elapsed in seconds since the source has been known.
Expiry Time	Time left in seconds before the entry is removed.

Example

```
console#show ipv6 mld groups ff1e::5

Interface.................................... vlan 6
Group Address............................... FF1E::5
Last Reporter.................. FE80::200:FF:FE00:22
Up Time (hh:mm:ss)......................... 00:03:43
Expiry Time (hh:mm:ss)........................ -----
Filter Mode.........................................Include
Version1 Host Timer........................... -----
Group compat mode............................ v2
Source Address    ExpiryTime
-----------------  -----------
  4001::6         00:03:15
  4001::7         00:03:15
  4001::8         00:03:15

console#show ipv6 mld groups vlan 6

Group Address............................... FF1E::1
Interface.................................... vlan 6
Up Time (hh:mm:ss)......................... 00:04:23
Expiry Time (hh:mm:ss)....................... ------

Group Address............................... FF1E::2
Interface.................................... vlan 6
Up Time (hh:mm:ss)......................... 00:04:23
Expiry Time (hh:mm:ss)....................... ------

Group Address............................... FF1E::3
Interface.................................... vlan 6
```

```
Up Time (hh:mm:ss)......................... 00:04:23
Expiry Time (hh:mm:ss)...................... ------

Group Address.............................. FF1E::4
Interface.................................. vlan 6
Up Time (hh:mm:ss)......................... 00:04:23
Expiry Time (hh:mm:ss)...................... ------
```

show ipv6 mld interface

The **show ipv6 mld interface** command is used to display MLD related information for an interface.

Syntax

show ipv6 mld interface { **vlan** *vlan-id* | **all**}

- *vlan-id* — A valid VLAN id.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed for the specified interface:

Field	Description
Interface	The interface number in unit/slot/port format.
MLD Global Admin Mode	This field displays the configured global administrative status of MLD.
MLD Interface Admin Mode	This field displays the configured interface administrative status of MLD.
MLD Operational Mode	The operational status of MLD on the interface.
MLD Version	This field indicates the version of MLD configured on the interface.

Query Interval	This field indicates the configured query interval for the interface.
Query Max Response Time	This field indicates the configured maximum query response time (in seconds) advertised in MLD queries on this interface.
Robustness	This field displays the configured value for the tuning for the expected packet loss on a subnet attached to the interface.
Startup Query Interval	This value indicates the configured interval between General Queries sent by a Querier on startup.
Startup Query Count	This value indicates the configured number of Queries sent out on startup, separated by the Startup Query Interval.
Last Member Query Interval	This value indicates the configured Maximum Response Time inserted into Group-Specific Queries sent in response to Leave Group messages.
Last Member Query Count	This value indicates the configured number of Group-Specific Queries sent before the router assumes that there are no local members.

The following information is displayed if the operational mode of the MLD interface is enabled:

Field	**Description**
Querier Status	This value indicates whether the interface is a MLD querier or non-querier on the subnet with which it is associated.
Querier Address	The IP address of the MLD querier on the subnet the interface with which it is associated.
Querier Up Time	Time elapsed in seconds since the querier state has been updated.
Querier Expiry Time	Time left in seconds before the Querier losses its title as querier.
Wrong Version Queries	Indicates the number of queries received whose MLD version does not match the MLD version of the interface.
Number of Joins	The number of times a group membership has been added on this interface.
Number of Leaves	The number of times a group membership has been removed on this interface.

Number of Groups	The current number of membership entries for this interface.

Example

```
console#show ipv6 mld interface vlan 2

Interface.................................. vlan 2
MLD Global Admin Mode...................... Enabled
MLD Interface Admin Mode................... Disabled
MLD Operational Mode....................... Disabled
MLD Version................................ 2
Query Interval (secs)...................... 100
Query Max Response Time(milli-secs)........ 1111
Robustness................................. 2
Startup Query Interval (secs).............. 31
Startup Query Count........................ 2
Last Member Query Interval (milli-secs)..... 1111
Last Member Query Count.................... 2
```

show ipv6 mld host-proxy

Use the **show ipv6 mld host-proxy** command to display a summary of the host interface status parameters.

Syntax

show ipv6 mld host-proxy

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

Default Configuration

There is no default configuration for this command.

User Guidelines

The command displays the following parameters only when you enable MLD Proxy:

Field	Description
Interface Index	The interface number of the MLD Proxy interface.

Admin Mode	Indicates whether MLD Proxy is enabled or disabled. This is a configured value.
Operational Mode	Indicates whether MLD Proxy is operationally enabled or disabled. This is a status parameter.
Version	The present MLD host version that is operational on the proxy interface.
Number of Multicast Groups	The number of multicast groups that are associated with the MLD-Proxy interface.
Unsolicited Report Interval	The time interval at which the MLD-Proxy interface sends unsolicited group membership reports.
Querier IP Address on Proxy Interface	The IP address of the Querier, if any, in the network attached to the upstream interface (MLD-Proxy interface).
Older Version 1 Querier Timeout	The interval used to timeout the older version 1 queriers.
Proxy Start Frequency	The number of times the MLD-Proxy has been stopped and started.

Example

```
console#show ipv6 mld host-proxy
Interface Index............................. vlan 10
Admin Mode.................................. Enabled
Operational Mode............................ Enabled
Version........................................ 3
Num of Multicast Groups........................ 0
Unsolicited Report Interval.................... 1
Querier IP Address on Proxy Interface..... fe80::1:2:5
Older Version 1 Querier Timeout............ 00:00:00
Proxy Start Frequency..........................1
```

show ipv6 mld host-proxy groups

Use the **show ipv6 mld host-proxy groups** command to display information about multicast groups that the MLD Proxy reported.

Syntax

show ipv6 mld host-proxy groups

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following parameters are displayed by this command:

Field	Description
Interface	The MLD Proxy interface.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group on the network attached to the MLD-Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.
Member State	Possible values are: • Idle_Member—The interface has responded to the latest group membership query for this group. • Delay_Member—The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.

Example

```
console#show ipv6 mld host-proxy groups
Interface................................ vlan 10
Group Address Last Reporter  Up Time    Member State      Filter Mode  Sources
------------- -------------- ---------- ----------------- ------------ -----
--
FF1E::1       FE80::100:2.3  00:01:40   DELAY_MEMBER      Exclude        2
FF1E::2       FE80::100:2.3  00:02:40   DELAY_MEMBER      Include        1
FF1E::3       FE80::100:2.3  00:01:40   DELAY_MEMBER      Exclude        0
FF1E::4       FE80::100:2.3  00:02:44   DELAY_MEMBER      Include        4
```

show ipv6 mld host-proxy groups detail

Use the **show ipv6 mld host-proxy groups detail** command to display information about multicast groups that MLD Proxy reported.

Syntax

show ipv6 mld host-proxy groups detail

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following parameters are displayed by this command:

Field	Description
Interface	The interface number of the MLD-Proxy.
Group Address	The IP address of the multicast group.
Last Reporter	The IP address of the host that last sent a membership report for the current group on the network attached to the MLD Proxy interface (upstream interface).
Up Time (in secs)	The time elapsed in seconds since last created.
Member State	Possible values are: • Idle_Member—The interface has responded to the latest group membership query for this group. • Delay_Member—The interface is going to send a group membership report to respond to a group membership query for this group.
Filter Mode	Possible values are Include or Exclude.
Sources	The number of sources attached to the multicast group.

Group Source List	The list of IP addresses of the sources attached to the multicast group.
Expiry Time	The time left for a source to get deleted.

Example

```
console#show ipv6 mld host-proxy groups
Interface................................ vlan 10

Group Address Last Reporter    Up Time   Member State      Filter Mode
Sources
------------- ---------------- --------- ----------------- ------------- ---
FF1E::1       FE80::100:2.3      244     DELAY_MEMBER      Exclude        2

Group Source List          Expiry Time
------------------         ---------------
2001::1                    00:02:40
2001::2                    --------

FF1E::2       FE80::100:2.3      243     DELAY_MEMBER      Include        1

Group Source List          Expiry Time
------------------         ---------------
3001::1                    00:03:32
3002::2                    00:03:32

FF1E::3       FE80::100:2.3      328     DELAY_MEMBER      Exclude        0
FF1E::4       FE80::100:2.3      255     DELAY_MEMBER      Include        4

Group Source List          Expiry Time
------------------         ---------------
4001::1                    00:03:40
5002::2                    00:03:40
4001::2                    00:03:40
5002::2                    00:03:40
```

show ipv6 mld host-proxy interface

Use the **show ipv6 mld-proxy interface** command to display a detailed list of the host interface status parameters.

Syntax

show ipv6 mld host-proxy interface

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The following parameters are displayed only when MLD Proxy is enabled:

Parameter	Description
Interface	The MLD Proxy interface.

The column headings of the table associated with the interface are as follows:

Parameter	Description
Ver	The MLD version.
Query Rcvd	Number of MLD queries received.
Report Rcvd	Number of MLD reports received.
Report Sent	Number of MLD reports sent.
Leaves Rcvd	Number of MLD leaves received. Valid for version 2 only.
Leaves Sent	Number of MLD leaves sent on the Proxy interface. Valid for version 2 only.

Example

```
console#show ipv6 mld host-proxy interface

Interface................................ vlan 10

Ver Query Rcvd Report Rcvd Report Sent Leave Rcvd Leave Sent
-----------------------------------------------------------
1     2          0           0           0          2
2     3          0           4         -----      -----
```

show ipv6 mld traffic

The **show ipv6 mld traffic** command is used to display MLD statistical information for the router.

Syntax

show ipv6 mld traffic

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Field	Description
Valid MLD Packets Received	The number of valid MLD packets received by the router.
Valid MLD Packets Sent	The number of valid MLD packets sent by the router.
Queries Received	The number of valid MLD queries received by the router.
Queries Sent	The number of valid MLD queries sent by the router.
Reports Received	The number of valid MLD reports received by the router.
Reports Sent	The number of valid MLD reports sent by the router.
Leaves Received	The number of valid MLD leaves received by the router.
Leaves Sent	The number of valid MLD leaves sent by the router.
Bad Checksum MLD Packets	The number of bad checksum MLD packets received by the router.
Malformed MLD Packets	The number of malformed MLD packets received by the router.

Example

```
console#show ipv6 mld traffic

Valid MLD Packets Received..................... 52
Valid MLD Packets Sent......................... 7
```

```
Queries Received.............................. 0
Queries Sent.................................. 7
Reports Received.............................. 52
Reports Sent.................................. 0
Leaves Received............................... 0
Leaves Sent................................... 0
Bad Checksum MLD Packets...................... 0
Malformed MLD Packets......................... 0
```

show ipv6 nd raguard policy

Use this command to display the RA Guard policy on all interfaces for which it is enabled.

Syntax

show ipv6 nd raguard policy

Default Configuration

By default, no RA guard policies are applied to any interface.

Command Mode

Privileged Exec, Global Configuration

User Guidelines

This command has no user guidelines.

Command History

Introduced in version 6.2.0.1 firmware.

Example

The following example configures an unnamed RA Guard policy to drop all RA advertisements and router redirect messages on interface Gi1/0/1 (VLAN 10). The configured interfaces are shown.

```
console(config)#vlan 10
console(config-vlan101)#exit
console(config)#interface vlan 10
console(config-if-vlan10)#ipv6 enable
console(config-if-vlan10)#exit
console(config)#ipv6 unicast-routing
```

```
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 10
console(config-if-Gi1/0/1)#exit
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#ipv6 nd raguard attach-policy
console(config-if-Gi1/0/1)#show ipv6 nd raguard policy

Ipv6 RA-Guard Configured Interfaces

Interface        Role
---------------  -------
Gi1/0/1          Host
```

show ipv6 neighbors

Use the **show ipv6 neighbors** command to display information about the IPv6 neighbors.

Syntax

show ipv6 neighbors [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays information about the IPv6 neighbors.

```
console(config)#show ipv6 neighbors
Neighbor Last
IPv6 Address         MAC Address       isRtr  State   Updated
                                                      Interface
-------------------- ----------------- -----  ------- ---------
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 protocols

Use the **show ipv6 protocols** command to display information about the configured IPv6 routing protocols

Syntax

show ipv6 protocols [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode, all Configuration submodes.

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ipv6 protocols

Routing Protocol .............................. BGP
BGP Router ID ................................. 255.255.255.255
Local AS Number ............................... 1565001
BGP Admin Mode ................................ Enable
Maximum Paths ................................. Internal 3, External 2
Always compare MED ............................ TRUE
Maximum AS Path Length ........................ 100
Fast Internal Failover ........................ Disable
Fast External Failover ........................ Disable

Distance ...................................... Ext 126, Int 127, Local 126

Prefix List In ................................ none
Prefix List Out ............................... none

Redistributing:
```

```
Source    Metric     Dist List                         Route Map
--------- ---------- -------------------------------- ----------------------
----------
connected

Networks Originated:

Neighbors:
2001::1
    Filter List In ............................ 1
    Filter List Out ........................... 1

Routing Protocol .............................. OSPFv3
Router ID ..................................... 0.0.0.0
OSPF Admin Mode ............................... Disable
Maximum Paths ................................. 4
Routing for networks .......................... Not Configured
Distance ...................................... Intra 110 Inter 110 Ext 110
Default Route Advertise ....................... Disabled
Always ........................................ False
Metric ........................................ Not configured
Metric Type ................................... External Type 2

Number of Active Areas ........................ None
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 route

Use the **show ipv6 route** command in User Exec or Privileged Exec mode to display the IPv6 routing table. The output of the command also displays the IPv6 address of the default gateway and the default route associated with the gateway.

Syntax

show ipv6 route [vrf ***vrf-name***][**ipv6-address** | *ipv6-prefix/prefix-length* |*protocol*] [**best**] | **track-table**

- *vrf-name* — The name of an existing VRF instance.
- **ipv6-address**—Specifies an IPv6 address for which the best-matching route would be displayed.
- **protocol**—Specifies the protocol that installed the routes. Is one of the following keywords: connected, ospf, static.

- *ipv6-prefix/ prefix-length*—Specifies an IPv6 network for which the matching route would be displayed.
- **best**—Specifies that only the best routes are displayed. If the connected keyword is selected for protocol, the best option is not available because there are no best or non-best connected routes.
- **all**—Display all routes.
- **track-table**—Display the tracked IPv6 static routes for the selected VRF or the global routing instance.
- **preferences**—Display the routing preferences.
- **static**—Show static routes only.
- **summary**—Show a summary of the route types.
- **vlan** *vlan-id*—A VLAN identifier.
- **loopback** *loopback-id*—A loopback identifier.
- **tunnel** *tunnel-id*—A tunnel identifier.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The output of the command also displays the IPv6 address of the default gateway and the default route associated with the gateway.

Use the track-table argument to display the IPv6 routes being tracked.

Example

The following example displays the IPv6 address of the default gateway and the default route associated with the gateway.

```
console(config)#show ipv6 route
IPv6 Routing Table - 0 entries
Route Codes: C - connected, S - static
O - OSPF Intra, OI - OSPF Inter, OE1 - OSPF Ext 1, OE2 - OSPF Ext 2
ON1 - OSPF NSSA Ext Type 1, ON2 - OSPF NSSA Ext Type 2
```

```
Default gateway is 10.1.20.1

S       0.0.0.0/0 [254/0] via 10.1.20.1
C       10.1.20.0/24 [0/1] directly connected,   vlan2
C       20.1.20.0/24 [0/1] directly connected,   vlan4
```

The following example shows a tracked route:

```
console#show ipv6 route track-table

ipv6 route 2001:B66::/32 4001::1 track 15 state is [up]
```

Command History

Command updated in version 6.6 firmware. Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 route preferences

Use the **show ipv6 route preferences** command to show the preference value associated with the type of route. Lower numbers have a greater preference.

Syntax

show ipv6 route preferences [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows the preference value associated with the type of route.

```
console#show ipv6 route preferences

Local....................................... 0
Static...................................... 1
OSPF Intra-area routes...................... 110
OSPF Inter-area routes...................... 110
OSPF External routes........................ 110
BGP External................................ 20
BGP Internal................................ 200
BGP Local................................... 200
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 route summary

Use the **show ipv6 route summary** command to display a summary of the routing table for all routes, including best and non-best routes. Use best to display the count summary for only best routes.

Syntax

show ipv6 route summary [**vrf** ***vrf-name***] [**best**]

- *vrf-name* — The name of an existing VRF instance.
- **best** — Displays the count summary for only best routes.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays a summary of the routing table.

```
console#show ipv6 route summary
```

```
Connected Routes..............................32
Static Routes................................ 0
6To4 Routes.................................. 0
BGP Routes................................... 10
  External................................... 0
  Internal................................... 10
  Local...................................... 0
OSPF Routes.................................. 0
  Intra Area Routes.......................... 0
  Inter Area Routes.......................... 0
  External Type-1 Routes..................... 0
  External Type-2 Routes..................... 0
Reject Routes................................ 0
Total routes................................. 0
```

Command History

Updated in version 6.3.0.1 firmware. Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 snooping counters

Use this command to display the RA guard dropped packet counters.

Syntax

show ipv6 snooping counters [**interface** *interface-id*]

- *interface-id*—An interface identifier (Ethernet or port-channel).

Default Configuration

By default, no RA guard policies are applied to any interface.

Command Mode

Privileged Exec, Global Configuration, and all submodes

User Guideline

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config-if-vlan10)#show ipv6 snooping counters

IPv6 Dropped Messages

RA (Router Advertisement - ICMP type 134),
REDIR (Router Redirect - ICMP type 137)
Interface           RA         REDIR
---------------  ----------   ----------
Gi1/0/1                   0            0
Gi1/0/2                 431         6599
```

show ipv6 traffic

Use the **show ipv6 traffic** command in User Exec mode to show traffic and statistics for IPv6 and ICMPv6.

Syntax

show ipv6 traffic [**vlan** *vlan-id* **|** **tunnel** *tunnel-id* **|** **loopback** *loopback-id*]

- *vlan-id* — Valid VLAN ID, shows information about traffic on a specific interface or, without the optional parameter, shows information about traffic on all interfaces.
- *tunnel-id* — Tunnel identifier. (Range: 0-7)
- *loopback-id* — Loopback identifier. (Range: 0-7)

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following examples show traffic and statistics for IPv6 and ICMPv6, first for all interfaces and an individual VLAN.

```
console> show ipv6 traffic
IPv6 STATISTICS
Total Datagrams Received......................... 0
Received Datagrams Locally
Delivered........................................ 0
Received Datagrams Discarded Due To Header Errors.. 0
Received Datagrams Discarded Due To MTU........... 0
Received Datagrams Discarded Due To No Route....... 0
Received Datagrams With Unknown Protocol.......... 0
Received Datagrams Discarded Due To Invalid Address.0
Received Datagrams Discarded Due To Truncated Data. 0
Received Datagrams Discarded Other................ 0
Received Datagrams Reassembly Required............ 0
Datagrams Successfully Reassembled................ 0
Datagrams Failed To Reassemble.................... 0
Datagrams Forwarded............................... 0
Datagrams Locally Transmitted..................... 0
Datagrams Transmit Failed......................... 0
Datagrams Successfully Fragmented................. 0
Datagrams Failed To Fragment...................... 0
Fragments Created................................. 0
Multicast Datagrams Received...................... 0
Multicast Datagrams Transmitted................... 0

console> show ipv6 traffic vlan 11
Interface ...................................... 11
IPv6 STATISTICS
Total Datagrams Received......................... 0
Received Datagrams Locally Delivered.............. 0
Received Datagrams Discarded Due To Header Errors.. 0
Received Datagrams Discarded Due To MTU........... 0
Red Datagrams Discarded Due To No Route........... 0
Received Datagrams With Unknown Protocol.......... 0
Received Datagrams Discarded Due To Invalid Address 0
Received Datagrams Discarded Due To Truncated Data. 0
Received Datagrams Discarded Other................ 0
Received Datagrams Reassembly Required............ 0
Datagrams Successfully Reassembled................ 0
Datagrams Failed To Reassemble.................... 0
Datagrams Forwarded............................... 0
Datagrams Locally Transmitted..................... 0
Datagrams Transmit Failed......................... 0
Datagrams Successfully Fragmented................. 0
Datagrams Failed To Fragment...................... 0
Fragments Created................................. 0
Multicast Datagrams Received...................... 0
Multicast Datagrams Transmitted................... 0
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 vlan

Use the **show ipv6 vlan** command to display IPv6 VLAN routing interface addresses.

Syntax

show ipv6 vlan

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays IPv6 VLAN routing interface addresses.

```
console#show ipv6 vlan
MAC Address used by Routing VLANs: 00:02:BC:00:30:68
VLAN ID  IPv6 Address/Prefix Length
-------  ---------------------------------------
1
```

traceroute ipv6

Use the **traceroute ipv6** command to determine the path and measure the transit delay to another device in the network. The transit delays are measured for each hop in the network.

Syntax

traceroute ipv6 [**vrf** *vrf-name*]{**ipv6-address**|**hostname**} [**count** *1-10*] [**init-ttl** *1-255*] [**interval** *1-60*] [**max-fail** *0-255*] [**max-ttl** *1-255*] [**port** *1-65535*] [**size** *0-39936*] [**source** {*ipv6-address* | **loopback** *loopback-id*| **vlan** *vlan-id*}]

- *vrf-name* — The name of an existing VRF instance.

- ipv6-address | hostname—The target IP address or host to ping.
- out-of-band—Send the ping over the out-of-band interface.
- vlan-id—The VLAN over which to send the echo request.
- loopback-id—Use the source address from the selected loopback. (Range 0-7)
- count—The number of echo request packets to send for each ttl value. (Range 1-10. Default 3).
- interval—The time (in seconds) between successive echo requests. Default 3.
- init-ttl—The initial TTL sent in the ICMP echo request packets (Range 1-255. Default 1).
- max-ttl—The maximum ttl sent in the ICMP echo request packet (Range 1-255, default 30). Must be equal to or larger than init-ttl.
- port—The destination UDP port of the probe. (Range 1-65535).
- size—The packet size padding in bytes. (Range 0-39936, default 0).
- source—Use the specified source IP address, loopback address, VLAN address, tunnel or out-of-band interface address in the transmitted packets.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec and User Exec modes

User Guidelines

Traceroute operates by sending a sequence of Internet Control Message Protocol (ICMP) echo request packets. The time-to-live (TTL) value, is used in determining the intermediate routers through which the packet flows toward the destination address. Routers decrement a packet’s TTL value and discard packets whose TTL equals 0. On discarding a packet, the router returns an ICMP time exceeded message to the source.

Example

```
(console)# traceroute ipv6 2001::2 init-ttl 1 max-ttl 4 max-fail 0 interval 1
count 3 port 33434 size 43

Traceroute to 2001::2, 4 hops max, 43 byte packets:
1 2001::2   708 msec     41 msec     11 msec
2 2001::2    12 msec     13 msec     12 msec
3 2001::2    14 msec      9 msec     11 msec
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

Loopback Interface Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking provides for the creation, deletion, and management of loopback interfaces. They are dynamic interfaces that are created and deleted by user configuration.

A loopback interface is always expected to be up. As such, it provides a means to configure a stable IP address on the device which may be referred to by other switches in the network. This interface never transmits data but may receive data. It is typically expected to be used by routing protocols.

Loopback interfaces will respond to pings.

Loopback interfaces are not supported on the N1100-ON and N1500 Series switches.

interface loopback

Use the **interface loopback** command to enter the Interface Loopback configuration mode.

Syntax

interface loopback *loopback-id*

no interface loopback *loopback-id*

- *loopback-id* — Loopback identifier. (Range: 0-7)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enters the Interface Loopback 1 configuration mode.

```
console(config)#interface loopback 1
console(config-if-loopback0)#ip address 192.168.22.1 255.255.255.255
console(config-if-loopback0)#exit
console(config)#ex
console#ping 192.168.22.1
 Pinging 192.168.22.1 with 0 bytes of data:

Reply From 192.168.22.1: icmp_seq = 0. time <10 msec.
Reply From 192.168.22.1: icmp_seq = 1. time <10 msec.
Reply From 192.168.22.1: icmp_seq = 2. time <10 msec.
Reply From 192.168.22.1: icmp_seq = 3. time <10 msec.
```

show interfaces loopback

Use the **show interfaces loopback** command to display information about one or all configured loopback interfaces.

Syntax

show interfaces loopback [*loopback-id*]

- *loopback-id* — Loopback identifier. (Range: 0-7)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Loopback interfaces are not supported on the N1100-ON Series switches.

Examples

The following examples display information about configured loopback interfaces.

```
console# show interfaces loopback
Loopback Id  Interface  IP Address  Received Packets  Sent Packets
-----------  ---------  ----------  ----------------  ------------
```

```
1            loopback   1 0.0.0.0   0                  0

console# show interfaces loopback 1
Interface Link Status.......................... Up
IP Address..................................... 0.0.0.0 0.0.0.0
MTU size....................................... 1500 bytes
```

IP Multicast Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

> The Dell Network N1500/N2000/N2100-ON/N2200-ON Series switches support limited routing and multicast capabilities. See the Users Configuration Guide section "Feature Limitations and Platform Constants" for supported capabilities.

The Dell EMC Networking multicast component is best suited for video and audio traffic requiring multicast packet control for optimal operation. The multicast component includes support for IGMPv2, IGMPv3, PIM-DM, PIM-SM, and DVMRP. Communication from point to multipoint is called multicasting. The source host (point) transmits a message to a group of zero or more hosts (multipoint) that are identified by a single IP destination address. Although the task may be accomplished by sending unicast (point-to-point) messages to each of the destination hosts, multicasting is the more desirable method for this type of transmission. A multicast message is delivered to all members of its destination host group with the same best-efforts reliability as regular unicast IP messages. The message is not guaranteed to arrive intact at all members of the destination group or in the same order relative to other messages. The advantages of multicasting are explained below:

- Traffic reduction: A number of applications are required to transmit packets to hundreds of stations. The packets transmitted to these stations share a group of links on their paths to their destinations. Multicast transmission can conserve much needed network bandwidth, since multicasting transmission requires the transmission of only a single packet by the source and replicates this packet only if it is necessary (at forks of the multicast delivery tree).
- Discovery of resources: A number of applications require a host to find out whether a certain type of service is available. Internet protocols such as Bootstrap Protocol (BOOTP) and Open Shortest Path First (OSPF) protocol are among these applications. Using multicast messages and sending the query to those hosts which are potentially capable of providing this service speeds the gathering of this information considerably. Although a group of hosts residing on the same network are the intended target for the majority of multicast packets, this limitation is not

mandatory. Discovering the local domain-name server is the intended use of multicast messages on remote networks when there is less than one server per network.

- Applications used for datacasting: Since multimedia transmission has become increasingly popular, multicast transmission use has increased. Multicast transmission may be used to efficiently accommodate this type of communication. For instance, the audio and video signals are captured, compressed and transmitted to a group of receiving stations. Instead of using a set of point-to-point connections between the participating nodes, multicasting can be used for distribution of the multimedia data to the receivers. The participating stations are free to join or leave an audio-cast or a video-cast as needed. The variable membership maintenance is managed efficiently through multicasting.

clear ip mroute

Use this command to selectively clear IPv4 multicast entries from the cache.

Syntax

clear ip mroute { * | *group-address* [*source-address*] }

- ***—Deletes all IPv4 entries from the IP multicast routing table.
- *group-address*— IP address of the multicast group.
- *source-address*—IP address of a multicast source that is sending multicast traffic to the group.

Default configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

When a * entry is deleted through this command, it cannot be formed again until it is expired in IGMP and started again via the host. The default mcache time-out is 210 seconds.

Example

The following example deletes all entries from the IP multicast routing table:

```
console# clear ip mroute *
```

The following example deletes from the IP multicast routing table all entries that match the given multicast group address (239.1.2.1), irrespective of which source is sending for this group:

```
console# clear ip mroute 239.1.2.1
```

The following example deletes from the IP multicast routing table all entries that match the given multicast group address (239.1.2.1) and the multicast source address (192.168.10.10):

```
console# clear ip mroute 239.1.2.1 192.168.10.10
```

ip multicast boundary

Use the **ip multicast boundary** command in Interface Configuration mode to add an administrative scope multicast boundary specified by *groupipaddr* and *mask* for which this multicast administrative boundary is applicable. *groupipaddr* is a group IP address and *mask* is a group IP mask.

Syntax

ip multicast boundary *groupipaddr mask*

no ip multicast boundary *groupipaddr*

- *groupipaddr* — IP address of multicast group. Valid range is 239.0.0.0 to 239.255.255.255.
- *mask*—The group address mask in dotted quad notation.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

The administratively scoped multicast address range is 239.0.0.0 to 239.255.255.255

Example

The following example adds an administrative scope multicast boundary.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip multicast boundary 239.5.5.5 255.255.255.255
```

ip mroute

Use the **ip mroute** command to create a static multicast route for a source range. Use the **no** form of this command to delete a static multicast route.

Syntax

ip mroute *source-address mask rpf-address preference*

no ip mroute *source-address mask*

- *source-address* — The IP address of the multicast data source.
- *mask* — The IP subnet mask of the multicast data source.
- *rpf-address* — The IP address of the next hop towards the source.
- *preference* — The cost of the route (Range: 1 - 255).

Default Configuration

There is no default configuration for this command.

Command Mode

Global Configuration mode

User Guidelines

The source IP address must contain 0's for the address bits corresponding to 0's in the netmask.

Multicast source data is flooded/forwarded by default in the VLAN on which it is received. For this reason, multi-access VLANs are not recommended for multicast routing interfaces.

Example

```
console(config)#ip mroute 1.1.0.0 255.255.0.0 192.168.20.1 34
```

ip multicast-routing

Use the **ip multicast-routing** command in Global Configuration mode to set the administrative mode of the IP multicast forwarder in the router to active. It enables both IPv4 and IPv6 multicast routing. For multicast routing to become operational, IGMP must be currently enabled. Enabling PIM or DVMRP enables IGMP.

Syntax

ip multicast-routing

no ip multicast-routing

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Use of a multicast routing protocol is recommended (e.g., PIM) when IP multicast is enabled.

IGMP/MLD snooping may be enabled when IP multicast is enabled. If a multicast source is connected to a VLAN on which both L3 multicast and IGMP/MLD snooping are enabled, the multicast source is forwarded to the mrouter ports that have been discovered when the multicast source is first seen. If a new mrouter is later discovered on a different port, the multicast source data is not forwarded to the new port. Likewise, if an existing mrouter times out or stops querying, the multicast source data continues to be forwarded to that port. If a host in the VLAN subsequently joins or leaves the group, the list of mrouter ports is updated for the multicast source and the forwarding of the multicast source is adjusted. The workaround to this limitation is to statically configure mrouter ports when enabling IGMP/MLD snooping in L3 multicast enabled VLANs.

Multicast routing requires IGMP to be enabled to become operationally enabled. Enabling PIM or DVMRP enables IGMP.

This command enables both IPv4 and IPv6 multicast routing. Multicast source data is flooded/forwarded by default in the VLAN on which it is received. For this reason, multi-access VLANs are not recommended for multicast routing interfaces.

Example

The following example enables IP multicast on the router.

```
console#configure
console(config)#ip multicast-routing
```

Command History

User Guidelines updated in release 6.3.5. User Guidelines updated in release 6.4 release.

ip multicast ttl-threshold

Use the **ip multicast ttl-threshold** command in Interface VLAN Configuration mode to apply a *ttlvalue* to a routing interface. *ttlvalue* is the TTL threshold which is applied to the multicast Data packets forwarded through the interface.

Syntax

ip multicast ttl-threshold *ttlvalue*

no ip multicast ttl-threshold

- *ttlvalue* — Specifies TTL threshold. (Range: 0-255)

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example applies a *ttlvalue* of 5 to the VLAN 15 routing interface.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip multicast ttl-threshold 5
```

ip pim

Use the **ip pim** command in Interface (VLAN) Configuration mode to administratively configure PIM mode for IP multicast routing on a VLAN interface. Enabling or disabling PIM mode concurrently enables/disables IGMP. Use the **no** form of the command to disable PIM on the interface.

Syntax

ip pim

no ip pim

Default Configuration

PIM is not enabled on interfaces by default.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

PIM requires that routing and multicast routing be enabled. Enabling PIM enables IGMP/MLD. Disabling PIM may operationally disable multicast routing.

Example

```
console(config)#ip routing
console(config)#ip multicast
console(config)#interface vlan 10
console(if-vlan-10)#ip pim
```

Command History

User Guidelines updated in release 6.3.5.

ip pim bsr-border

The **ip pim bsr-border** command is used in Interface (VLAN) Configuration mode to administratively disable bootstrap router (BSR) messages on the interface. Use the **no** form of this command to return the configuration to the default.

Syntax

ip pim bsr-border

no ip pim bsr-border

Default Configuration

BSR messages are enabled on the interface by default.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command only has an effect if sparse mode is enabled.

Example

```
console(if-vlan-10)#ip pim bsr-border
```

ip pim bsr-candidate

The **ip pim bsr-candidate** command is used to configure the router to advertise itself as a bootstrap router (BSR). Use the **no** form of this command to return to the default configuration. This command replaces the **ip pimsm bsr-candidate, ip pimsm cbsrhaskmasklength** and **ip pimsm cbsrpreference** commands.

Syntax

ip pim bsr-candidate vlan {*vlan-id hash-mask-length bsr-priority* [**interval** *interval*]}

no ip pim bsr-candidate vlan {*vlan-id*}

- *vlan-id*—A valid VLAN identifier with multicast routing enabled.

- *hash-mask-length* —Length of the BSR hash to be ANDed with the multicast group address. (Range 0–32 bits). Default 0.
- *bsr-priority*—The advertised priority of the BSR candidate. Range 0-255. Default 0.
- *interval*—(Optional) Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Default Configuration

None - the router does not advertise itself as a BSR candidate.

Command Mode

Global Configuration mode

User Guidelines

All multicast groups with the same hash value correspond to the same RP. Lower priority values are preferred.

Example

```
console(config)#ip pim bsr-candidate vlan 10 16 0 interval 30
```

ip pim dense-mode

Use the **ip pim dense-mode** command in Global Configuration mode to administratively configure PIM dense mode for IP multicast routing. Use the **no** form of this command to disable PIM.

Syntax

ip pim dense-mode

no ip pim

Default Configuration

PIM is not enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Only one of sparse or dense mode can be configured on a router. IGMP is automatically enabled if PIM is enabled and disabled when PIM is disabled. **ip multicast-routing** may be operationally enabled or disabled by this command.

PIM is not compatible with DVMRP. DVMRP must be disabled before enabling PIM.

Example

```
console(config)#ip multicast-routing
console(config)#ip pim dense-mode
```

ip pim dr-priority

The **ip pim dr-priority** command in Interface (VLAN) Configuration mode to administratively configure the advertised designated router (DR) priority value. Use the **no** form of this command to return the configuration to the default.

Syntax

ip pim dr-priority *priority*

no ip pim dr-priority

- *priority* — The administratively configured priority (Range: 0–2147483647).

Default Configuration

The default election priority is 1.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command only has an effect if sparse mode is enabled. Lower values are preferred.

Example

```
console(if-vlan10)#ip pim dr-priority 32768
```

ip pim hello-interval

The **ip pim hello-interval** command in Interface (VLAN) Configuration mode to administratively configure the frequency of PIM Hello messages on the specified interface. Use the **no** form of this command to return the configuration to the default.

Syntax

ip pim hello-interval *interval*

no ip pim hello-interval

- *interval* — The number of seconds between successive hello transmissions. Range: 0–18000 seconds. Default is 30.

Default Configuration

The default hello interval is 30 seconds.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan10)#ip pim hello-interval 20
```

ip pim join-prune-interval

The **ip pim join-prune-interval** command in Interface (VLAN) Configuration mode to administratively configure the frequency of join/prune messages on the specified interface. Use the **no** form of this command to return the configuration to the default.

Syntax

ip pim join-prune-interval *interval*

no ip pim join-prune-interval

- *interval* — The number of seconds between successive join-prune transmissions. Range: 0–18000 seconds. Default is 60.

Default Configuration

The default join/prune interval is 60 seconds.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command only has an effect if sparse mode is enabled.

Example

```
console(if-vlan10)#ip pim join-prune-interval 30
```

ip pim rp-address

Use the **ip pim rp-address** command in Global Configuration mode to define the address of a PIM Rendezvous point (RP) for a specific multicast group range. Use the **no** form of this command to remove a configured RP. This command replaces the **ip pimsm rp-address** command.

Syntax

ip pim rp-address *{rp-address group-address group-mask* [**override**]}

no ip pim rp-address {*rp-address group-address group-mask}*

- *rp-address* —The valid IPv4 address for the rendezvous point.
- *group-address*—A valid multicast group address to be sourced from the rendezvous point.
- *group-mask*—A mask indicating the range of multicast groups sourced from the RP.

- **override**—A flag indicating that the static entry should override dynamically learned entries for the configured multicast group.

Default Configuration

None —no static multicast groups are configured for an RP.

Command Mode

Global Configuration mode

User Guidelines

A maximum of 32 multicast group ranges may be defined for each rendezvous point. The configured ranges may not overlap.

Command History

Updated guidelines in version 6.5 firmware.

Example

```
console(config)#ip pim rp-address 192.168.21.1 239.1.0.0 255.255.0.0
override
```

ip pim rp-candidate

Use the **ip pim rp-candidate** command in Global Configuration mode to configure the router to advertise itself to the bootstrap router (BSR) router as a PIM candidate rendezvous point (RP) for a specific multicast group range. Use the **no** form of this command to return to the default configuration. This command replaces the **ip pimsm rp-candidate** command.

Syntax

ip pim rp-candidate vlan {*vlan-id group-address group-mask* [**interval** *interval*]}

no ip pim rp-candidate vlan *vlan-id group-address group-mask}*

- *vlan-id*—A valid VLAN identifier with multicast routing enabled.
- *group-address*—A valid multicast group address.
- *group-mask*—A mask indicating the range of multicast groups for which the router should advertise itself as an RP-candidate.

- *interval*—(Optional) Indicates the RP candidate advertisement interval. The range is from 1 to 16383 seconds. The default value is 60 seconds.

Default Configuration

None - the router does not advertise itself as an RP candidate by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ip pim rp-candidate vlan 10 239.1.0.0 255.255.0.0 interval 30
```

ip pim sparse-mode

Use the **ip pim sparse-mode** command in Global Configuration mode to administratively configure PIM sparse mode for IP multicast routing. Use the **no** form of this command to disable PIM.

Syntax

ip pim sparse-mode

no ip pim

Default Configuration

PIM not enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Only one of sparse or dense mode can be configured on a router.IGMP is automatically enabled if PIM is enabled and disabled when PIM is disabled.

IP multicast must be enabled for PIM to operate. **ip multicast-routing** is not disabled or enabled by this command.

It is recommended that IGMP snooping be disabled if IP multicast is enabled unless specifically required.

PIM is not compatible with DVMRP. DVMRP must be disabled before enabling PIM.

Example

```
console(config)#ip pim sparse-mode
```

ip pim ssm

Use the **ip pim ssm** command in Global Configuration mode to administratively configure PIM source specific multicast range of addresses for IP multicast routing. Use the **no** form of this command to remove configured ranges of addresses from the router.

Syntax

ip pim ssm {**default** | *group-address group-mask*}

no ip pim ssm {**default** | *group-address group-mask*}

- **default**—Defines the SSM range access list to 232/8.
- *group-address*—An IP multicast group address.
- group-mask—An IPv4 mask in a.b.c.d form where a, b, c and d range from 0-255.

Default Configuration

There are no group addresses configured by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ip pim ssm 239.0.10.0 255.255.255.0
```

show ip mfc

Use the **show ip mfc** command to display the multicast forwarding cache.

Syntax

show ip mfc

Default Configuration

This command does not have a default configuration.

Command Mode

Privileged Exec mode, Global Config mode, all sub-modes.

User Guidelines

This command display both the IPv4 and IPv6 MFC entries.

The following information is displayed.

Field	Description
MFC IPv4 Mode	Enabled when IPv4 multicast routing is operational.
MFC IPv6 Mode	Enabled when IPv6 multicast routing is operational.
MFC Entry Count	The number of entries present in MFC.
Total Pkts Forwarded in SW	Total Number of multicast packets forwarded in software.
Source Address	Source address of the multicast route entry.
Group Address	Group address of the multicast route entry.
Protocol	The current operating multicast routing protocol.
Pkts Forwarded in SW	Number of multicast packets that are forwarded in software for a specific multicast route entry.

Example

```
console#show ip mfc
```

```
MFC IPv4 Mode................................. Disabled
MFC IPv6 Mode................................. Disabled
MFC Entry Count............................... 0
Current multicast IPv4 protocol............... PIMSM
Current multicast IPv6 protocol............... No protocol enabled.
Total software forwarded packets.............. 0
-------------------- -------------------- ---------- --------------
Source Address       Group Address        Protocol   Pkts
     Forwarded in SW
-------------------- -------------------- ---------- --------------
192.168.28.4         232.1.2.3            PIM-SM     61
```

show ip multicast

Use the **show ip multicast** command to display the system-wide multicast information.

Syntax

show ip multicast

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays system-wide multicast information.

```
console#show ip multicast
Admin Mode..........................  Enabled
Protocol State......................  Non-Operational
Table Max Size......................  768
Protocol............................  PIMDM
Multicast forwarding cache entry count 0
```

show ip pim boundary

Use the **show ip pim boundary** command to display all the configured administrative scoped multicast boundaries.

Syntax

show ip pim boundary {vlan *vlan-id* | all}

- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays all the configured administrative scoped multicast boundaries.

```
console#show ip pim boundary all
MULTICAST BOUNDARY
Interface  Group IP  Mask
--------  ------     ---------------
```

show ip multicast interface

Use the **show ip multicast interface** command to display the multicast information for the specified interface.

Syntax

show ip multicast interface [*type number*]

- *type number*—Interface type and number for which to display IP multicast information. VLAN Vlan-ID is the only supported type and number.

Default Configuration

Show information for all multicast interfaces.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the multicast information for VLAN 15.

```
console#show ip mcast interface vlan 15
Interface  TTL
---------  -----
Vl15       1
```

show ip mroute

Use the **show ip mroute** command to display a summary or details of the multicast table.

Syntax

show ip mroute

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip mroute

                    IP Multicast route table
                                 Expiry   Up Time
Source IP       Group IP         (mm:ss)  (hh:mm:ss)  RPF Neighbor    Flags
--------------- --------------- -------- ----------- --------------- -----
192.168.0.11  239.0.5.7      3:03    15:54:12  192.168.0.10
```

show ip mroute group

Use the **show ip mroute group** command to display the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the *groupipaddr* value.

Syntax

show ip mroute group *groupipaddr* [**summary**]

- *groupipaddr* — IP address of the multicast group.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces.

```
console#show ip mroute group 239.5.5.5 summary
console#show ip mroute group 239.5.5.5
```

show ip mroute source

Use the **show ip mroute source** command to display the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the *sourceipaddr* or *sourceipaddr* | *groupipaddr* pair value(s).

Syntax

show ip mroute source *sourceipaddr* {**summary**}

- *sourceipaddr* — IP address of source.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Use the summary option to summarize the information displayed.

Example

The following example displays multicast configuration settings.

```
console#show ip mroute source 10.1.1.1 summary

console#show ip mroute source 10.1.1.1 239.5.5.5
```

show ip mroute static

Use the **show ip mroute static** command to display all the static routes configured in the static mcast table if it is specified or display the static route associated with the particular *sourceipaddr*.

Syntax

show ip mroute static [*sourceipaddr*]

- *sourceipaddr* — IP address of source.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the static routes configured in the static mcast table.

```
console#show ip mroute static

                     MULTICAST STATIC ROUTES
   Source IP      Source Mask   RPF Address     Preference
--------------- --------------- --------------- ----------
1.1.1.1         255.255.255.0   2.2.2.2         23
```

show ip pim

The **show ip pim** command displays information about the interfaces enabled for PIM.

Syntax

show ip pim

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed:

Field	Description
PIM Mode	The routers that are enabled for PIM.

Example

```
console#show ip pim

PIM Mode............................. None
```

If no routers are enabled for PIM, the following message is displayed.

```
None of the routing interfaces are enabled for PIM.
```

show ip pim bsr-router

The **show ip pim bsr-router** command displays information about a bootstrap router (BSR).

Syntax

show ip pim bsr-router {candidate|elected}

- candidate – Shows the candidate routers capable of acting as the bootstrap router.
- elected – Shows the router elected as the PIM bootstrap router.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed:

Field	Description

BSR address	IP address of the BSR.
BSR Priority	The configured BSR priority.
BSR Hash Mask Length	The configured hash mask length (32 bits maximum).
Next Bootstrap Message in	Time remaining (in hours, minutes, and seconds) until a BSR message is sent.
Next Candidate RP Advertisement	Time remaining (in hours, minutes, and seconds) until the next RP advertisement is sent.

Example

```
console#show ip pim bsr-router

BSR Address............................ 192.168.10.1
BSR Priority........................... 0
BSR Hash Mask Length................... 30
C-BSR Advertisement Interval (secs)........60
Next Bootstrap message(hh:mm:ss).......... NA
```

If no configured/elected BSRs exist on the router, the following message is displayed.

```
No BSR's exist/learned on this router.
```

show ip pim interface

The **show ip pim interface** command displays the PIM interface status parameters. If the interface number is not is specified, the command displays the status parameters of all the PIM-enabled interfaces.

Syntax

show ip pim interface [**vlan** *vlan-id*]

- *vlan-id* — A valid VLAN ID for which multicast routing has been enabled.

Field Descriptions

Field	Description
Mode	Active PIM Protocol
Interface	Interface number
Hello Interval	Hello interval value

Field	Description
Join-prune Interval	Join-prune interval value
DR Priority	DR Priority configured on this interface
BSR Border	Whether or not this interface is configured as a BSR Border
Neighbor Count	Number of PIM Neighbors learned on this interface
Designated-Router	IP address of the elected DR on the interface

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec and Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
(console)#show ip pim interface

InterfaceVLAN0010
  ModeSparse
  Hello Interval(secs)30
  Join Prune Interval(secs)60
  DR Priority1
  BSR BorderDisabled
  Neighbor Count1
  Designated Router192.168.10.1

InterfaceVLAN0001
  ModeSparse
  Hello Interval(secs)30
  Join Prune Interval(secs)60
  DR Priority1
  BSR BorderDisabled
  Neighbor Count1
  Designated Router192.168.10.1
```

If none of the interfaces are enabled for PIM, the following message is displayed:

```
None of the routing interfaces are enabled for PIM
```

show ip pim neighbor

Use the **show ip pim neighbor** command in User Exec or Privileged Exec modes to display PIM neighbors discovered by PIMv2 Hello messages. If the interface number is not specified, this command displays the neighbors discovered on all the PIM-enabled interfaces.

Syntax

show ip pim neighbor [**vlan** *vlan-id*]

- *vlan-id* — A valid VLAN ID for which multicast routing has been enabled.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The following information is displayed.

Field	Description
Neighbor Addr	IP address of the PIM neighbor
Interface	Interface number
Uptime	Time since the neighbor is learned
Expiry Time	Time remaining for the neighbor to expire

Example

```
(console)#show ip pim neighbor vlan 10
                           Up Time   Expiry Time
Neighbor Addr  Interface   hh:mm:ss  hh:mm:ss
--------------- ---------- --------- -----------
192.168.10.2    VLAN0010     00:02:55     00:01:15

(console)#show ip pim neighbor

Neighbor Addr   Interface  Uptime      Expiry Time
                           (HH:MM::SS) (HH:MM::SS)
```

```
--------------- ---------  ----------- -----------
192.168.10.2    VLAN0001      00:02:55     00:01:15
192.168.20.2    VLAN0010      00:03:50     00:02:10
```

If no neighbors are learned on any of the interfaces, the following message is displayed.

```
No neighbors are learned on any interface.
```

show ip pim rp-hash

The **show ip pim rp-hash** command displays the rendezvous point (RP) selected for the specified group address.

Syntax

show ip pim rp-hash *group-address*

- *group-address* — A valid multicast address supported by RP.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Field	Description
RP Address	Address of the RP
Type	Origin from where this group mapping was learned.

Example

```
console#show ip pim rp-hash 239.1.2.0
RP-Address  192.168.10.1    Type Static
```

If no RP Group mapping exists on the router, the following message is displayed:

```
No RP-Group mappings exist/learned for the specified group address.
```

show ip pim rp mapping

The **show ip pim rp mapping** command is used in User Exec and Privileged Exec modes to display the mappings for the PIM group to the active rendezvous points.

Syntax

show ip pim rp mapping [*rp-address* |**candidate**|**static**]

rp-address — An RP address.

Default configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Field	Description
RP Address	Address of the RP
Group Address	Address of the multicast group.
Group Mask	Mask for the group address.
Origin	Origin from where this group mapping is learned.

Example

```
console#show ip pim rp mapping candidate
RP Address.................................. 192.168.10.1
   Group Address............................ 224.1.2.1
   Group Mask............................... 255.255.0.0
   Origin................................... BSR
   C-RP Advertisement Interval (secs)......... 60
   Next Candidate RP Advertisement (hh:mm:ss). 00:00:15
```

If no RP Group mapping exists on the router, the following message is displayed:

```
No RP-Group mappings exist on this router.
```

If no static RP Group mapping exists on the router, the following message is displayed:

```
No Static RP-Group mappings exist on this router.
```

show ip pim statistics

Use the **show ip pim statistics** command to display the count of PIM sparse mode received control packets per VLAN.

Syntax

show ip pim statistics [**vlan** *vlan-id*]

vlan-id — The VLAN for which PIM sparse mode statistics are displayed.

Default configuration

There is no default configuration for this command.

Command Mode

Privileged Exec modes, Global Configuration mode and all submodes

User Guidelines

This command only displays output if pim sparse-mode is enabled.

The following statistics are displayed.

Field	Description
Stat	Rx: Packets received. Tx: Packets transmitted.
Interface	The PIM enabled routing interface.
Hello	Number of PIM Hello messages.
Register	Number of PIM Register messages.
Reg-Stop	Number of PIM Register-Stop messages.
Join/Pru	Number of PIM Join/Prune messages.
BSR	Number of PIM Boot Strap messages.

Field	Description
Assert	Number of PIM Assert messages
CRP	Number of PIM Candidate RP Advertisement messages.

Example

```
console#show ip pim statistics
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10        Rx       0        0        0        0     0      0     0
            Tx       2        0        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
Vl20        Rx       0        0        0        5     0      0     0
            Tx       8        7        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------


console#show ip pim statistics vlan 10
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10        Rx       0        0        0        0     0      0     0
            Tx       2        0        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
```

IPv6 Multicast Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON/N2200-ON Series switches support limited routing and multicast capabilities. See the Users Configuration Guide section "Feature Limitations and Platform Constants" for supported capabilities.

clear ipv6 mroute

This command is used to selectively clear dynamic IPv6 multicast entries from the cache.

Syntax

clear ipv6 mroute { * | *group-address* [*source-address*] }

*—Deletes all IPv6 entries from the IP multicast routing table.

group-address— IPv6 address of the multicast group.

source-address—IPv6 address of a multicast source that is sending multicast traffic to the group.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command does not clear static multicast route entries.

When a * entry is deleted through this command, it cannot be formed again until it is expired in MLD and started again via the host. The default mcache time-out is 210 seconds.

Example

The following example deletes all entries from the IPv6 multicast routing table:

```
console# clear ipv6 mroute *
```

The following example deletes from the IPv6 multicast routing table all entries that match the given multicast group address (FF4E::1), irrespective of which source is sending for this group:

```
console# clear ipv6 mroute FF4E::1
```

The following example deletes from the IPv6 multicast routing table all entries that match the given multicast group address (FF4E::1) and the multicast source address (2001::2):

```
console# clear ipv6 mroute FF4E::1 2001::2
```

ipv6 pim (VLAN Interface config)

Use the **ipv6 pim** command in VLAN Interface configuration mode to administratively enable PIM multicast routing mode on a particular IPv6 router interface. Use the `no` form of this command to disable PIM on an interface.

Syntax

ipv6 pim

no ipv6 pim

Default Configuration

PIM is disabled by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Either PIM-SM or PIM-DM are enabled by this command depending on the globally configured mode. Refer to the **ipv6 pim sparse-mode** and **ipv6 pim dense-mode** commands for further information.

Example

```
console(config-if-vlan3)#ipv6 pim
```

ipv6 pim bsr-border

Use the **ipv6 pim bsr-border** command to prevent bootstrap router (BSR) messages from being sent or received through an interface. Use the `no` form of this command to disable the interface from being the BSR border.

Syntax

ipv6 pim bsr-border

no ipv6 pim bsr-border

Default Configuration

BSR-border is disabled by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 pim bsr-border
```

ipv6 pim bsr-candidate

Use the **ipv6 pim bsr-candidate** command to configure the router to announce its candidacy as a bootstrap router (BSR). Use the `no` form of this command to stop the router from announcing its candidacy as a bootstrap router.

Syntax

ipv6 pim bsr-candidate vlan *vlan-id hash-mask-len* [*priority*] [interval]

no ipv6 pim bsr-candidate vlan *vlan-id*

- *vlan-id*—A valid VLAN ID value.

- *hash-mask-len*—The length of a mask that is to be ANDed with the group address before the hash function is called. All groups with the same seed hash correspond to the same RP. For example, if this value is 24, only the first 24 bits of the group addresses matter. This allows you to get one RP for multiple groups. (Range 0–128 bits).
- *priority*—The priority of the candidate BSR. The BSR with the higher priority is preferred. If the priority values are the same, the router with the higher IP address is the BSR. (Range: 0–255).
- interval—The interval at which candidate rendezvous point advertisements are sent.

Default Configuration

The router will not announce its candidacy by default.

The default hash mask length is 126 bits.

The default priority is 0.

The default C-RP advertisement interval is 60 seconds.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 pim bsr-candidate vlan 9 10 34
```

ipv6 pim dense-mode

Use the **ipv6 pim dense-mode** command in Global configuration mode to administratively configure PIM dense mode for IPv6 multicast routing. This command also enables MLD. Use the **no** form of this command to disable PIM and MLD. This command does not affect **ip multicast-routing**.

Syntax

ipv6 pim dense-mode

no ipv6 pim

Default Configuration

PIM dense mode is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

Only one of sparse or dense mode can be configured on a router. DVMRP must be disabled before enabling PIM.

Example

```
console(config)#ipv6 pim dense
```

ipv6 pim dr-priority

Use the **ipv6 pim dr-priority** command to set the priority value for which a router is elected as the designated router (DR). Use the `no` form of this command to set the priority to the default.

Syntax

ipv6 pim dr-priority *priority*

no ipv6 pim dr-priority

- *priority*—The election priority (Range: 0–2147483647).

Default Configuration

The default election priority is 1.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 pim dr-priority  10
```

ipv6 pim hello-interval

Use the **ipv6 pim hello-interval** command to configure the PIM-SM Hello Interval for the specified interface. Use the **no** form of this command to set the hello interval to the default.

Syntax

ipv6 pim hello-interval *interval*

no ipv6 pim hello-interval

- interval—The hello interval (Range: 0–18000 seconds).

Default Configuration

The default hello interval is 30 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

Setting the hello interval to 0 disables sending on PIM Hellos.

Example

```
console(config-if-vlan3)#ipv6 pim hello-interval 45
```

ipv6 pim join-prune-interval

Use the **ipv6 pim join-prune-interval** command to configure the interface join/prune interval for the PIM-SM router. Use the **no** form of this command to set the join/prune interval to the default.

Syntax

ipv6 pim join-prune-interval *interval*

no ipv6 pim join-prune-interval

- interval—The join/prune interval (Range: 0–18000 seconds).

Default Configuration

The default join/prune interval is 60 seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan3)#ipv6 pim join-prune-interval 90
```

ipv6 pim register-threshold

Use the **ipv6 pim register-threshold** command to configure the Register Threshold rate for the RP router to switch to the shortest path. Use the **no** form of this command to set the register threshold rate to the default.

Syntax

ipv6 pim register-threshold *threshold*

no ipv6 pim register-threshold

- threshold—The threshold rate (Range: 0–2000 Kbps).

Default Configuration

The default threshold rate is 0.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 pim register-threshold 250
```

ipv6 pim rp-address

Use the **ipv6 pim rp-address** command to statically configure the RP address for one or more multicast groups. The optional keyword override indicates that if there is a conflict, the RP configured with this command prevails over the RP learned by BSR. Use the **no** form of this command to remove the RP address for one or more multicast groups.

Syntax

ipv6 pim rp-address *rp-address group-address/prefixlength* [**override**]

no ipv6 pim rp-address *rp-address group-address/prefixlength*

- *rp-address*—An RP address.
- *group-address*—The group address to display.
- *prefixlength*—This parameter specifies the prefix length of the IP address for the media gateway. (Range: 1–128)

Default Configuration

There are no static RP addresses configured by default.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 pim rp-address 2001::1 ff1e::/64
```

ipv6 pim rp-candidate

Use the **ipv6 pim rp-candidate** command to configure the router to advertise itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR). Use the `no` form of this command to disable the router from advertising itself as a PIM candidate rendezvous point (RP) to the bootstrap router (BSR).

Syntax

ipv6 pim rp-candidate vlan *vlan-id group-address/prefixlength* [interval *c_rp_interval*]

no ipv6 pim rp-candidate vlan *vlan-id*

- vlan-id—A valid VLAN ID value.
- group-address—The group address to display.
- prefixlength—This parameter specifies the prefix length of the IP address for the media gateway. (Range: 1–128)
- c_rp_interval—The Candidate RP advertisement interval (range 1-16383 seconds, default 60 seconds).

Default Configuration

The router does not advertise itself as a PIM candidate rendezvous point by default.

Command Mode

Global Configuration mode

User Guidelines

The default interval for a Candidate Rendezvous Point (C-RP) to send C-RP Advertisement messages to the Bootstrap Router (BSR) is 60 seconds.

Example

```
console(config)#ipv6 pim rp-candidate vlan 6 ff1e::/64
```

ipv6 pim sparse-mode

Use the **ipv6 pim sparse-mode** command to administratively configure PIM sparse mode for multicast routing. This command also enables MLD. Use the **no** form of this command to disable PIM and MLD.

Syntax

ipv6 pim sparse-mode

no ipv6 pim

Default Configuration

IPv6 PIM sparse mode is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

Only one of sparse or dense mode can be configured on a router. DVMRP must be disabled before enabling PIM.

Example

```
console(config)#ipv6 pim sparse-mode
```

ipv6 pim ssm

Use the **ipv6 pim ssm** command to define the Source Specific Multicast (SSM) range of multicast addresses.

Syntax

ipv6 pim ssm {**default** | *group-address*/*prefixlength*}

- **default**—Defines the SSM range access list to FF3x::/32.
- *group-address*—Group IP address supported by RP.
- *prefixlength*—This parameter specifies the prefix length of the IP address for the media gateway. (Range: 1–128)

Default Configuration

The default range is FF3x::/32.

Command Mode

Global Configuration mode

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#ipv6 pim ssm ff1e::/64
```

show ipv6 pim

Use the **show ipv6 pim** command to display global status of IPv6 PIMSM and its IPv6 routing interfaces.

Syntax

show ipv6 pim

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console(config)#show ipv6 pim

PIM Mode....................................... Sparse

Interface  Interface-Mode  Operational-Status
---------  --------------  ------------------
Vl1        Enabled         Operational
```

show ipv6 pim bsr-router

Use the **show ipv6 pim bsr-router** command to display the bootstrap router (BSR) information.

Syntax

show ipv6 pim bsr-router { **candidate** | **elected** }

- candidate—Show the IPv6 PIM candidate bootstrap router information.
- elected—Show the IPv6 elected PIM bootstrap router information.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

Field descriptions are shown in the following table.

Field	Description
BSR Address	Address of the BSR
BSR Priority	Configured BSR priority
BSR Hash Mask Length	Configured hash mask length
Next Bootstrap Message	Remaining time until a BSR message is sent
Next Candidate RP Advertisement	Time remaining until the next RP advertisement is sent.

Example

```
console(config)#show ipv6 pim bsr-router candidate

BSR Address................................... 2001:0db8:0:badc::1
BSR Priority................................ 0
BSR Hash Mask Length........................ 64
C-BSR Advertisement Interval (secs)......... 60
Next Bootstrap message (hh:mm:ss)........... 00:00:32
```

If no configured/elected BSR’s exist on the router, the following message is displayed:

```
No BSR’s exist/learned on this router.
```

show ipv6 mroute

Use the **show ipv6 mroute** command to display a summary or all the details of the multicast table.

Syntax

show ipv6 mroute [**group** *groupip* [**summary**] **|** **source** *sourceip* [**summary**] **|** **static summary**]

- group—Show the multicast route information for the specified multicast group.
- source—Show the multicast route information for the specified multicast source.
- static—Show the multicast route information for the specified static multicast group.
- summary—Summarize the information.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ipv6 mroute summary

                  Multicast Route Table Summary

Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- -------
       *        FF43::5         PIMSM              Vl11
                                                   Vl13
2001::5         FF43::5         PIMSM    Vl12      Vl11
                                                   Vl13

console#show ipv6 mroute summary
```

```
                  Multicast Route Table Summary

Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- -------
       *        FF43::5         PIMSM              Vl11
                                                   Vl13
2001::5         FF43::5         PIMSM    Vl12      Vl11
                                                   Vl13

console#show ipv6 mroute source 2001::5 ?

<cr>                      Press enter to execute the command.
|                         Output filter options.
summary                   Display the IPV6 multicast routing table summary.

console#show ipv6 mroute source 2001::5

                   Multicast Route Table
                                Expiry   Up Time
Source IP       Group IP        (mm:ss)  (hh:mm:ss)  RPF Neighbor    Flags
--------------- --------------- -------- ----------- --------------- -----
2001::5         FF43::5         03:08    00:00:21    2001::5         SPT

console#show ipv6 mroute source 2001::5 summary

                  Multicast Route Table Summary

Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- -------
2001::5         FF43::5         PIMSM    Vl12      Vl11
                                                   Vl13

console#show ipv6 mroute group FF43::5 ?

<cr>                      Press enter to execute the command.
|                         Output filter options.
summary                   Display the IPV6 multicast routing table summary.

console#show ipv6 mroute group FF43::5

                   Multicast Route Table
                                Expiry   Up Time
Source IP       Group IP        (mm:ss)  (hh:mm:ss)  RPF Neighbor    Flags
--------------- --------------- -------- ----------- --------------- -----
       *        FF43::5         00:00    00:01:00    ::              RPT
2001::5         FF43::5         02:54    00:00:35    2001::5         SPT

console#show ipv6 mroute group FF43::5 summary

                  Multicast Route Table Summary
```

```
Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- -------
       *        FF43::5         PIMSM              Vl11
                                                   Vl13
2001::5         FF43::5         PIMSM    Vl12      Vl11
                                                   Vl13
```

show ipv6 mroute group

Use the **show ipv6 mroute group** command to display the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the *groupipaddr* value.

Syntax

show ipv6 mroute group *groupipaddr* [**summary**]

- *groupipaddr* — IP address of the multicast group.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ipv6 mroute group FF43::5 ?

<cr>                      Press enter to execute the command.
|                         Output filter options.
summary                   Display the IPV6 multicast routing table summary.

console#show ipv6 mroute group FF43::5

                   Multicast Route Table
                                Expiry   Up Time
Source IP       Group IP        (mm:ss)  (hh:mm:ss)  RPF Neighbor    Flags
--------------- --------------- -------- ----------- --------------- -----
```

```
      *        FF43::5         00:00    00:01:00    ::              RPT
2001::5        FF43::5         02:54    00:00:35    2001::5         SPT

console#show ipv6 mroute group FF43::5 summary

                     Multicast Route Table Summary

Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- ------
      *        FF43::5         PIMSM              Vl11
                                                  Vl13
2001::5        FF43::5         PIMSM    Vl12      Vl11
                                                  Vl13
```

show ipv6 mroute source

Use the **show ipv6 mroute source** command to display the multicast configuration settings such as flags, timer settings, incoming and outgoing interfaces, RPF neighboring routers, and expiration times of all the entries in the multicast mroute table containing the *sourceipaddr* or *sourceipaddr* | *groupipaddr* pair value(s).

Syntax

show ipv6 mroute source *sourceipaddr* {**summary** | *groupipaddr*}

- *sourceipaddr* — IP address of source.
- *groupipaddr* — IP address of multicast group.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ipv6 mroute source 2001::5 ?
```

```
<cr>                      Press enter to execute the command.
|                         Output filter options.
summary                   Display the IPV6 multicast routing table summary.

console#show ipv6 mroute source 2001::5

                   Multicast Route Table
                                Expiry   Up Time
Source IP       Group IP        (mm:ss)  (hh:mm:ss)  RPF Neighbor    Flags
--------------- --------------- -------- ----------- --------------
2001::5         FF43::5         03:08    00:00:21    2001::5         SPT

console#show ipv6 mroute source 2001::5 summary

                  Multicast Route Table Summary

Source IP       Group IP        Protocol IIF       OIF       Expiry
--------------- --------------- -------- --------- --------- ------
2001::5         FF43::5         PIMSM    Vl12      Vl11
                                                   Vl13
```

show ipv6 pim interface

Use the **show ipv6 pim interface** command to display interface config parameters. If no interface is specified, all interfaces are displayed.

Syntax

show ipv6 pim interface [**vlan** *vlan-id*]

- *vlan-id*—A valid VLAN ID value.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ipv6 pim interface vlan 6

Slot/Port..................................... vlan 6
IP Address.................................... FE80::2FF:EDFF:FED0:2/128
Hello Interval (secs)......................... 30
Join Prune Interval (secs).................... 60
Neighbor Count................................ 0
Designated Router............................. FE80::2FF:EDFF:FED0:2
DR Priority................................... 1
BSR Border.................................... Disabled
```

show ipv6 pim neighbor

Use the **show ipv6 pim neighbor** command to display IPv6 PIMSM neighbors learned on the routing interfaces.

Syntax

show ipv6 pim neighbor [**interface vlan** *vlan-id*]

- *vlan-id* —A valid VLAN ID value.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If a VLAN interface is not specified, all neighbors are shown.

Example

```
console#show ipv6 pim neighbor
Slot/Port..................................... vlan 6
Neighbor Address.............................. FE80::200:FF:FE00:33
Up Time (hh:mm:ss)............................ 00:00:12
Expiry Time (hh:mm:ss)........................ 00:01:34
DR Priority................................... 0
```

show ipv6 pim rp-hash

Use the **show ipv6 pim rp-hash** command to display which rendezvous point (RP) is being selected for a specified group.

Syntax

show ipv6 pim rp-hash *group-address*

group-address—Group IP address supported by RP.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ipv6 pim rp-hash ff1e::/64

RP                       Type
Address
------------------------ -----
3001::1                  BSR
```

show ipv6 pim rp mapping

Use the **show ipv6 pim rp mapping** command to display all group-to-RP mappings of which the router is aware (either configured or learned from the bootstrap router (BSR). If no RP is specified, all active RPs are displayed

Syntax

show ipv6 pim rp mapping [*rp-address* | *candidate* | *static*]

- *rp-address*—IP address of RP.
- candidate—Show candidate rendezvous point mappings.

- static—Show static rendezvous point mappings.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Example

```
console#show ipv6 pim rp mapping

Group Address.................................. FF1E::/64
RP Address..................................... 2001::1
origin......................................... Static
Group Address.................................. FF1E::/64
RP Address..................................... 3001::1
origin......................................... BSR
```

show ipv6 pim statistics

Use the **show ipv6 pim statistics** command to display the count of IPv6 PIM sparse mode received control packets.

Syntax

show ipv6 pim statistics [**vlan** *vlan-id*]

- **vlan** *vlan-id*—The VLAN for which to display spare mode statistics.

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec mode, Global Configuration mode, all sub-modes.

User Guidelines

This command only displays output if pim sparse-mode is enabled.

The following counters are displayed in the output.

Field	Description
Stat	Rx: Packets received.
	Tx: Packets transmitted.
Interface	The PIM enabled routing interface.
Hello	Number of PIM Hello messages.
Register	Number of PIM Register messages.
Reg-Stop	Number of PIM Register-Stop messages.
Join/Pru	Number of PIM Join/Prune messages.
BSR	Number of PIM Boot Strap messages.
Assert	Number of PIM Assert messages.
CRP	Number of PIM Candidate RP Advertisement messages.

Example

```
console#show ipv6 pim statistics
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
=====================================================================
Vl10        Rx        0        0        0        0     0      0     0
            Tx        2        0        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
Vl20        Rx        0        0        0        5     0      0     0
            Tx        8        7        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------
Gi1/0/5     Rx        0        0        6        5     0      0     0
            Tx        10       9        0        0     0      0     0

     Invalid Packets Received - 0
---------------------------------------------------------------------

console#show ipv6 pim statistics vlan 10
=====================================================================
Interface  Stat   Hello Register Reg-Stop Join/Pru  BSR  Assert  CRP
```

```
========================================================================
Vl10         Rx        0         0         0         0      0      0      0
             Tx        2         0         0         0      0      0      0

     Invalid Packets Received - 0
------------------------------------------------------------------------
```

IP Service Level Agreement Commands

Dell EMC Networking N2000E/N2100E-ON/N2200-ON/N3000-ON Series Switches

The IP service-level agreement (SLA) feature allows users to monitor network performance between routers or from a router to a remote IP device. N2000/N2100-ON/N2200-ON/N3000E-ON Series supports the following measurement capabilities:

- Remote IP reachability tracking.
- Round-trip-time threshold monitoring

These metrics are collected by measuring ICMP response time and connectivity. This feature is deployed mostly in Enterprise networks on multi-homed customer edge devices, where there is a need to automatically switch to the next priority ISP in case of reachability issues with the current ISP.

ip sla

Use the **ip sla** command to create and confirm an IP Service Level Agreement (SLAs) operation and enter IP SLA configuration mode. Use the **no** form of the command to remove all the configuration information of an IP SLA operation, which includes removing the schedule of the operation.

Syntax

ip sla *operation-number*

no ip sla *operation-number*

- operation-number—The number used to identify an IP SLA operation. The range is 1 to 128.

Default Configuration

By default, there are no operations configured.

Command Mode

Global Configuration mode

User Guidelines

Start configuring an IP SLA operation by using the **ip sla** command. This command specifies an identification number for the operation. Once this command is entered, the router enters IP SLA configuration mode.

At a minimum, an SLA consists of an operation, a tracking object and one or more routes. Routes are associated with a tracking object which is mapped to an operation. Operations may be scheduled. The tracking object maintains the state of the operation, and the associated routes are withdrawn or added to the routing table based upon the state of the tracking object. See the **track ip sla** command for information on tracking objects.

This command is supported for both IPv4 and IPv6 networks.

The maximum number of IP SLAs supported is 128 (IPv4 and IPv6 combined).

Once an operation is configured it needs to be scheduled to be started. Refer to the **ip sla schedule** global configuration command for more details on scheduling of an operation.

NOTE: The configuration of an operation cannot be modified after an operation has been scheduled to start. For modifying the configuration after the operation is scheduled, the schedule must be stopped (using the **no ip sla schedule** command) or the operation must be deleted (using the **no ip sla** command).

To display the current operational state of an IP SLA operation, use the **show ip sla configuration** command.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, operation 55 is configured as a ICMP Echo operation in an IPv4 network and is scheduled to start. The example shows the ip sla schedule command being used in an IPv4 network.

```
console(config)# ip sla 55
console(config-ip-sla)# icmp-echo 172.16.1.175
console(config-ip-sla-echo)# exit
console(config-ip-sla)# exit
console(config)# ip sla schedule 55
```

ip sla schedule

Use the **ip sla schedule** command to start an IP SLA. Use the **no** form of the command to stop an IP SLA operation.

Syntax

ip sla schedule *operation-number*

no ip sla schedule *operation-number*

- operation-number—The number used to identify an IP SLA operation. The range is 1 to 128.

Default Configuration

By default, there are no operations configured.

Command Mode

Global Configuration mode

User Guidelines

After configuring an IP SLA operation, the IP SLA is in pending state and needs to be started using the **ip sla schedule** global configuration command. To stop the operation and place it in the default state (pending), use the **no** form of this command.

By default IP SLAs are not scheduled. Once an IP SLA is created using the **ip sla** global configuration command it needs to be started (with a lifetime of forever) by using the **ip sla schedule** CLI configuration command. When an **ip sla schedule** command is issued the ip sla operation transitions from pending state to active and immediately begins probing and collecting information. The IP SLA probes can be stopped by using the **no ip sla schedule** command.

To display the current operational state of an IP SLA operation, use the **show ip sla configuration** command.

After an IP SLA has been scheduled, the configuration may not be modified. To modify the configuration of the operation, first stop the operation by using the **no ip schedule** command and then modify the configuration. Alternatively, delete the IP SLAs operation (using the **no ip sla** command) and then reconfigure the operation with the new operation parameters.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, operation 55 is configured as a ICMP Echo operation in an IPv4 network and is scheduled to start. The example shows the ip sla schedule command being used in an IPv4 network.

```
console(config)# ip sla 55
console(config-ip-sla)# icmp-echo 172.16.1.175
console(config-ip-sla-echo)# exit
console(config-ip-sla)# exit
console(config)# ip sla schedule 55
```

track ip sla

Use the **track ip sla** command to create and configure an IP Service Level Agreement (SLAs) tracking object and enter IP SLA Track Configuration mode. Use the **no** form of the command to remove all the configuration information of an IP SLA tracking object.

Syntax

track *object-number* **ip sla** *operation-number* [**reachability**|**state**]

no track *object-number*

- *object-number*—The number used to identify an IP SLA tracking object. The range is from 1 to 128.
- *operation-number*—The number used to identify an IP SLA operation. The range is 1 to 128.
- **reachability**—(Optional) Tracks whether the route is reachable.
- **state**—(Optional) Tracks the operation return code.

Default Configuration

By default, there are no tracking objects configured. The default tracking type is reachability.

Command Mode

Global Configuration mode

User Guidelines

An operation return-code value is maintained by every IP SLA operation. This return code is interpreted by the associated tracking object. The return code may return OK, OverThreshold, or Timeout.

Two facets of an IP SLAs operation can be tracked: reachability and state. The acceptance of the OverThreshold return code is the difference between these facets. Table 6-2 below shows the comparison between the reachability and state facets of IP SLAs operations that can be tracked.

Table 6-2. Comparison of Reachability and State Operations

Tracking	Return Code	Track State
Reachability	OK or OverThreshold	Up
	Timeout	Down
State	OK	Up
	Timeout, OverThreshold	Down

Tracking of a maximum of 128 (IPv4 and IPv6 combined) track objects is supported. If neither of the optional keywords (**reachability** or **state**) is specified in a configured **track ip sla** CLI command, then the default tracking type value **reachability** gets configured.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, the tracking process is configured to track the state of IP SLAs operation 5:

```
console(config)# track 2 ip sla 5 state
```

In the following example, the tracking process is configured to track the reachability of IP SLAs operation 6:

```
console(config)# track 3 ip sla 6 reachability
```

delay

Use the **delay** command to configure a delay for acting upon tracking object reachability state changes. Use the **no** form of the command to return the delay time to the default.

Syntax

delay {**up** *seconds* [**down** *seconds*] **|** [**down** *seconds*] **up** *seconds*}

no delay

- **up** *seconds*—(Optional) Time to delay the notification of an up event. Delay value, in seconds. The range is from 0 to 180. The default is 0.
- **down** *seconds*—(Optional) Time to delay the notification of a down event. Delay value, in seconds. The range is from 0 to 180. The default is 0.

Default Configuration

By default, no delay time is configured for tracking.

Command Mode

Track Configuration mode (config-track)

User Guidelines

To minimize flapping of the reachability state (Up/Down), use the **delay** command to introduce a non-zero delay in seconds between the UP and DOWN state transitions per Track object.

Delay time specifies the hold interval for an (UP/DOWN) state before taking action on the associated static routes.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, SLA 55 is created with an ICMP echo to 172.16.1.175 and then scheduled. Tracking object 10 is created using the default reachability test and is associated with IP SLAs operation 55 and then an up delay of 5 seconds and a down delay of 3 seconds is configured:

```
console(config)#ip sla 55
console(config-ip-sla)#icmp-echo 172.16.1.175
console(config-ip-sla-echo)#exit
console(config-ip-sla)#exit
console(config)#ip sla schedule 55
console(config)#track 10 ip sla 55
console(config-track)#delay up 5 down 3
```

icmp-echo

Use the icmp-echo command in IP SLA configuration mode to configure an IP Service Level Agreement (SLA) Internet Control Message Protocol (ICMP) echo operation.

Syntax

icmp-echo *destination-ip-address* [**source-interface** {*interface-name* **|** vlan *vlan-id*}]

- *destination-ip-address* —Destination IPv4 or IPv6 address.
- **source-interface** {*interface-name* **|** vlan *vlan-id*}—(Optional) Used to specify the source interface for the IP address used in the ICMP echo-request.

Default Configuration

By default, no IP SLAs operation type is configured.

Command Mode

Track Configuration mode (config-track)

User Guidelines

Only the ICMP Echo operation type is supported.

The type of IP operation (ICMP echo) must be configured before any other operational parameter. To change the operation values (*destination-ip-address* or *source-interface-name*) of an existing scheduled IP SLAs ICMP echo operation, stop the IP SLA operation using the **no ip sla schedule** *operation-number* or delete the IP SLA operation (using the **no ip sla global** configuration command) and then reconfigure the operation with the desired values.

The IP SLA ICMP echo operation supports both IPv4 and IPv6 addresses.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, SLA 55 is created with an ICMP echo to 172.16.1.175 and then scheduled. Tracking object 10 is created using the default reachability test and is associated with IP SLAs operation 55 and then an up delay of 5 seconds and a down delay of 3 seconds is configured:

```
console(config)#ip sla 55
console(config-ip-sla)#icmp-echo 172.16.1.175
console(config-ip-sla-echo)#exit
console(config-ip-sla)#exit
console(config)#ip sla schedule 55
console(config)#track 10 ip sla 55
console(config-track)#delay up 5 down 3
```

In the following example, IP SLA operation 13 is created and configured as an echo operation using the ICMP protocol and the destination IPv6 address 3001:CD6:200::1 :

```
console(config)#ip sla 13
console(config-ip-sla)#icmp-echo 3001:CD6:200::1
```

frequency

Use the **frequency** command to configure the rate at which a specified IP Service Level Agreement (SLA) operation repeats. To return to the default value, use the **no** form of the command.

Syntax

frequency *seconds*

no frequency

- *seconds* —Number of seconds between the IP SLAs operations. The range is 1 to 3600.

Default Configuration

The default is 60 seconds.

Command Mode

IP SLA ICMP Echo Configuration mode (config-ip-sla-echo).

User Guidelines

The IP SLA operation will repeat at a given frequency for the lifetime of the operation. For example, the ICMP Echo operation with a frequency of 60 sends an ICMP Echo Request packet once every 60 seconds for the lifetime of the operation. This packet is sent when the operation is started, then is sent again 60 seconds later.

If an individual IP SLAs operation takes longer to execute than the specified frequency value, a statistics counter called *busy* is incremented rather than immediately repeating the operation.

The recommended guidelines for configuring the **frequency**, **timeout** and **threshold** commands of the IP SLAs ICMP Echo operation are:

(**frequency** seconds) > (**timeout** milliseconds) > (**threshold** milliseconds).

NOTE: It is recommended to not set the frequency value to less than 60 seconds because the potential overhead from numerous active operations could significantly affect switch performance.

This command is supported in IPv4 networks and also for IPv6 networks where IPv6 addresses are supported.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to configure an IP SLAs ICMP echo operation (operation 11) to repeat every 80 seconds. This example shows the frequency (IP SLA) command being used in an IPv4 network in ICMP echo configuration mode within IP SLA configuration mode.

```
console(config)#ip sla 11
console(config-ip-sla)#icmp-echo 152.15.10.145
console(config-ip-sla-echo)#frequency 80
```

timeout

Use the **timeout** command to configure the amount of time an IP Service Level Agreement's (SLA's) operation waits for a response from its request packet. To return to the default value, use the **no** form of the command.

Syntax

timeout *milliseconds*

no timeout

- *milliseconds* —The length of time the operation waits to receive a response from its request packet, in milliseconds (ms). The range is 50 to 300000.

Default Configuration

The default is 5000 milliseconds.

Command Mode

IP SLA ICMP Echo Configuration mode (config-ip-sla-echo).

User Guidelines

Use the **timeout** (IP SLA) command to set how long the operation waits to receive a response from its request packet, and use the **frequency** (IP SLA) command to set the rate at which the IP SLA's operation restarts. The value specified for the **timeout** (IP SLA) command cannot be greater than the value specified for the **frequency** (IP SLA) command.

The recommended guidelines for configuring the **frequency**, **timeout** and **threshold** commands of the IP SLAs ICMP Echo operation are:

(**frequency** seconds) > (**timeout** milliseconds) > (**threshold** milliseconds)

This command is supported in IPv4 networks and also for IPv6 networks where IPv6 addresses are supported.

Command History

Command introduced in version 6.6 firmware.

Example

In the following example, the timeout value for an IP SLA's operation 11 is set for 2500 ms:

```
console(config)#ip sla 11
console(config-ip-sla)#icmp-echo 152.17.10.145
console(config-ip-sla-echo)#timeout 2500
```

threshold

Use the **threshold** command to set the upper threshold value for calculating network monitoring statistics created by an IP SLA operation. To reset to the default value, use the **no** form of the command.

Syntax

threshold *milliseconds*

no threshold

- *milliseconds* —The length of time in milliseconds (ms) required for a rising threshold to be declared. The range is 50 to 60000. The default is 5000 ms.

Default Configuration

The default is 5000 milliseconds.

Command Mode

IP SLA ICMP Echo Configuration mode (config-ip-sla-echo).

User Guidelines

The value specified for this command must not be greater than the value specified for the **timeout** command. The threshold value configured by this command is used only to calculate network monitoring statistics created by an IP SLA's operation.

For the IP SLA's ICMP Echo operation, the **threshold** (IP SLA) command sets the upper threshold value for the round-trip time (**RTT**) measurement.

The recommended guidelines for configuring the **frequency**, **timeout** and **threshold** commands of the IP SLAs ICMP Echo operation are:

(**frequency** seconds) > (**timeout** milliseconds) > (**threshold** milliseconds)

This command is supported in IPv4 networks and also for IPv6 networks where IPv6 addresses are supported.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to configure the threshold of the IP SLAs ICMP echo operation to 3500. This example shows the threshold (IP SLA) command being used in an IPv4 network in ICMP echo configuration mode within IP SLA configuration mode.

```
console(config)#ip sla 11
console(config-ip-sla)#icmp-echo 152.17.10.145
console(config-ip-sla-echo)#threshold 3500
```

vrf (IP SLA)

Use the **vrf** command to allow reachability monitoring within Virtual Private Networks (VPNs) using IP Service Level Agreements (SLAs). To reset to the default value, use the **no** form of the command.

Syntax

vrf *vrf-name*

no vrf

- *vrf-name*—An existing VPN routing and forwarding (VRF) name.

Default Configuration

By default, IP SLA operations occur in the Default VRF.

Command Mode

IP SLA ICMP Echo Configuration mode (config-ip-sla-echo).

User Guidelines

This command identifies the VPN for the operation being configured.

The **vrf** (IP SLA) command is supported only for IPv4 networks. This command is *not* supported in IPv6 networks to configure an IP SLAs operation that supports IPv6 addresses.

Command History

Command introduced in version 6.6 firmware.

Example

This example shows how IP SLA monitoring may be configured for a non-default VRF. The tracking object number and the operation number are the same simply for convenience.

```
console(config)#ip vrf vpn1
console(config-vrf-vpn1)#ip routing
console(config-vrf-vpn1)#exit
console(config)#vlan 100
console(config-vlan100)#interface vlan 100
console(config-if-vlan100)#ip vrf forwarding vpn1
console(config-if-vlan100)#ip address 35.1.10.1 /24
console(config-if-vlan100)#exit
console(config)#ip sla 11
console(config-ip-sla)#icmp-echo 35.1.10.2
console(config-ip-sla-echo)#vrf vpn1
console(config-ip-sla-echo)#exit
console(config-ip-sla)#exit
console(config)#ip sla schedule
console(config)#track 11 ip sla 11 reachability
console(config)#ip route vrf vpn1 10.11.12.0 /24 35.1.10.2 track 11
console(config)#interface Te1/0/1
console(config-Te1/0/1)#switchport trunk native vlan 100
console(config-Te1/0/1)#switchport mode trunk
```

clear ip sla statistics

Use the **clear ip sla statistics** command to clear IP SLA statistical information for a given IP SLA operation or for all IP SLAs.

Syntax

clear ip sla statistics [*operation-number]*

- *operation-number*—(Optional) IP SLA number of a specific operation whose statistics need to be cleared.

Default Configuration

By default, IP SLA operation statistics are cleared.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Example

This example clears the statistics for operation 11.

```
console(config)#clear ip sla statistics 11
```

show ip sla configuration

Use the **show ip sla configuration** command in User Exec mode, Privileged Exec mode, Global Configuration mode and all submodes to see the configuration values (including all defaults) for a specified IP SLA operation or all operations.

Syntax

show ip sla configuration [*operation-number*]

- *operation-number*—(Optional) IP SLA number of a specific operation associated with the statistics to display.

Default Configuration

By default, IP SLA operation configurations are shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all submodes

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Example

IP SLAs Internet Control Message Protocol (ICMP) echo operations support both IPv4 and IPv6 addresses. The sample outputs from the show ip sla configuration command for different IP SLAs operations in IPv4 and IPv6 networks are shown below.

```
console#show ip sla configuration 3

Entry number: 3
Type of operation: echo
Target address/Source address: 1.1.1.1/0.0.0.0
Operation timeout (milliseconds): 5000
Vrf Name:
Schedule:
    Next Scheduled Start Time: Start Time already passed
    Operation frequency (seconds): 60
    Life: Forever
Threshold (milliseconds): 5000
```

In the following example the output from the show ip sla configuration command when the specified operation is an ICMP echo operation in an IPv6 network is shown.

```
console#show ip sla configuration 5
```

```
Entry number: 3
Type of operation: echo
Target address/Source address: 2001:DB8:100::1/2001:0DB8:200::FFFE
Operation timeout (milliseconds): 5000
Vrf Name:
Schedule:
    Next Scheduled Start Time: Pending Trigger
    Operation frequency (seconds): 60
    Life: Forever
Threshold (milliseconds): 5000
```

show ip sla statistics

Use the **show ip sla statistics** command to see the statistics and the current operational status of a specified IP SLA operation or of all operations.

Syntax

show ip sla statistics [*operation-number*] [**details**]

- *operation-number*—(Optional) IP SLA operation number for which statistics and the operational status are displayed.
- **details**—(Optional) Statistics and the operational status are shown in greater detail.

Default Configuration

By default, IP SLA operation statistics are shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all submodes

User Guidelines

The **show ip sla statistics** command when issued shows the current state of IP SLAs operations, including whether the operation is active and also the monitoring data returned for the last (most recently completed) operation.

Command History

Command introduced in version 6.6 firmware.

Example

```
console# show ip sla statistics details

Round Trip Time (RTT) for       Index 1
Type of operation: icmp-echo
        Latest RTT: 1 ms
Latest operation start time: 47 milliseconds
Latest operation return code: OK
Over thresholds occurred: FALSE
Number of successes: 14
Number of failures: 0
Operation time to live: Forever
Operational state of entry: Active
```

show track

Use the **show track** to display detailed information for all tracking objects or for a specific track-object. This command is also used to display brief information for all tracking objects or for tracking objects associated with an IP SLA operation.

Syntax

show track [**brief** | *track-number* | {**ip sla** *operation-number*}]

- **brief**—(Optional) To display brief information for all tracking objects.
- *track-number*—(Optional) Tracking object's number whose detailed information needs to be displayed.
- **ip sla** *operation-number*—(Optional) IP SLA operation number of associated tracking object related information to be displayed.

Default Configuration

By default, IP SLA operation statistics are shown.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all submodes

User Guidelines

The **show track brief** command shows limited information in a tabular format. The other invocations of the command display more detailed information.

Command History

Command introduced in version 6.6 firmware.

Example

The example below shows detailed information for all track objects.

```
console#show track

Track 10
  IP SLA 1 reachability
  Reachability is Up
    1 change, last change 01:12:36
  Delay up 5 secs, down 5 secs
  Latest operation return code: OK
  Latest RTT (millisecs) 1500

Track 11
  IP SLA 2 state
  State is Up
    1 change, last change 00:41:55
  Delay up 10 secs, down 10 secs
  Latest operation return code: OK
  Latest RTT (millisecs) 1000

Track 13
  IP SLA 1 state
  State is Up
    1 change, last change 00:34:08
  Delay up 5 secs, down 5 secs
  Latest operation return code: OK
  Latest RTT (millisecs) 1500
```

The following example shows detailed information for track object 10.

```
console#show track 10

Track 10
  IP SLA 1 reachability
  Reachability is Up
    1 change, last change 01:12:36
  Delay up 5 secs, down 5 secs
  Latest operation return code: OK
```

```
  Latest RTT (millisecs) 1500
```

The example below shows brief information for all track objects associated with IP SLA operation 1.

```
console#show track ip sla 1

Track   Object                    Parameter         Value Last Change
10      ip sla      1             reachability      Up    01:12:36
13      ip sla      1             state             Up    00:34:08
```

The example below shows brief information for all track objects.

```
console#show track brief

Track   Object                    Parameter         Value Last Change
10      ip sla      1             reachability      Up    01:12:36
11      ip sla      2             state             Up    00:41:55
13      ip sla      1             state             Up    00:34:08
```

OSPF Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON/N2200-ON series support limited routing and multicast capabilities. See the Users Configuration Guide section “Feature Limitations and Platform Constants” for supported capabilities.

OSPF is a link-state protocol. Dell EMC Networking OSPF supports variable-length subnet masks. Dell EMC Networking OSPF only operates over VLAN interfaces.

OSPF operates within a hierarchy. The largest entity within the hierarchy is the autonomous system (AS), a collection of networks under a common administration sharing a common routing strategy. This is sometimes called a routing domain. An AS can be divided into a number of areas or groups of contiguous networks and attached hosts. Routers within the same area share the same information, so they have identical topological databases. Information is sent in the form of link-state advertisements (LSAs) to all other routers within the same hierarchical area. An area's topology is not visible to routers outside the area.

Two different types of OSPF routing occur as a result of area partitioning: Intra-area and Inter-area. Intra-area routing occurs if a source and destination are in the same area. Inter-area routing occurs when a source and destination are in different areas. An OSPF backbone distributes information between areas.

For IPv4 networks, Dell EMC Networking routing supports OSPF version 2 in accordance with RFC 2328. The Dell EMC Networking routing also provides a compatibility mode for the RFC 1583 OSPF specification, which allows interoperability with OSPF version 2 routers using the older implementation.

The Dell EMC Networking OSFPv2 implementation supports point-to-point operation on Ethernet interfaces. The user can configure an OSPFv2 interface to run in broadcast or point-to-point mode. When there are only two routers attached to the link, OSPFv2 point-to-point mode has the advantage of not requiring designated router election or origination of a network LSA for the LAN. This makes the protocol more efficient. Dell EMC Networking also supports OSPFv3 for use with IPv6 networks.

The Dell EMC Networking routing OSPF NSSA feature supports RFC 3101, The OSPF Not-So-Stubby Area (NSSA) Option.

Route Preferences

Normally, OSPF select routes in the following order:

- Local
- Static
- Intra-area
- Inter-area
- External
- RIP

Dell EMC Networking OSPF allows the administrator to change the preference for selecting intra, inter, and external routes according to the following rules:

a External route preferences apply to all ospf external routes like type1, type2, nssa-type1, nssa-type2 equally.

b Multiple route types may be configured with equal preference values.

c Configuring a route preference of 255 makes the route ineligible to be selected as the best route to its destination. That is, a route type with a preference of 255 shall never be used for forwarding.

The RIP preference is not used in IPv6 routing.

OSPF Equal Cost Multipath (ECMP)

A device running the IP routing protocol OSPF maintains multiple equal-cost routes to all destinations. The multiple routes are of the same type (intra-area, inter-area, type 1 external or type 2 external), cost, and have the same associated area. However, each route is defined by a separate advertising router and next hop.

With ECMP, a device forwards traffic to a specified destination through multiple paths thereby taking advantage of the bandwidth of both links.

ECMP routes are configured statically or learned dynamically as follows:

- Configured Statically: If an operator configures multiple static routes to the exact same destination but with different next hops, those routes are treated as a single route with two next hops.
- Learned Dynamically: Routing protocols can learn ECMP routes. For example, if OSPF is configured on both links connecting Router A to Router B with interface addresses 10.1.1.2 and 10.1.2.2 respectively, and Router B advertises its connection to 20.0.0.0/ 8, then Router A computes an OSPF route to 20.0.0.0/8 with next hops of 10.1.1.2 and 10.1.2.2.

Dell EMC Networking routing stores static and dynamic routes in a single combined routing table. RTO accepts ECMP routes, but it is important to understand that RTO does not combine routes from different sources to create ECMP routes. Referring to the above configuration, assume OSPF is only configured on the 10.1.1.2 Router B interface connecting Router A and Router B. Then on Router A, OSPF reports to RTO a route to 20.0.0.0/8 with a next hop of 10.1.1.2. If the user configures a static route to 20.0.0.0/8 with a single next hop of 10.1.2.2, RTO does NOT combine the OSPF and static route into a single route to 20.0.0.0/8 with two next hops. All next hops within an ECMP route must be provided by the same source.

On Dell EMC Networking N3000-ON, N3100, and N3200-ON platforms, the ECMP hashing support utilizes Enhanced hashing mode, which provides improved load-balancing performance. ECMP hashing on these platforms has the following features:

- MODULO-N operation based on the number N of next hops in the route.
- Packet attributes selection based on the packet type. For IP packets, the following fields are used: Source IP address, Destination IP address, TCP/UDP port, IPv4 Protocol, IPv6 next header.

Forwarding of OSPF Opaque LSAs Enabled by Default

Dell EMC Networking supports the flooding capability of opaque LSAs. Dell EMC Networking cannot originate or process opaque LSAs. In the past, the capability to flood opaque LSAs was disabled by default.

Passive Interfaces

The passive interface feature is used to disable sending OSPF routing updates on an interface. An OSPF adjacency will not be formed on such an interface. On a passive interface, subnet prefixes for IP addresses configured on the interface will continue to be advertised as stub networks.

Graceful Restart

The Dell EMC Networking implementation of OSPFv2 supports graceful restart as specified in RFC 3623. Graceful restart works in concert with Dell EMC Networking nonstop forwarding to enable the hardware to continue forwarding IPv4 packets using OSPFv2 routes while a backup unit takes over management unit responsibility. When OSPF executes a graceful restart, it informs its neighbors that the OSPF control plane is restarting, but that it will be back shortly. Helpful neighbors continue to advertise to the rest of the network that they have full adjacencies with the restarting router, avoiding announcement of a topology change and everything that goes with that (i.e., flooding of LSAs, SPF runs). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

Dell EMC Networking implements both the restarting router and helpful neighbor features described in RFC 3623.

area default-cost (Router OSPF)

Use the **area default-cost** command in Router OSPF Configuration mode to configure the advertised default cost for the stub area. Use the **no** form of the command to return the cost to the default value.

Syntax

area *area-id* **default-cost** *integer*

no area *area-id* **default-cost**

- *area-id* — Identifies the OSPF stub area to configure. (Range: IP address or decimal from 0-4294967295)
- *integer* — The default cost for the stub area. (Range: 1–16777215)

Default Configuration

10 is the default configuration for *integer*.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example identifies a stub area of 10 and default cost of 100.

```
console(config)#router ospf
console(config-router)#area 10 default-cost 100
```

area nssa (Router OSPF)

Use the **area nssa** command in Router OSPF Configuration mode to configure the specified area ID to function as an NSSA. If the area has not been previously created, this command creates the area and then applies the NSSA distinction. If the area already exists, the NSSA distinction is added or modified. Use the **no** form of the command to remove the NSSA distinction from the specified area ID.

Syntax

area *area-id* **nssa** [**no-redistribution**] [**default-information-originate** [**metric** *metric-value*] [**metric-type** *metric-type-value*]] [**no-summary**] [**translator-role role**] [**translator-stab-intv interval**]

no area *area-id* **nssa** [**no-redistribution**] [**default-information-originate**] [**no-summary**] [**translator-role**] [**translator-stab-intv**]

- *area-id*—Identifies the OSPF stub area to configure. (Range: IP address or decimal from 0–4294967295)
- *metric-value*—Specifies the metric of the default route advertised to the NSSA. (Range: 1–16777214)
- *metric-type-value*—The metric type can be one of the following:
  - A metric type of nssa-external 1

  - A metric type of nssa-external 2 (default)
- **role**—The translator role where role is one of the following:
  - always - The router assumes the role of the translator when it becomes a border router.
  - candidate - The router to participate in the translator election process when it attains border router status.
- **interval**—The period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router. (Range: 0–3600)

Default Configuration

If no metric is defined, 10 is the default configuration.

The default role is candidate. The default metric is type 2.

Command Mode

Router OSPF Configuration mode.

User Guidelines

Specifying a metric with no metric type is equivalent to specifying a metric with a metric type of 2.

Example

The following example configures not-so-stubby-area 10 as an NSSA.

```
console(config)#router ospf
console(config-router)#area 10 nssa
```

The following example configures the metric value and type for the default route advertised into the NSSA and configures the NSSA so that summary LSAs are not advertised into the NSSA.

```
console(config-router)#area 20 nssa default-info-originate metric 250
metric-type 2 no-summary
```

area nssa default-info-originate (Router OSPF Config)

Use the **area nssa default-info-originate** command in Router OSPF Configuration mode to configure the metric value and type for the default route advertised into the NSSA. The metric type can be comparable (nssa-external 1) or noncomparable (nssa-external 2). Use the no form of the command to return the metric value and type to the default value.

Syntax

area *area-id* **nssa default-info-originate** [*integer*] [**comparable | non-comparable**]

no area *area-id* **nssa default-info-originate**

- *area-id* — Identifies the OSPF NSSA to configure. (Range: IP address or decimal from 0–4294967295)
- *integer* — Specifies the metric of the default route advertised to the NSSA. (Range: 1–16777214)
- **comparable** — A metric type of nssa-external 1
- **non-comparable** — A metric type of nssa-external 2

Default Configuration

If no metric is defined, 10 is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the metric value and type for the default route advertised into the NSSA.

```
console(config-router)#area 20 nssa default-info-originate 250 non-
comparable
```

area nssa no-redistribute

Use the **area nssa no-redistribute** command in Router OSPF Configuration mode to configure the NSSA Area Border router (ABR) so that learned external routes are not redistributed to the NSSA.

Syntax

area *area-id* **nssa no-redistribute**

no area *area-id* **nssa no-redistribute**

- *area-id* — Identifies the OSPF NSSA to configure. (Range: IP address or decimal from 0–4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the NSSA ABR.

```
console(config-router)#area 20 nssa no-redistribute
```

area nssa no-summary

Use the **area nssa no-summary** command in Router OSPF Configuration mode to configure the NSSA so that summary LSAs are not advertised into the NSSA.

Syntax

area *area-id* **nssa no-summary**

no area *area-id* **nssa no-summary**

- *area-id* — Identifies the OSPF NSSA to configure. (Range: 0–4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the NSSA so that summary LSAs are not advertised into the NSSA.

```
console(config-router)#area 20 nssa no-summary
```

area nssa translator-role

Use the **area nssa translator-role** command in Router OSPF Configuration mode to configure the translator role of the NSSA.

Syntax

area *area-id* **nssa translator-role** {**always** | **candidate**}

no area *area-id* **nssa translator-role**

- *area-id* — Identifies the OSPF NSSA to configure. (Range: IP address or decimal from 0–4294967295)
- always — The router assumes the role of the translator when it becomes a border router.
- candidate — The router to participate in the translator election process when it attains border router status.

Default Configuration

The default role is candidate.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the translator role of the NSSA.

```
console(config-router)#area 20 nssa translator-role always
```

area nssa translator-stab-intv

Use the **area nssa translator-stab-intv** command in Router OSPF Configuration mode to configure the translator stability interval of the NSSA.

Syntax

area *area-id* **nssa translator-stab-intv** *integer*

no area *area-id* **nssa translator-stab-intv**

- *area-id* — Identifies the OSPF NSSA to configure. (Range: IP address or decimal from 0–4294967295)
- *integer* — The period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router. (Range: 0–3600)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the translator stability interval of the area 20 NSSA.

```
console(config-router)#area 20 nssa translator-stab-intv 2000
```

area range (Router OSPF)

Use the **area range** command in Router OSPF Configuration mode to configure a summary prefix that an area border router advertises for a specific area. There are two types of area ranges. An area range can be configured to summarize intra-area routes. An ABR advertises the range rather than the specific intra-area route as a type 3 summary LSA. Also, an area range can be configured at the edge of an NSSA to summarize external routes reachable within the NSSA. The range is advertised as a type 5 external LSA.

Use the **no** form of the command to delete an area range or revert an option to its default.

Syntax

area *area-id* **range** *prefix netmask* {**summarylink | nssaexternallink**} [**advertise | not-advertise**] [cost *cost*]

no area *area-id* **range** *prefix netmask* {**summarylink | nssaexternallink**}

- *area-id* —Identifies the OSPF NSSA to configure. (Range: IP address or decimal from 0–4294967295)
- *prefix netmask*—The summary prefix to be advertised when the ABR computes a route to one or more networks within this prefix in this area.
- **summarylink**—When this keyword is given, the area range is used when summarizing prefixes advertised in type 3 summary LSAs.
- **nssaexternallink**—When this keyword is given, the area range is used when translating type 7 LSAs to type 5 LSAs.
- **advertise**—[Optional] When this keyword is given, the summary prefix is advertised when the area range is active. This is the default.
- **not-advertise**—[Optional] When this keyword is given, neither the summary prefix nor the contained prefixes are advertised when the area range is active. Then the not-advertise option is given, any static cost previously configured is removed from the system configuration.
- **cost**—[Optional] If an optional cost is given, OSPF sets the metric field in the summary LSA to the configured value, rather than setting the metric to the largest cost among the networks covered by the area range. A static cost may only be configured if the area range is configured to advertise the summary. The range is 0 to 16,777,215. If the cost is set to 16,777,215 for type 3 summarization, a

type 3 summary LSA is not advertised, but contained networks are suppressed. This behavior is equivalent to specifying the not-advertise option. If the range is configured for type 7 to type 5 translation, a type 5 LSA is sent if the metric is set to 16,777,215; however, other routers will not compute a route from a type 5 LSA with this metric.

Default Configuration

No area ranges are configured by default. No cost is configured by default.

Command Mode

OSPFv2 Router Configuration mode

User Guidelines

The **no** form of this command can be used to delete an area range. For example:

```
!! Create area range
console (config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink
!! Delete area range
console (config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink
```

The **no** form may be used to revert the [**advertise** | **not-advertise**] option to its default without deleting the area range. Deleting and recreating the area range would cause OSPF to temporarily advertise the prefixes contained within the range. Note that using either the **advertise** or **not-advertise** keyword reverts the configuration to the default. For example:

```
!! Create area range. Suppress summary.
console (config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink not-
advertise
!! Advertise summary.
console (config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink not-
advertise
```

The **no** form may be use to remove a static area range cost, so that OSPF sets the cost to the largest cost among the contained routes. For example:

```
!! Create area range with static cost.
console (config-router)#area 1 range 10.0.0.0 255.0.0.0 summarylink cost 1000
!! Remove static cost.
console (config-router)#no area 1 range 10.0.0.0 255.0.0.0 summarylink cost
```

If the user tries to configure both types of ranges for the same prefix and area:

```
A T3 range with the same prefix is already configured on this area.
```

If the network mask is invalid:

```
console (config-router)#area 1 range 0.0.0.0 0.0.0.0 summarylink
An area range mask must have contiguous ones and be no longer than 31 bits.
```

If the prefix is not a valid area range prefix:

```
console (config-router)#area 1 range 0.0.0.0 255.0.0.0 summarylink
Cannot create this area range because it represents a default route.

console (config-router)#area 1 range 225.0.0.0 255.0.0.0 summarylink
225.0.0.0 255.0.0.0 is an invalid prefix for an area range.
```

If the maximum number of ranges is already configured:

```
console (config-router)#area 3 range 90.0.0.0 255.0.0.0 summarylink cost 50
The maximum number of area ranges (60) is already configured.
```

If the user tries to delete an area range that does not exist:

```
console (config-router)#no area 4 range 40.0.0.0 255.0.0.0 summarylink
Delete failed. No matching area range configured.
```

Example

The following example defines an area range for the area 20.

```
console(config-router)#area 20 range 192.168.6.0 255.255.255.0 summarylink
advertise
```

area stub

Use the **area stub** command in Router OSPF Configuration mode to create a stub area for the specified area ID. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS

External LSAs and Summary LSAs can significantly reduce the link state database of routers within the stub area. Use the no form of the command to remove the stub area.

Syntax

area *area-id* **stub**

no area *area-id* **stub**

- *area-id* — Identifies the area identifier of the OSPF stub. (Range: IP address or decimal from 0–4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

Use the **area stub no-summary** command, in conjunction with this command, to create a totally stubby area.

Examples

The following examples define area 3 for the stub and then removes the stub area.

```
console(config-router)#area 3 stub
console(config-router)#no area 3 stub
```

area stub no-summary

Use the **area stub no-summary** command in Router OSPF Configuration mode to prevent Summary LSAs from being advertised into the NSSA. Use the no form of the command to return the Summary LSA mode to the default value.

Syntax

area *area-id* **stub no-summary**

no area *area-id* **stub no-summary**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)

Default Configuration

Disabled is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command creates a totally stubby area when used in conjunction with the **area stub** command.

Example

The following example prevents the Summary LSA from being advertised into the area 3 NSSA. Area 3 will be configured as a totally stubby area.

```
console(config-router)#area 3 stub
console(config-router)#area 3 stub no-summary
```

area virtual-link

Use the **area virtual-link** command in Router OSPF Configuration mode to create the OSPF virtual interface for the specified area-id and neighbor router. To remove the link, use the **no** form of the command. Use the optional parameters to configure authentication, dead-interval, hello-interval, retransmit-interval and transmit-delay. If the area has not been previously created, it is created by this command. If the area already exists, the virtual-link information is added or modified.

Syntax

area *area-id* **virtual-link** *router-id* [**authentication** [**message-digest** | **null**]] [**hello-interval** *seconds*] [**retransmit-interval** *seconds*] [**transmit-delay** *seconds*] [**dead-interval** *seconds*] [[**authentication-key** *key*] | [message-digest-key *key-id* **md5** *key*]]

no area *area-id* **virtual-link** *router-id* [**authentication** [**message-digest** | **null**]] [**hello-interval**] [**retransmit-interval**] [**transmit-delay**] [**dead-interval**] [[**authentication-key**] | [**message-digest-key**]]

- *area-id*—Identifies the OSPF stub area to configure. (Range: IP address or decimal from 0-4294967295)
- *router-id*—Valid IP address.
- **authentication**—Specifies authentication type.
- **message-digest** —Specifies that message-digest authentication is used.
- **null**—No authentication is used. Overrides password or message-digest authentication if configured for the area.
- **hello-interval** *seconds*—Number of seconds to wait before sending hello packets to the OSPF virtual interface. (Range: 1–65535)
- **dead-interval** *seconds*—Number of seconds to wait before the OSPF virtual interface on the virtual interface is assumed to be dead. (Range: 1–65535)
- **retransmit-interval** *seconds*—The number of seconds to wait between retransmitting LSAs if no acknowledgment is received. (Range: 0–3600)
- **transmit-delay** *seconds*—Number of seconds to increment the age of the LSA before sending, based on the estimated time it takes to transmit from the interface. (Range: 0–3600)
- **md5**—Use MD5 Encryption for an OSPF Virtual Link.
- *key*—Authentication key for the specified interface. (Range: 8 bytes or less if the authentication type is simple and 16 bytes or less if the type is encrypt.)
- *key-id*—Authentication key identifier for the authentication type encrypt. (Range: 0–255)

Default Configuration

Parameter	Default
area-id	No area ID is predefined.
router-id	No router ID is predefined.

Parameter	Default
hello-interval seconds	10 seconds
retransmit-interval seconds	5 seconds
transmit-delay seconds	1 second
dead-interval seconds	40 seconds
authentication-key key	No key is predefined.
message-digest-key key-id md5 key	No key is predefined.

Command Mode

Router OSPF Configuration mode.

User Guidelines

Unauthenticated interfaces cannot be configured with an authentication key. Use the area virtual-link authentication command to enable configuration of an authentication key.

Example

The following example establishes a virtual link with a 40-second transmit-delay interval and default values for all other optional parameters:

```
router ospf
 network 10.50.50.0 0.0.0.255 area 10
 area 10 virtual-link 192.168.2.2 transmit-delay 40
```

The following example establishes a virtual link with MD5 authentication:

```
router ospf
 network 10.50.50.0 0.0.0.255 area 10
 area 10.0.0.0 virtual-link 10.3.4.5 message-digest-key 100 md5 test123
```

area virtual-link authentication

Use the **area virtual-link authentication** command in Router OSPF Configuration mode to configure the authentication type and key for the OSPF virtual interface identified by the area ID and neighbor ID. Use the no form of the command to return the authentication type to the default value.

Syntax

area *area-id* **virtual-link** *neighbor-id* **authentication** [**none** | **simple** *key* | **encrypt** *key key-id*]

no area *area-id* **virtual-link** *neighbor-id* **authentication**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the Router identifier of the neighbor.
- encrypt — Use MD5 Encryption for an OSPF Virtual Link.
- *key* — Authentication key for the specified interface. (Range: 8 bytes or less if the authentication type is simple and 16 bytes or less if the type is encrypt.)
- *key-id* — Authentication key identifier for the authentication type encrypt. (Range: 0–255)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

Unauthenticated interfaces cannot be configured with an authentication key. If no parameters are specified after the authentication keyword, then plain-text password authentication is used.

Example

The following example configures the authentication type and key for the area 10 OSPF virtual interface and neighbor ID.

```
console(config-router)#area 10 virtual-link 192.168.2.7 authentication
console(config-router)#area 10 virtual-link 192.168.2.7 authentication
encrypt test123 1001010
```

area virtual-link dead-interval

Use the **area virtual-link dead-interval** command in Router OSPF Configuration mode to configure the dead interval for the OSPF virtual interface on the virtual interface identified by area-id and neighbor router. Use the no form of the command to return the dead interval to the default value.

Syntax

area *area-id* **virtual-link** *neighbor-id* **dead-interval** *seconds*

no area *area-id* **virtual-link** *neighbor-id* **dead-interval**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the Router ID of the neighbor.
- *seconds* — Number of seconds to wait before the OSPF virtual interface on the virtual interface is assumed to be dead. (Range: 1–2147483647)

Default Configuration

40 seconds is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the dead interval for the area 10 OSPF virtual interface on the virtual interface and neighbor router.

```
console(config-router)#area 10 virtual-link 192.168.2.2 dead-interval 655555
```

area virtual-link hello-interval

Use the **area virtual-link hello-interval** command in Router OSPF Configuration mode to configure the hello interval for the OSPF virtual interface on the virtual interface identified by the area ID and neighbor ID. Use the no form of the command to return the hello interval to the default value.

Syntax

area *area-id* **virtual-link** *neighbor-id* **hello-interval** *seconds*

no area *area-id* **virtual-link** *neighbor-id* **hello-interval**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the Router ID of the neighbor.
- *seconds* — Number of seconds to wait before sending hello packets to the OSPF virtual interface. (Range: 1–65535)

Default Configuration

10 seconds is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a 50-second wait interval.

```
console(config-router)#area 10 virtual-link 192.168.2.2 hello-interval 50
```

area virtual-link retransmit-interval

Use the **area virtual-link retransmit-interval** command in Router OSPF Configuration mode to configure the retransmit interval for the OSPF virtual interface on the virtual interface identified by the area ID and neighbor ID. Use the no form of the command to return the retransmit interval to the default value.

Syntax

area *area-id* **virtual-link** *neighbor-id* **retransmit-interval** *seconds*

no area *area-id* **virtual-link** *neighbor-id* **retransmit-interval**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the Router ID of the neighbor.
- *seconds* — The number of seconds to wait between retransmitting LSAs if no acknowledgment is received. (Range: 0–3600)

Default Configuration

The default configuration is 5 seconds.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a 500-second retransmit wait interval.

```
console(config-router)#area 10 virtual-link 192.168.2.2 retransmit-interval
500
```

area virtual-link transmit-delay

Use the **area virtual-link transmit-delay** command in Router OSPF Configuration mode to configure the transmit delay for the OSPF virtual interface identified by the area ID and neighbor ID. Use the no form of the command to return the transmit delay to the default value.

Syntax

area *area-id* **virtual-link** *neighbor-id* **transmit-delay** *seconds*

no area *area-id* **virtual-link** *neighbor-id* **transmit-delay**

- *area-id* — Identifies the OSPF area to configure. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the Router ID of the neighbor.
- *seconds* — Number of seconds to increment the age of the LSA before sending, based on the estimated time it takes to transmit from the interface. (Range: 0–3600)

Default Configuration

1 second is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a 40-second transmit-delay interval.

```
console(config-router)#area 10 virtual-link 192.168.2.2 transmit-delay 40
```

auto-cost

By default, OSPF computes the link cost of each interface from the interface bandwidth. The link cost is computed as the ratio of a “reference bandwidth” to the interface bandwidth (ref_bw / interface bandwidth), where interface bandwidth is defined by the “bandwidth” command. Because the default reference bandwidth is 100 Mbps, OSPF uses the same default link cost for all interfaces whose bandwidth is 100 Mbps or greater. To change the reference bandwidth, use the auto-cost command, specifying the reference bandwidth in megabits per second. The different reference bandwidth can be independently configured for OSPFv2 and OSPFv3.

Syntax

auto-cost reference-bandwidth *ref_bw*

- *ref_bw* — The reference bandwidth in Mbps (Range: 1–4294967).

Default Configuration

The default reference bandwidth is 100 Mbps.

Command Mode

OSPFv2 or OSPFv3 Router Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example configures a reference bandwidth of 500 Mbps.

console(config-router)#auto-cost reference-bandwidth 500

bandwidth

By default, OSPF computes the link cost of an interface as the ratio of the reference bandwidth to the interface bandwidth. Reference bandwidth is specified with the auto-cost command. For the purpose of the OSPF link cost calculation, the bandwidth command specifies the interface bandwidth. The bandwidth is specified in kilobits per second. If no bandwidth is configured, the bandwidth defaults to the actual interface bandwidth for port-based routing interfaces and to 10 Mbps for VLAN routing interfaces. This command does not affect the actual speed of an interface.

Syntax

bandwidth *bw*

- *bw* — Interface bandwidth in Kbps (Range: 1–10000000).

Default Configuration

The default reference bandwidth is 10 Mbps

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example configures the interface bandwidth to 500000 Kbps.

```
console(config-if-vlan1)#bandwidth 500000
```

bfd

Use the **bfd** command to enable processing of BFD events by OSPF on all interfaces enabled for BFD. Use the **no** form of the command to ignore BFD events.

Syntax

bfd

no bfd

Default Configuration

The processing of BFD events is not enabled by default.

Command Mode

Router OSPF Configuration mode, Router OSPFv3 Configuration mode

User Guidelines

BFD processing notifies OSPF of layer 3 connectivity issues with the peer. The interface must be a VLAN interface enabled for routing.

BFD event notification must also be enabled in VLAN interface mode in order for processing of BFD events to occur.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example

```
console#configure
console(config)#ip routing
console(config)#interface vlan 3
console(config-if-vlan3)#ip address 192.168.0.1 /24
console(config-if-vlan3)#ip ospf area 0
console(config-if-vlan3)#ip ospf bfd
onsole(config-if-vlan3)#exit
console(config)#router ospf
console(config-router)#bfd
```

capability opaque

Use the **capability opaque** command to enable Opaque Capability on the router. Use the “no” form of this command to disable Opaque Capability.

Syntax

capability opaque

no capability opaque

Default Configuration

Opaque Capability is enabled by default.

Command Mode

Router Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-router)#capability opaque
```

clear ip ospf

Use the **clear ip ospf** command to reset specific OSPF states. If no parameters are specified, OSPF is disabled and then re-enabled.

Syntax

clear ip ospf [{**configuration** | **redistribution** | **counters** | **neighbor** [**interface vlan** *vlan id* [*neighbor id*]]}] [**vrf** *vrf-name*]

- **configuration** — Reset the OSPF configuration to factory defaults.
- **redistribution** — Flush all self-originated external LSAs. Reapply the redistribution configuration and re originate prefixes as necessary.
- **counters** — Reset global and interface statistics.
- **neighbor** — Drop the adjacency with all OSPF neighbors. On each neighbor's interface, send a one-way hello. Adjacencies may then be reestablished.
- **interface vlan** *vlan-id* — Drop adjacency with all neighbors on a specific interface.
- *neighbor-id* — Drop adjacency with a specific router ID on a specific interface.
- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode.

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Example

The following example shows the options for the **clear ip ospf** command.

```
console#clear ip ospf ?
<cr> Press enter to execute the command.
configuration Restore OSPF configuration to defaults
counters Clear OSPF counters
neighbor Bounce all OSPF neighbors
redistribution Flush and re-originate external LSAs
```

clear ip ospf stub-router

Use the **clear ip ospf stub-router** command to force OSPF to exit stub router mode when it has automatically entered stub router mode because of a resource limitation.

Syntax

clear ip ospf stub-router [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

OSPF only exits stub router mode if it entered stub router mode because of a resource limitation or if it is in stub router mode at startup. This command has no effect if OSPF is configured to be in stub router mode permanently.

The VRF identified in the parameter must have been previously created or an error is returned.

compatible rfc1583

Use the **compatible rfc1583** command in Router OSPF Configuration mode to enable OSPF 1583 compatibility. Use the **no** form of the command to disable it.

Syntax

compatible rfc1583

no compatible rfc1583

Syntax Description

This command has no arguments or keywords.

Default Configuration

Compatible with RFC 1583.

Command Mode

Router OSPF Configuration mode.

User Guidelines

If all OSPF routers in the routing domain are capable of operating according to RFC 2328, OSPF 1583 compatibility mode should be disabled.

Example

The following example enables 1583 compatibility.

```
console(config-router)#compatible rfc1583
```

default-information originate (Router OSPF Configuration)

Use the **default-information originate** command in Router OSPF Configuration mode to control the advertisement of default routes. Use the **no** form of the command to return the default route advertisement settings to the default value.

Syntax

default-information originate [**always**] [**metric** *metric-value*] [**metric-type type-value**]

no default-information originate [metric] [metric-type]

- **always**—Always advertise default routes.
- *metric-value*—The metric (or preference) value of the default route. (Range: 1–16777214)
- **type-value**—One of the following:

1. External type-1 route.
2. External type-2 route.

Default Configuration

The default configuration is **no default-information originate**. The default metric is none and the default type is 2.

Command Mode

Router OSPF Configuration mode.

User Guidelines

The only routers that actually have Internet connectivity should advertise a default route. All other routers in the network should learn the default route from the routers that have connections to the Internet. The edge router should also have a static default route configured with an upstream ISP router as the destination. The **always** keyword will cause the router to advertise a default route to its neighbors, even if no valid default route is known.

Example

The following example always advertises default routes.

```
console(config-router)#default-information originate always metric 100
metric-type 1
```

default-metric

Use the **default-metric** command in Router OSPF Configuration mode to set a default for the metric of distributed routes. Use the **no** form of the command to remove the metric from the distributed routes. If the area has not been previously created, it is created by this command. If the area already exists, the default-metric information is added or modified.

Syntax

default-metric *metric-value*

no default-metric

- *metric-value* — The metric (or preference) value of the default route. (Range: 1–16777214)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets a value of 50 for the default metric.

```
console(config-router)#default-metric 50
```

distance ospf

The **distance ospf** command sets the preference values of OSPF route types in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be intra, inter, external. All the external type routes are given the same preference value. Use the **no** form of this command to reset the preference values to the default.

Syntax

distance ospf {[*intra-area dist1*] [*inter-area dist2*] [*external dist3*]}

no distance ospf {*intra-area* | *inter-area* | *external*}

- *intra-area dist1*—Used to select the best path within an area when there are two or more routes to the same destination from two different routing protocols (Range: 1–255).
- *inter-area dist2*—Used to select the best path from one area to another area when there are two or more routes to the same destination from two different routing protocols (Range: 1–255).
- *external dist3*—Used to select the best path for routes from other routing domains, learned by redistribution when there are two or more routes to the same destination from two different routing protocols (Range: 1–255).

Default Configuration

The default preference value is 110 for dist1, dist2 and dist3.

Command Mode

Router OSPF Configuration mode.

Router OSPFv3 Configuration mode.

User Guidelines

There are no user guidelines for this command.

Examples

The following examples set route preference values of OSPF in the router.

```
console(config-router)#distance ospf intra 4
console(config-router)#distance ospf type1 19
```

distribute-list out

Use the **distribute-list out** command in Router OSPF Configuration mode to specify the access list to filter routes received from the source protocol. Use the **no** form of the command to remove the specified source protocol from the access list.

Syntax

distribute-list *name* **out** {**bgp** | **rip** | **static** | **connected**}

no distribute-list *name* **out** {**bgp** | **rip** | **static** | **connected**}

- *name*—The name used to identify an existing ACL. The range is 1–31 characters.
- **bgp**—Apply the specified access list when BGP is the source protocol.
- **rip**—Apply the specified access list when RIP is the source protocol.
- **static**—Apply the specified access list when packets come through the static route.
- **connected**—Apply the specified access list when packets come from a directly connected route.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example specifies the access list to filter routes received from the RIP source protocol.

```
console(config-router)#distribute-list ACL40 out rip
```

enable

Use the **enable** command in Router OSPF Configuration mode to set the administrative mode of OSPF in the router (active). OSPF is now globally enabled using the **router ospf** command. Use the **no** form of the command to disable the administrative mode for OSPF.

Syntax

enable

no enable

Default Configuration

Disabled is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

The **no** form of the **enable** command removes the OSPF router configuration from the running config. It does not, however, reset the OSPF configuration. For example, following **no enable** with the **enable** command restores the OSPF configuration to the running config.

OSPF must be disabled in order to assign or change the router ID.

Example

The following example enables OSPF router mode.

```
console(config-router)#enable
```

exit-overflow-interval

Use the **exit-overflow-interval** command in Router OSPF Configuration mode to configure the exit overflow interval for OSPF. When a router leaves the overflow state it can originate non-default AS-external-LSAs. When set to 0, the router will not leave Overflow State until restarted. Use the no form of the command to return the interval to the default value.

Syntax

exit-overflow-interval *seconds*

no exit-overflow-interval

- *seconds* — Number of seconds after entering overflow state that a router will wait before attempting to leave the overflow state. (Range: 0–2147483647)

Default Configuration

0 seconds is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the exit overflow interval for OSPF at 10 seconds.

```
console(config-router)#exit-overflow-interval 10
```

external-lsdb-limit

Use the **external-lsdb-limit** command in Router OSPF Configuration mode to configure the external LSDB limit for OSPF. If the value is -1, then there is no limit. When the number of non-default AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit non-default AS-external-LSAs in it database. Use the no form of the command to return the limit to the default value.

Syntax

external-lsdb-limit *integer*

no external-lsdb-limit

- *integer* — Maximum number of non-default AS-external-LSAs allowed in the router's link-state database. (Range: –1 to 2147483647)

Default Configuration

-1 is the default configuration.

Command Mode

Router OSPF Configuration mode.

User Guidelines

The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area.

Example

The following example configures the external LSDB limit for OSPF with the number of non-default AS-external-LSAs set at 20.

```
console(config-router)#external-lsdb-limit 20
```

ip ospf area

The **ip ospf area** command enables OSPFv2 and sets the area ID of an interface. This command supersedes the effects of network area command. It can also configure the advertisability of the secondary addresses on this interface into OSPFv2 domain. Use the “no” form of this command to disable OSPFv2 on an interface.

Syntax

ip ospf area *area-id* [**secondaries none**]

no ip ospf area [**secondaries none**]

- *area-id* — The ID of the area (Range: IP address or decimal from 0 –4294967295).

Default Configuration

OSPFv2 is disabled by default. No area id is configured by default.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-if-vlan1)#ip ospf area 192.168.1.10
console(config-if-vlan1)#ip ospf area 3232235786
```

ip ospf authentication

Use the **ip ospf authentication** command in the Interface Configuration mode to set the OSPF Authentication Type and Key for the specified interface. Use the no form of the command to return the authentication type to the default value.

Syntax

ip ospf authentication {**none** | {**simple** *key*} | {**encrypt** *key key-id*}}

no ip ospf authentication

- encrypt — MD5 encrypted authentication key.
- *key* — Authentication key for the specified interface. (Range: 8 bytes or less if the authentication type is **simple** and 16 bytes or less if the type is **encrypt**.)
- *key-id* — Authentication key identifier for the authentication type **encrypt**. (Range: 0–25)

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

Unauthenticated interfaces do not need an authentication key or authentication key ID.

Example

The following example sets the OSPF Authentication Type and Key for VLAN 15.

```
console(config-if-vlan15)#ip ospf authentication encrypt test123 100
```

ip ospf cost

Use the **ip ospf cost** command in Interface Configuration mode to configure the cost on an OSPF interface. Use the **no** form of the command to return the cost to the default value.

Syntax

ip ospf cost *interface-cost*

no ip ospf cost

- *interface-cost* — Specifies the cost (link-state metric) of the OSPF interface. (Range: 1–65535)

Default Configuration

10 is the default link-state metric configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the cost on the OSPF interface at 5.

```
console(config-if-vlan1)#ip ospf cost 5
```

ip ospf database-filter all out

Use the **ip ospf database-filter all out** command in Interface Configuration mode to prevent flooding of OSPF LSAs on an interface.

Use the **no** form of the command to enable flooding of LSAs on an interface.

Syntax

ip ospf database-filter all out

no ip ospf database-filter all out

Default Configuration

By default, LSAs are flooded on all interfaces in a routed VLAN.

Command Mode

Interface Configuration mode

User Guidelines

This command is only applicable to OSPFv2 routing configurations.

ip ospf dead-interval

Use the **ip ospf dead-interval** command in Interface Configuration to set the OSPF dead interval for the specified interface. Use the no form of the command to return the interval to the default value.

Syntax

ip ospf dead-interval *seconds*

no ip ospf dead-interval

- *seconds* — Number of seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. (Range: 1–65535)

Default Configuration

40 is the default number of seconds.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e., 4).

Example

The following example sets the dead interval at 30 seconds.

```
console(config-if-vlan1)#ip ospf dead-interval 30
```

ip ospf hello-interval

Use the **ip ospf hello-interval** command in Interface Configuration mode to set the OSPF hello interval for the specified interface. Use the no form of the command to return the interval to the default value.

Syntax

ip ospf hello-interval *seconds*

no ip ospf hello-interval

- *seconds* — Number of seconds to wait before sending Hello packets from the interface. (Range: 1–65535)

Default Configuration

10 is the default number of seconds.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The value for the length of time must be the same for all routers attached to a network.

Example

The following example sets the OSPF hello interval at 30 seconds.

```
console(config-if-vlan1)#ip ospf hello-interval 30
```

ip ospf mtu-ignore

Use the **ip ospf mtu-ignore** command in Interface Configuration mode to disable OSPF maximum transmission unit (MTU) mismatch detection. OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the

Database Description packet is rejected and the OSPF adjacency is not established. Use the no form of the command to enable OSPF maximum transmission unit (MTU) mismatch detection.

Syntax

ip ospf mtu-ignore

no ip ospf mtu-ignore

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example disables OSPF MTU mismatch detection on VLAN interface 15.

```
console(config-if-vlan1)#ip ospf mtu-ignore
```

ip ospf network

Use the **ip ospf network** command to configure OSPF to treat an interface as a point-to-point rather than broadcast interface. To return to the default value, use the no form of this command.

Syntax

ip ospf network {*broadcast* | *point-to-point*}

no ip ospf network

- *broadcast* — Set the network type to broadcast.
- *point-to-point* — Set the network type to point-to-point

Default Configuration

Interfaces operate in broadcast mode by default.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

OSPF treats interfaces as broadcast interfaces by default. Loopback interfaces have a special loopback network type, which cannot be changed. When there are only two routers on the network, OSPF can operate more efficiently by treating the network as a point-to-point network. For point-to-point networks, OSPF does not elect a designated router or generate a network link state advertisement (LSA). Both endpoints of the link must be configured to operate in point-to-point mode.

Example

The following example shows the options for the **ip ospf network** command.

```
console(config-if-vlan1)#ip ospf network ?

broadcast Set the OSPF network type to Broadcast
point-to-point Set the OSPF network type to Point-to-Point
```

ip ospf priority

Use the **ip ospf priority** command in Interface Configuration mode to set the OSPF priority for the specified router interface. Use the **no** form of the command to return the priority to the default value.

Syntax

ip ospf priority *number-value*

no ip ospf priority

- *number-value* — Specifies the OSPF priority for the specified router interface. (Range: 0–255)

Default Configuration

1 is the default integer value.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

A value of 1 is the highest router priority. A value of 0 indicates that the interface is not eligible to become the designated router on this network.

Example

The following example sets the OSPF priority for the VLAN 15 router at 100.

```
console(config-if-vlan1)#ip ospf priority 100
```

ip ospf retransmit-interval

Use the **ip ospf retransmit-interval** command in Interface Configuration mode to set the OSPF retransmit Interval for the specified interface. Use the no form of the command to return the interval to the default value.

Syntax

ip ospf retransmit-interval *seconds*

no ip ospf retransmit-interval

- *seconds* — Number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. (Range: 0–3600 seconds)

Default Configuration

5 is the default number of seconds.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

A value of 1 is the highest router priority. A value of 0 indicates that the interface is not eligible to become the designated router on this network.

Example

The following example sets the OSPF retransmit Interval for VLAN 15 at 50 seconds.

```
console(config-if-vlan1)#ip ospf retransmit-interval 50
```

ip ospf transmit-delay

Use the **ip ospf transmit-delay** command in Interface Configuration mode to set the OSPF Transit Delay for the specified interface. Use the no form of the command to return the delay to the default value.

Syntax

ip ospf transmit-delay *seconds*

no ip ospf transmit-delay

- *seconds* — Sets the estimated number of seconds it takes to transmit a link state update packet over this interface. (Range: 1–3600 seconds)

Default Configuration

1 is the default number of seconds.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF Transit Delay for VLAN 15 at 20 seconds.

```
console(config-if-vlan1)#ip ospf transmit-delay 20
```

log adjacency-changes

Use the **log adjacency-changes** command in OSPFv2 Router Configuration mode to enable logging of OSPFv2 neighbor state changes.

Use the **no** form of the command to disable state change logging.

Syntax

log-adjacency-changes [detail]

no log-adjacency-changes [detail]

- **detail**—(Optional) When this keyword is specified, all adjacency state changes are logged. Otherwise, OSPF only logs transitions to FULL state and when a backwards transition occurs.

Default Configuration

Adjacency changes are not logged by default.

Command Mode

OSPFv2 Router Configuration mode

User Guidelines

State changes are logged with INFORMATIONAL severity.

max-metric router-lsa

Use the **max-metric router-lsa** command in router OSPF Global Configuration mode to configure OSPF to enable stub router mode.

To disable stub router mode, use the **no max-metric router-lsa** command in OSPFv2 Global Router Configuration mode.

Syntax

max-metric router-lsa [on-startup *seconds*] [summary-lsa {*metric*}]

no max-metric router-lsa [on-startup] [summary-lsa]

- **on-startup**—(Optional) OSPF starts in stub router mode after a reboot.
- *seconds*—(Required if on-startup) The number of seconds that OSPF remains in stub router mode after a reboot. The range is 5 to 86,400 seconds. There is no default value.
- **summary-lsa**—(Optional) Set the metric in type 3 and 4 summary LSAs to LsInfinity (0xFFFFFF).

- *metric*—(Optional) Metric to send in summary LSAs when in stub router mode. Range is 1 to 16,777,215. Default is 16,711,680 (0xFF0000).

Default Configuration

By default, OSPF is not in stub router mode.

Command Mode

OSPFv2 Global Configuration mode

User Guidelines

When OSPF is in stub router mode, as defined by RFC 3137, OSPF sets the metric in the non-stub links in its router LSA to LsInfinity. Other routers therefore compute very long paths through the stub router, and prefer any alternate path. Doing so eliminates all transit traffic through the stub router, when alternate routes are available. Stub router mode is useful when adding or removing a router from a network or to avoid transient routes when a router reloads.

One can administratively force OSPF into stub router mode. OSPF remains in stub router mode until OSPF is taken out of stub router mode. Alternatively, one can configure OSPF to start in stub router mode for a specific period of time after the router boots up.

If the summary LSA metric is set to 16,777,215, other routers will skip the summary LSA when they compute routes.

If the router is configured to enter stub router mode on startup (max-metric router-lsa on-startup), and one then enters max-metric router lsa, there is no change. If OSPF is administratively in stub router mode (the max-metric router-lsa command has been given), and one configures OSPF to enter stub router mode on startup (max-metric router-lsa on-startup), OSPF exits stub router mode (assuming the startup period has expired) and the configuration is updated.

The command **no max-metric router-lsa** clears either type of stub router mode (always or on-startup) and resets the summary-lsa option. If OSPF is configured to enter global configuration mode on startup, and during normal operation one wants to immediately place OSPF in stub router mode, one may issue the command no max-metric router-lsa on-startup. The command no max-metric router-lsa summary-lsa causes OSPF to send summary LSAs with metrics computed using normal procedures defined in RFC 2328.

maximum-paths

Use the **maximum-paths** command in Router OSPF Configuration mode to set the number of paths that OSPF can report for a given destination. Use the no form of the command to reset the number to the default value.

Syntax

maximum-paths *integer*

no maximum-paths

- *integer* — Number of paths that OSPF can report for a given destination. (Range: 1–4.)

Default Configuration

4 is the *integer* default value.

Command Mode

Router OSPF Configuration mode.

User Guidelines

OSPF is only enabled on an interface if the primary IPv4 address on the interface matches a network area range. Any individual interface can only be attached to a single area. If an interface address matches multiple network area ranges, the interface is assigned to the area for the first matching range. If the **ip ospf area** command is given for an interface, it overrides any matching network area command.

OSPF only advertises IP subnets for secondary IP addresses if the secondary address is within the range of a network area command for the same area as the primary address on the same interface.

When a network area command is deleted, matching interfaces are reevaluated against all remaining network area commands.

Example

The following example sets the number of paths at 2 that OSPF can report for a given destination.

```
console(config-router)#maximum-paths 2
```

network area

The **network area** command enables OSPFv2 on an interface and sets its area ID if the ip-address of an interface is covered by this network command. Use the “no” form of this command to disable OSPFv2 on an interface.

Syntax

network *ip-address wildcard-mask* **area** *area-id*

no network *ip-address wildcard-mask* **area** *area-id*

- *ip-address* — Base IPv4 address of the network area.
- *wildcard-mask* — The network mask indicating the wildcard bit. A 1 bit in the mask indicates a don’t care condition for the corresponding bit in the address.
- *area-id* — The ID of the area (Range: IPv4 address or 32-bit decimal in the range 0–4294967295).

Default Configuration

OSPFv2 is disabled

Command Mode

Router OSPF Configuration mode.

User Guidelines

OSPF is only enabled on an interface if the primary IPv4 address on the interface matches a network area range. Any individual interface can only be attached to a single area. If an interface address matches multiple network area ranges, the interface is assigned to the area for the first matching range. If the **ip ospf area** command is given for an interface, it overrides any matching network area command.

OSPF only advertises IP subnets for secondary IP addresses if the secondary address is within the range of a network area command for the same area as the primary address on the same interface.

When a network area command is deleted, matching interfaces are reevaluated against all remaining network area commands.

Ones in the wildcard mask indicate “don't care” bits in the network address.

Example

```
console(config-router)#network 10.50.50.0 0.0.0.255 area 4
```

nsf

Use this command to enable OSPF graceful restart. Use the **no** form of this command to disable graceful restart.

Syntax

nsf [**ietf**] [**planned-only**]

no nsf [**ietf**]

- **ietf** — This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.
- **planned-only** — This keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the **initiate failover** command).

Default Configuration

Graceful restart is disabled by default

Command Mode

Router OSPF Configuration mode

User Guidelines

Graceful restart works in concert with nonstop forwarding to enable the hardware to continue forwarding IPv4 packets using OSPFv2 routes while a backup unit takes over management unit responsibility. When OSPF executes a graceful restart, it informs its neighbors that the OSPF control plane is restarting, but that it will be back shortly. Helpful neighbors continue to advertise to the rest of the network that they have full adjacencies with the restarting router, avoiding announcement of a topology change and everything that goes with that (i.e., flooding of LSAs, SPF runs). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

This implementation of graceful restart restarting router behavior is only useful with a router stack. Graceful restart does not work on a standalone, single-unit router.

nsf helper

Use the **nsf-helper** to allow OSPF to act as a helpful neighbor for a restarting router. Use the “no” form of this command to prevent OSPF from acting as a helpful neighbor.

Syntax

nsf [**ietf**] **helper**[**planned-only**]

no nsf [**ietf**] **helper**

- **planned-only** — This keyword indicates that OSPF should only help a restarting router performing a planned restart.

Default Configuration

OSPF may act as a helpful neighbor for both planned and unplanned restarts

Command Mode

Router OSPF Configuration mode

User Guidelines

The grace LSA announcing the graceful restart includes a restart reason. Reasons 1 (software restart) and 2 (software reload/upgrade) are considered planned restarts. Reasons 0 (unknown) and 3 (switch to redundant control processor) are considered unplanned restarts.

nsf ietf helper disable is functionally equivalent to no nsf helper and is supported solely for IS CLI compatibility.

nsf helper strict-lsa-checking

Use the **nsf-helper strict-lsa-checking** command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs. Use the “no” form of this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Syntax

nsf [**ietf**] **helper strict-lsa-checking**

no nsf [**ietf**] **helper strict-lsa-checking**

- **ietf** —This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.

Default Configuration

A helpful neighbor exits helper mode when a topology change occurs.

Command Mode

Router OSPF Configuration mode

User Guidelines

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router.

A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

nsf restart-interval

Use the **nsf restart-interval** command to configure the length of the grace period on the restarting router. Use the “no” form of this command to revert the grace period to its default.

Syntax

nsf [**ietf**] **restart-interval** *seconds*

no nsf [**ietf**] **restart-interval**

- **ietf** — This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.
- *seconds* — The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The restarting router includes the restart interval in its grace LSAs (range 1–1800 seconds).

Default Configuration

The default restart interval is 120 seconds.

Command Mode

Router OSPF

User Guidelines

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

Example

```
console(config-router)#nsf restart-interval 180
```

passive-interface default

The **passive-interface default** command enables the global passive mode by default for all interfaces. It overrides any interface level passive mode. Use the "no" form of this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to non-passive mode.

Syntax

passive-interface default

no passive-interface default

Default Configuration

Global passive mode is disabled by default.

Command Mode

Router OSPF Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-router)#passive-interface
```

passive-interface

Use the **passive-interface** command to set the interface as passive. It overrides the global passive mode that is currently effective on the interface. Use the “no” form of this command to set the interface as non-passive.

Syntax

passive-interface vlan *vlan-id*

no passive-interface vlan *vlan-id*

- *vlan-id* — The VLAN number

Default Configuration

Passive interface mode is disabled by default.

Command Mode

Router OSPF Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-router)#passive-interface vlan 1
```

redistribute (OSPF)

Use the **redistribute** command in Router OSPF Configuration mode to configure OSPF protocol to allow redistribution of routes from the specified source protocol/routers. Use the **no** version of the command to disable redistribution from the selected source or to reset options to their default values.

Syntax

redistribute {protocol}[**metric** ***metric-value***] [**metric-type** ***type-value***] [**tag** ***tag-value***] [**subnets**]

no redistribute {protocol}[**metric**] [**metric-type**] [**tag**] [**subnets**]

- *protocol* —One of the following:
  - static—Specifies that static routes are to be redistributed.
  - connected—Specifies that connected routes are to be redistributed.
  - bgp—Specifies BGP originated routes are to be redistributed.
  - rip—Specifies RIP originated routes are to be redistributed.
- *metric-value*—Specifies the metric to use when redistributing the route. (Range: 0–16777214)
- *type-value*—One of the following:
  - Type 1 external route.
  - Type 2 external route.
- *tag-value*—Inserts the specified tag value into redistributed routes.(Range: 0–4294967295)
- **subnets**—Specifies whether to redistribute the routes to subnets.

Default Configuration

The default tag value is 0.

There is no default metric or route map configured.

Command Mode

Router OSPF Configuration mode

User Guidelines

When redistributing a route metric, the receiving protocol must understand the metric. The OSPF metric is a cost value equal to 10^8/ link bandwidth in bits/sec. For example, the OSPF cost of GigabitEthernet is $10^8/10^8 = 1$.

The RIP metric is a hop count with a maximum value of 15 (infinity).

If no metric value is specified, the metric redistributed for a type 1 route is the sum of the external cost and the internal cost used to reach that route.

The metric redistributed for a type 2 route is always the external cost, irrespective of the interior cost to reach that route. Redistribution of BGP originated routes is only available on BGP-capable routers.

Example

The following example configures OSPF protocol to allow redistribution of RIP originated routes with a metric of 5 and a route tag of 555.

```
console(config-router)#redistribute rip metric 3 metric-type 1 tag 555
subnets
```

router-id

Use the **router-id** command in Router OSPF Configuration mode to set a 32-bit integer in 4-digit dotted-decimal number uniquely identifying the router ID.

Syntax

router-id *router-id*

- *router-id*— A 32-bit interface (in IPv4 address format) that uniquely identifies the router ID.

Default Configuration

There is no default router ID.

Command Mode

Router OSPF Configuration mode.

User Guidelines

The router-id must be set in order for OSPF to become operationally enabled. It is recommended that the router ID be set to the IP address of a loopback interface to ensure that the router remains up internally.

Example

The following example defines the router ID as 5.5.5.5.

```
console(config)#router ospf
console(config-router)#router-id 5.5.5.5
```

router ospf

Use the **router ospf** command in Global Configuration mode to enter Router OSPF mode and globally enable OSPF. Using the no form of the command disables OSPF and removes the OSPF interface and global configuration.

Syntax

router ospf [**vrf** *vrf-name*]

no router ospf

- *vrf-name*—The name of the VRF if which OSPF is to be enabled. If no VRF is specified, OSPF is enabled for the global routing instance.

Default Configuration

OSPF routing is disabled by default

Command Mode

Global Configuration mode.

User Guidelines

The command prompt changes when the **router ospf** command executes.

The VRF identified in the parameter must have been previously created or an error is returned.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

IPv4 OSPF is the only routing protocol currently implemented for VRFs.

The **no** form of the command removes all OSPF configuration (including interface configuration) for the specified VRF

Example

The following example enters into router OSPF mode.

```
console(config)#router ospf
console(config-router)#
```

show ip ospf

Use the **show ip ospf** command to display information relevant to the OSPF router. This command has been modified to show additional fields.

Syntax

show ip ospf [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Syntax Description

This command has no arguments or keywords.

Default Configuration

There is no default configuration for this command.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Some of the information below displays only if you enable OSPF and configure certain features. The following fields may be displayed:

Field	Description
Router ID	A 32-bit integer in dotted decimal format identifying the router about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether OSPF is administratively enabled or disabled.
RFC 1583 Compatibility	This configuration option controls the preference rules used when choosing among multiple external LSAs advertising the same destination. When enabled, the preference rules remain those specified by RFC 1583. When disabled, the preference rules are those stated in Section 16.4.1 of RFC 2328. These rules prevent routing loops when external LSAs for the same destination have been originated from different areas.
External LSDB Limit	Shows the maximum number of non-default external LSAs entries that can be stored in the link-state database.
Exit Overflow Interval	Shows the number of seconds that, after entering OverflowState, as defined by RFC 1765, a router will attempt to leave OverflowState.
Spf Delay Time	The number of seconds to wait before running a routing table calculation after a topology change.
Spf Hold Time	The minimum number of seconds between routing table calculations.
Flood Pacing Interval	The average time, in milliseconds, between LS Update packet transmissions on an interface. This is the value configured with the **timers pacing flood** command.
LSA Refresh Group Pacing Time	The size of the LSA refresh group window, in seconds. This is the value configured with the **timers pacing lsa-group** command.
Opaque Capability	Shows whether router is capable of sending Opaque LSAs.
AutoCost Ref BW	The configured autocost reference bandwidth. This value is used to determine the OSPF metric on its interfaces. The reference bandwidth is divided by the interface speed to compute the metric.

Default Passive Setting	When enabled, OSPF interfaces are passive by default.
Maximum Paths	Shows the maximum number of paths that OSPF can report for a given destination.
Default Metric	Default metric for redistributed routes.
Stub Router Configuration	One of **Always**, **Startup**, or **None**.
Stub Router Startup Time	Configured value in seconds. This row is only listed if OSPF is configured to be a stub router at startup.
Summary LSA Metric Override	One of **Enabled** (*met*), **Disabled**, where *met* is the metric to be sent in summary LSAs when in stub router mode.
BFD Enabled	The BFD status.
Default Route Advertise	When enabled, OSPF originates a type 5 LSA advertising a default route.
Always	When this option is configured, OSPF only originates a default route when the router has learned a default route from another source.
Metric	Shows the metric for the advertised default routes. If the metric is not configured, this field is not configured.
Metric Type	Shows whether the metric for the default route is advertised as External Type 1 or External Type 2.
Number of Active Areas	The number of OSPF areas to which the router is attached on interfaces that are up.
ABR Status	Shows whether the router is an OSPF Area Border Router.
ASBR Status	Indicates whether the router is an autonomous system border router. Router automatically becomes an ASBR when it is configured to redistribute routes learned from another protocol. The possible values for the ASBR status is enabled (if the router is configured to redistribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router Status	One of **Active** or **Active**.
Stub Router Reason	One of **Configured**, **Startup**, or **Resource Limitation**. This row is only listed if stub router is active.

Stub Router Time Remaining	The remaining time until OSPF exits stub router mode. This row is only listed if OSPF is in startup stub router mode.
External LSDB Overflow	OSPF enters this state when the number of external LSAs exceeds a configured limit, as described in RFC 1765.
External LSA Count	Shows the number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	Shows the sum of the LS checksums of external link-state advertisements contained in the link-state database.
AS_OPAQUE LSA Count	Shows the number of AS Opaque LSAs received.
AS_OPAQUE LSA Checksum	Sum of the checksums of all AS Opaque LSAs in the link state database.
New LSAs Originated	Shows the number of link-state advertisements that have been originated.
LSAs Received	Shows the number of link-state advertisements received determined to be new instantiations.
LSA Count	The number of LSAs in the link state database.
Maximum Number of LSAs	The limit on the number of LSAs that the router can store in its link state database.
LSA High Water Mark	The maximum number of LSAs that have been in the link state database since OSPF began operation.
AS Scope LSA Flood List Length	The number of LSAs currently in the global flood queue waiting to be flooded through the OSPF domain. LSAs with AS flooding scope, such as type 5 external LSAs and type 11 Opaque LSAs.
Retransmit List Entries	The current number of entries on all neighbors' retransmit lists.
Maximum Number of Retransmit Entries	The maximum number of entries that can be on neighbors' retransmit lists at any given time. This is the sum for all neighbors. When OSPF receives an LSA and cannot allocate a new retransmit list entry, the router does not acknowledge the LSA, expecting the sender to retransmit.
Retransmit Entries High Water Mark	The maximum number of retransmit list entries that have been on all neighbors' retransmit lists at one time.
NSF Support	Whether graceful restart is administratively enabled. Possible values are Support Always, Disabled, or Planned.

NSF Restart Interval	The number of seconds a helpful neighbor allows a restarting router to complete its graceful restart.
NSF Restart Status	Whether the router is currently performing a graceful restart.
NSF Restart Age	The number of seconds until a graceful restart expires. Only non-zero when the router is in graceful restart.
NSF Restart Exit Reason	The reason the previous graceful restart ended. Possible values are Not attempted, In progress, Completed, Timed out, Topology change, and Manual clear.
NSF Helper Support	Whether this router is configured to act as a graceful restart helpful neighbor. Possible values are: Helper Support Always, Disabled, or Planned.
NSF Helper Strict LSA Checking	As a graceful restart helpful neighbor, whether to terminate the helper relationship if a topology change occurs during a neighbor's graceful restart.
Redistributing	This field is a heading and appears only if you configure the system to take routes learned from a non-OSPF source and advertise them to its peers.
Source	Shows source protocol/routes that are being redistributed. Possible values are BGP, connected, RIP, and static.
Tag	Shows the decimal value attached to each external route.
Subnets	When this option is not configured, OSPF will only redistribute classful prefixes.
Distribute-List	Shows the access list used to filter redistributed routes.

Example #1

The following example displays OSPF router information.

```
console#show ip ospf

Router ID............................... 1.1.1.1
OSPF Admin Mode......................... Enable
RFC 1583 Compatibility.................. Enable
External LSDB Limit..................... No Limit
Exit Overflow Interval.................. 0
Spf Delay Time.......................... 5
Spf Hold Time........................... 10
Opaque Capability....................... Disable
AutoCost Ref BW......................... 100 Mbps
Default Passive Setting................. Disabled
```

```
Maximum Paths............................ 4
Default Metric........................... Not configured
Default Metric........................... Not configured
Stub Router Configuration................ None
Summary LSA Metric Override.............. Disabled

BFD Enabled.............................. NO

Default Route Advertise.................. Disabled
Always................................... FALSE
Metric................................... Not configured
Metric Type.............................. External Type 2


Number of Active Areas... 1 (1 normal, 0 stub, 0 nssa)
ABR Status.......................... Disable
ASBR Status......................... Disable
Stub Router......................... FALSE
External LSDB Overflow.............. FALSE
External LSA Count.................. 0
External LSA Checksum............... 0
AS_OPAQUE LSA Count................. 0
AS_OPAQUE LSA Checksum.............. 0
New LSAs Originated................. 25
LSAs Received....................... 7
LSA Count........................... 4
Maximum Number of LSAs.............. 18200
LSA High Water Mark................. 4
Retransmit List Entries............. 0
Maximum Number of Retransmit Entries..72800
Retransmit Entries High Water Mark... 2

NSF Support.......................... Disabled
NSF Restart Interval................. 120
NSF Restart Status................... Not Restarting
NSF Restart Age...................... 0 seconds
NSF Restart Exit Reason.............. Not Attempted
NSF Helper Support................... Always
NSF Helper Strict LSA Checking........ Enabled
```

Example #2

The following example displays the length of the global flood queue for LSAs with AS flooding scope and for stub router configuration. Also displayed are the values of the LSA pacing configuration parameters.

```
console#show ip ospf
Router ID................................... 1.1.1.1
OSPF Admin Mode............................. Enable
RFC 1583 Compatibility...................... Enable
External LSDB Limit......................... No Limit
```

```
Exit Overflow Interval........................ 0
Spf Delay Time................................ 5
Spf Hold Time................................. 10
Flood Pacing Interval......................... 33 ms
LSA Refresh Group Pacing Time................. 60 sec
Opaque Capability............................. Enable
AutoCost Ref BW............................... 100 Mbps
Default Passive Setting....................... Disabled
Maximum Paths................................. 4
Default Metric................................ Not configured
Stub Router Configuration..................... <val>
Stub Router Startup Time...................... <val> seconds
Summary LSA Metric Override................... Enabled (<met>)
BFD Enabled...................................YES


Default Route Advertise....................... Disabled
Always........................................ FALSE
Metric........................................ Not configured
Metric Type................................... External Type 2


Number of Active Areas........................ 2 (2 normal, 0 stub, 0 nssa)
ABR Status.................................... Enable
ASBR Status................................... Disable
Stub Router Status............................ Inactive
Stub Router Reason............................ <reason>
Stub Router Time Remaining.................... <duration> seconds
External LSDB Overflow........................ FALSE
External LSA Count............................ 0
External LSA Checksum......................... 0
AS_OPAQUE LSA Count........................... 0
AS_OPAQUE LSA Checksum........................ 0
New LSAs Originated........................... 300269
LSAs Received................................. 300276
LSA Count..................................... 6020
Maximum Number of LSAs........................ 36968
LSA High Water Mark........................... 6020
AS Scope LSA Flood List Length................ 0
Retransmit List Entries....................... 0
Maximum Number of Retransmit Entries.......... 147872
Retransmit Entries High Water Mark............ 32616
NSF Helper Support............................ Always
NSF Helper Strict LSA Checking................ Enabled
```

show ip ospf abr

The **show ip ospf abr** command displays the internal OSPF routing table entries to Area Border Routers (ABR). This command takes no options.

Syntax

show ip ospf abr [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

```
console#show ip ospf abr
Type  Router Id   Cost  Area ID         Next Hop    Next Hop
                                                    Intf
----- ---------   ----- --------------- ---------   --------
INTRA 3.3.3.3     1     0.0.0.1         10.1.23.3   vlan11
INTRA 4.4.4.4     10    0.0.0.1         10.1.24.4   vlan12
```

show ip ospf area

Use the **show ip ospf area** command to display information about the identified OSPF area.

Syntax

show ip ospf area *area-id* [**vrf** *vrf-name*]

- *area-id* —Identifies the OSPF area whose ranges are being displayed. (Range: 0–4294967295)

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example #1

The following example displays OSPF router information.

```
console#show ip ospf area 10
AreaID......................................... 0.0.0.10
External Routing............................... Import External LSAs
Spf Runs....................................... 0
Area Border Router Count....................... 0
Area LSA Count................................. 0
Area LSA Checksum.............................. 0
Import Summary LSAs............................ Enable
```

Example #2

```
console#show ip ospf area 20
AreaID......................................... 0.0.0.20
External Routing............................... Import NSSAs
Spf Runs....................................... 0
Area Border Router Count....................... 0
Area LSA Count................................. 0
Area LSA Checksum.............................. 0
OSPF NSSA Specific Information.
Import Summary LSAs............................ Enable
Redistribute into NSSA......................... Enable
Default Information Originate.................. TRUE
Default Metric................................. 250
Default Metric Type............................ Non-Comparable
```

```
Translator Role............................... Candidate
Translator Stability Interval................. 2000
Translator State.............................. Disabled
```

Example #3

The following example shows the length of the area's flood queue for LSAs waiting to be flooded within the area.

```
console #show ip ospf area 1

AreaID.............................................. 0.0.0.1
External Routing.............................. Import External LSAs
Spf Runs...................................... 10
Area Border Router Count...................... 0
Area LSA Count................................ 3004
Area LSA Checksum............................. 0x5e0abed
Flood List Length............................. 0
Import Summary LSAs........................... Enable
```

show ip ospf asbr

The **show ip ospf asbr** command displays the internal OSPF routing table entries to Autonomous System Boundary Routes (ASBR). This command takes no options.

Syntax

show ip ospf asbr [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

```
console#show ip ospf asbr
Type   Router Id   Cost  Area ID   Next Hop    Next Hop
                                                Intf
-----  ----------  ----  --------  ----------- -----------
INTRA  1.1.1.1      1    0.0.0.1   10.1.12.1    vlan10
INTRA  4.4.4.4     10    0.0.0.1   10.1.24.4    vlan12
```

show ip ospf database

Use the **show ip ospf database** command to display information about the link state database when OSPF is enabled. If parameters are entered, the command displays the LSA headers. Use the optional parameters to specify the type of link state advertisements to display.

Syntax

show ip ospf [**vrf** *vrf-name*] [*area-id*] **database** [{**asbr-summary | external | network | nssa-external | router | summary**}][*ls-id*] [**adv-router** [*ip-address*] **| self-originate**] [**opaque-area**] [**opaque-as**] [**opaque-link**]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *area-id* — Identifies a specific OSPF area for which link state database information will be displayed.
- asbr-summary — Display the autonomous system boundary router (ASBR) summary LSAs.
- external — Display the external LSAs.
- network — Display the network LSAs.
- nssa-external — Display NSSA external LSAs.
- router — Display router LSAs.

- summary — Display the LSA database summary information.
- ls-id — Specifies the link state ID (LSID). (Range: IP address or an integer in the range of 0–4294967295)
- **adv-router** — Display the LSAs that are restricted by the advertising router. To specify a router, enter the IP address of the router.
- self-originate — Display the LSAs in that are self-originated.
- opaque-area— Display the area opaque LSAs.
- opaque-as— Display AS opaque LSAs.
- opaque-link— Display link opaque LSAs.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Information is only displayed if OSPF is enabled.

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example displays information about the link state database when OSPF is enabled.

```
console#show ip ospf database

                Router Link States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1360  80000006 3a1f   ------  -----
5.2.0.0         5.2.0.0         1360  80000009 a47e   ------  ---E-
20.20.20.20     20.20.20.20     1165  8000000b 0f80   -E----  -----
```

```
                Network Link States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
2.2.2.2         20.20.20.20     1165  80000005 f86d   -E--O-


                Network Summary States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1360  80000007 242e   ------

                Summary ASBR States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1361  80000006 183a   ------


                Link Opaque States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1361  80000005 ef59   ------

                Area Opaque States (Area 0.0.0.0)

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1362  80000005 e166   ------


                AS External States

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
6.0.0.0         5.2.0.0         1364  80000008 e35d

                AS Opaque States

Link Id         Adv Router      Age   Sequence Chksm  Options Rtr Opt
--------------- --------------- ----- -------- ------ ------- -----
5.2.0.0         0.0.0.0         1364  80000005 d373
```

show ip ospf database database-summary

Use the **show ip ospf database database-summary** command to display the number of each type of LSA in the database for each area and for the router. The command also displays the total number of LSAs in the database. This command has been modified.

Syntax

show ip ospf database database-summary [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The following fields are displayed:

Field	Description
Router	Shows Total number of router LSAs in the OSPF link state database.
Network	Shows Total number of network LSAs in the OSPF link state database.
Summary Net	Shows Total number of summary network LSAs in the database.

Summary ASBR	Shows Number of summary ASBR LSAs in the database.
Type-7 Ext	Shows Total number of Type-7 external LSAs in the database.
Self-Originated Type-7	Shows Total number of self originated AS external LSAs in the OSPFv3 link state database.
Opaque Link	Shows Number of opaque link LSAs in the database.
Opaque Area	Shows Number of opaque area LSAs in the database.
Subtotal	Shows Number of entries for the identified area.
Opaque AS	Shows Number of opaque AS LSAs in the database.
Total	Shows Number of entries for all areas.

Example

The following example displays the number of each type of LSA in the database for each area and for the router.

```
console#show ip ospf database database-summary
OSPF Router with ID (5.5.5.5)
Area 0.0.0.0 database summary
Router......................................... 0
Network........................................ 0
Summary Net.................................... 0
Summary ASBR................................... 0
Type-7 Ext..................................... 0
Self Originated Type-7......................... 0
Opaque Link.................................... 0
Opaque Area.................................... 0
Subtotal....................................... 0
Area 0.0.0.10 database summary
Router......................................... 0
Network........................................ 0
Summary Net.................................... 0
Summary ASBR................................... 0
Type-7 Ext..................................... 0
Self Originated Type-7......................... 0
Opaque Link.................................... 0
Opaque Area.................................... 0
Subtotal....................................... 0
Router database summary
Router......................................... 0
Network........................................ 0
Summary Net.................................... 0
Summary ASBR................................... 0
```

```
Type-7 Ext.................................... 0
Opaque Link................................... 0
Opaque Area................................... 0
Type-5 Ext.................................... 0
Self-Originated Type-5 Ext.................... 0
Opaque AS..................................... 0
Total......................................... 0
```

show ip ospf interface

Use the **show ip ospf interface** command to display the information for the VLAN or loopback interface. The long form of the command displays the configuration of flood blocking.

Syntax

show ip ospf interface [vrf *vrf-name*] [vlan *vlan-id* | loopback *loopback-id*]

- *loopback-id*—A configured loopback interface identifier. (Range: 0-7)
- *vlan-id*—A configured VLAN identifier. (Range: 0-4093)
- *vrf-name*—The name of the VRF instance on which the command operates. If no vrf parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example #1

The following example displays the information for the IFO object or virtual interface tables associated with VLAN 10.

```
console#show ip ospf interface vlan 10

IP Address.................................... 1.1.1.1
```

```
Subnet Mask.................................... 255.255.255.0
Secondary IP Address(es)......................
OSPF Admin Mode................................ Enable
OSPF Area ID................................... 0.0.0.0
OSPF Network Type.............................. Broadcast
Router Priority................................ 1
Retransmit Interval............................ 5
Hello Interval................................. 10
Dead Interval.................................. 40
LSA Ack Interval............................... 1
Iftransit Delay Interval....................... 1
Authentication Type............................ None
Metric Cost.................................... 10  (computed)
Passive Status................................. Non-passive interface
OSPF Mtu-ignore................................ Disable
State.......................................... designated-router
Designated Router.............................. 1.1.1.1
Backup Designated Router....................... 0.0.0.0
Number of Link Events.......................... 2
```

Example #2

The following example shows the configuration of flood blocking.

```
console#show ip ospf interface gi2/0/11

IP Address.......................... 172.20.11.2
Subnet Mask......................... 255.255.255.0
Secondary IP Address(es)............
OSPF Admin Mode..................... Enable
OSPF Area ID........................ 0.0.0.0
OSPF Network Type................... Point-to-Point
Router Priority..................... 1
Retransmit Interval................. 5
Hello Interval...................... 3
Dead Interval....................... 12
LSA Ack Interval.................... 1
Transmit Delay...................... 1
Authentication Type................. None
Metric Cost......................... 100  (computed)
Passive Status...................... Non-passive interface
OSPF Mtu-ignore..................... Disable
Flood Blocking...................... Disable
State............................... point-to-point
Number of Link Events............... 1
Local Link LSAs..................... 0
Local Link LSA Checksum............. 0
```

show ip ospf interface brief

Use the **show ip ospf interface brief** command to display brief information for the IFO object or virtual interface tables.

Syntax

show ip ospf interface brief [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example displays brief information for the IFO object or virtual interface tables.

```
console#show ip ospf interface brief
                                                   Hello Dead  Retrax        LSA
             Admin                  Router         Int.  Int.  Int.   Tranx  Ack
Interface    Mode       Area ID     Prior. Cost    Val.  Val.  Val.   Delay  Intval
------------ --------- ----------- ------ -----  ----- ----- ------ ------ ------
Vl10         Enable    0.0.0.10    1      10     10    40    5      1      1
Vl20         Enable    0.0.0.1     1      10     10    40    5      1      1
Vl100        Enable    0.0.0.111   1      10     10    40    5      1      1
loopback 1    Enable    0.0.0.0     1       1      10    40    5      1      1
```

show ip ospf interface stats

Use the show ip ospf interface stats command to display the statistics for a specific interface. The information is only displayed if OSPF is enabled.

Syntax

show ip ospf interface stats vlan *vlan-id*

- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the ospf statistics for VLAN 15.

```
console>show ip ospf interface stats vlan 15
OSPF Area ID...................................... 0.0.0.0
Area Border Router Count............................... 0
AS Border Router Count................................. 0
Area LSA Count......................................... 1
IP Address........................................ 2.2.2.2
OSPF Interface Events.................................. 1
Virtual Events......................................... 0
Neighbor Events........................................ 0
External LSA Count..................................... 0
```

show ip ospf lsa-group

Use this command to display the number of self-originated LSAs within each LSA group.

Syntax

show ip ospf lsa-group [**vrf** *vrf-name*]

- vrf-name—The name of the VRF instance from which to display the self-originated LSA groups.

Default Configuration

There are no self-originated LSA groups by default.

Command Mode

Privileged Exec mode, Global Configuration mode, and all sub-modes

User Guidelines

The following fields are displayed:

Field	Description
Total self-originated LSAs	The number of LSAs the router is currently originating.
Average LSAs per group	The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with timers pacing lsa-group) plus two.
Pacing group limit	The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
Groups	For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show ip ospf lsa-group

Total self-originated LSAs:  3019
Average LSAs per group:  100
```

```
Pacing group limit:  400
Number of self-originated LSAs within each LSA group...


Group Start Age   Group End Age    Count
              0              59       96
             60             119       88
            120             179      102
            180             239       95
            240             299       95
            300             359       92
            360             419       48
            420             479       58
            480             539      103
            540             599       99
            600             659      119
            660             719      110
            720             779      106
            780             839      122
            840             899      110
            900             959       99
            960            1019      135
           1020            1079      101
           1080            1139       94
           1140            1199      115
           1200            1259      110
           1260            1319      111
```

show ip ospf neighbor

Use the **show ip ospf neighbor** command to display locally derived information about OSPF neighbors. The information below only displays if OSPF is enabled and the interface has a neighbor.

Syntax

show ip ospf neighbor [**vrf** *vrf-name*] [*interface-type interface-number*] [*neighbor-id*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *interface-type*—Interface type – only supported type is vlan.
- *interface-number*—A valid interface number.
- *neighbor-id*—Valid IP address of the neighbor.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The following information is output.

Field	Description
Interface	The name of the interface on which the adjacency is formed.
Neighbor IP Address	The IPv4 address on the neighbor's interface used to form the adjacency.
Interface Index	The SNMP interface index.
Area Id	The OSPF area in which the adjacency is formed.
Options	The options advertised by the neighbor.
Router Priority	The router priority advertised by the neighbor.
Dead timer	The number of seconds until the dead timer expires.
Up Time	How long this adjacency has been in FULL state.
State	The local state of the adjacency. The neighbor state is not tracked locally.
Events	Incremented for the following events: • A DD is received from the neighbor with an MTU mismatch. • The neighbor sent an ACK for an LSA not on the neighbor's retransmit list. • The state of the adjacency changed.
Retransmitted LSAs	The number of LSAs retransmitted to a given neighbor.

Field	Description
Retransmission Queue Length	The number of LSAs sent to the neighbor's retransmit queue waiting for the neighbor to acknowledge.
Restart Helper Status	One of two values: • Helping — This router is acting as a helpful neighbor to this neighbor. A helpful neighbor does not report an adjacency change during graceful restart, but continues to advertise the restarting router as a FULL adjacency. A helpful neighbor continues to forward data packets to the restarting router, trusting that the restarting router's forwarding table is maintained during the restart. • Not Helping — This router is not a helpful neighbor at this time.

Field	Description
Restart Helper Exit Reason	One of the following values: • Restart Reason — When the router is in helpful neighbor mode, the output includes the restart reason the restarting router sent in its grace LSA. The Restart Reason is the value in the Graceful Restart Reason TLV in the grace LSA sent by the restarting router. Possible values for the Restart Reason are defined in RFC 3623 as follows: – Unknown (0) – Software restart (1) – Software reload/upgrade (2) – Switch to redundant control processor (3) – Unrecognized - a value not defined in RFC 3623 When the switch sends a grace LSA, it sets the Restart Reason to **Software Restart** on a planned warm restart (when the initiate failover command is invoked), and to **Unknown** on an unplanned warm restart. • Remaining Grace Time — The number of seconds remaining in the current graceful restart interval. This row is only included if the router is currently acting as a restart helper for the neighbor. • Restart Exit Reason — One of the following: – None — graceful restart has not been attempted – In Progress — restart is in progress – Completed — the previous graceful restart completed successfully – Timed Out — the previous graceful restart timed out – Topology Changed — The previous graceful restart terminated prematurely because of a topology change. A helpful neighbor declares a topology change when it forwards a changed LSA to the restarting router. An LSA is considered changed if its contents are changed, not if it is simply a periodic refresh.

Example

The following example displays locally derived information about OSPF neighbors on the specified Ethernet and IP interfaces.

```
console#show ip ospf neighbor 3.3.3.3

Interface...................................... 0/25
Neighbor IP Address............................ 172.20.25.3
Interface Index................................ 25
Area Id........................................ 0.0.0.0
Options........................................ 0x2
Router Priority................................ 1
Dead timer due in (secs)....................... 10
Up Time........................................ 4 days 3 hrs 33 mins 36 secs
State.......................................... Full/PtP
Events......................................... 4
Retransmitted LSAs............................. 32
Retransmission Queue Length.................... 0
Restart Helper Status........................ Not helping
Restart Helper Exit Reason................... Not attempted
```

show ip ospf range

Use the **show ip ospf range** command to display information about the area ranges for the specified area-id.

Syntax

show ip ospf range [**vrf** *vrf-name*] *area-id*

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *area-id* —Identifies the OSPF area whose ranges are being displayed. (Range: IP address or decimal from 0–4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The following information is displayed.

Field	Description
Prefix	The summary prefix.
Subnet Mask	The subnetwork mask of the summary prefix.
Type	S (Summary Link) or E (External Link)
Action	Advertise or Suppress
Cost	Metric to be advertised when the range is active. If a static cost is not configured, the field displays **Auto**. If the action is **Suppress**, the field displays **N/A**.
Active	Whether the range is currently active (**Y**) or not (**N**).

Example

The following example displays information about the area ranges configured for the specified area-id.

```
console#show ip ospf range 0
Prefix      Subnet Mask   Type     Action       Cost   Active
10.1.0.0      255.255.0.0      S  Advertise       Auto        N
172.20.0.0      255.255.0.0      S  Advertise        500        Y
```

show ip ospf statistics

This command displays information about recent Shortest Path First (SPF) calculations. The SPF is the OSPF routing table calculation. The output lists the number of times the SPF has run for each OSPF area. A table follows this information. For each of the 15 most recent SPF runs, the table lists how long ago the SPF ran, how long the SPF took, and the reasons why the SPF was scheduled.

Syntax

show ip ospf statistics [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

This command outputs the following.

Field	Description
Delta T	The time since the routing table was computed, in hours, minutes, and seconds (hh:mm:ss).
Intra	The time taken to compute intra-area routes, in milliseconds.
Summ	The time taken to compute inter-area routes, in milliseconds.
Ext	The time taken to compute external routes, in milliseconds.
SPF Total	The total time to compute routes, in milliseconds. The total may exceed the sum of the Intra, Summ, and Ext times.
RIB Update	The time from the completion of the routing table calculation until all changes have been made in the common routing table (the Routing Information Base, or RIB), in milliseconds.
Reason	The event or events that triggered the SPF. Reasons may include the following: • R – New router LSA • N – New network LSA • SN –New network summary LSA • SA – New ASBR summary LSA • X – New external LSA

Example

```
console# show ip ospf statistics

 Area 0.0.0.0: SPF algorithm executed 15 times

Delta T         Intra       Summ         Ext     SPF Total   RIB Update  Reason

00:05:33            0          0           0             0            0  R
00:05:30            0          0           0             0            0  R
00:05:19            0          0           0             0            0  N, SN
00:05:15           0          10          0             10           0  R, N, SN
00:05:11            0          0           0             0            0  R
00:04:50            0         60           0            60          460  R, N
00:04:46            0         90           0           100           60  R, N
00:03:42            0         70          10            90          160  R
00:03:39            0         70          40           120          240  X
00:03:36            0         60          60           130          160  X
00:01:28            0         60          50           130          240  X
00:01:25            0         30          50           110          310  SN
00:01:22            0          0          40            50          260  SN
00:01:19            0          0          20            20          190  X
00:01:16            0          0           0             0          110  R, X
```

show ip ospf stub table

Use the **show ip ospf stub table** command to display the OSPF stub table. The information below will only be displayed if OSPF is initialized on the switch.

Syntax

show ip ospf stub table [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

Example

The following example displays the OSPF stub table.

```
console(config)#show ip ospf stub table
AreaId        TypeofService  Metric Val Import SummaryLSA

------------- -------------  ---------- -----------------

0.0.0.1          Normal          1          Enable
```

show ip ospf traffic

Use the **show ip ospf traffic** command to display OSPFv2 packet and LSA statistics and OSPFv2 message queue statistics. Packet statistics count packets and LSAs since OSPFv2 counters were last cleared (using the clear ip ospf **counters** command.)

NOTE: Note that the **clear ip ospf counters** command does not clear the message queue high water marks.

Syntax

show ip ospf traffic [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default setting.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The **clear ip ospf counters** command does not clear the message queue high water marks.

The following is output.

Parameter	Description
OSPFv2 Packet Statistics	The number of packets of each type sent and received since OSPF counters were last cleared.
LSAs Retransmitted	The number of LSAs retransmitted by this router since OSPF counters were last cleared.
LS Update Max Receive Rate	The maximum rate of LS Update packets received during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
LS Update Max Send Rate	The maximum rate of LS Update packets transmitted during any 5-second interval since OSPF counters were last cleared. The rate is in packets per second.
Number of LSAs Received	The number of LSAs of each type received since OSPF counters were last cleared.
OSPFv2 Queue Statistics	For each OSPFv2 message queue, the current count, the high water mark, the number of packets that failed to be enqueued, and the queue limit. The high water marks are not cleared when OSPF counters are cleared.

Example

```
console# show ip ospf traffic

Time Since Counters Cleared:  4000 seconds

OSPFv2 Packet Statistics

         Hello   Database Desc   LS Request   LS Update    LS ACK   Total
Recd:      500              10           20          50        20     600
Sent:      400               8           16          40        16     480
```

```
LSAs Retransmitted................0
LS Update Max Receive Rate........20 pps
LS Update Max Send Rate...........10 pps

Number of LSAs Received

T1 (Router).......................10
T2 (Network)......................0
T3 (Net Summary)..................300
T4 (ASBR Summary).................15
T5 (External).....................20
T7 (NSSA External)................0
T9 (Link Opaque)..................0
T10 (Area Opaque).................0
T11 (AS Opaque)...................0
Total.............................345

OSPFv2 Queue Statistics

             Current       Max     Drops   Limit
Hello              0        10         0     500
ACK                2        12         0    1680
Data              24        47         0     500
Event              1         8         0    1000
```

show ip ospf virtual-links

Use the **show ip ospf virtual-links** command to display the OSPF Virtual Interface information for a specific area and neighbor or for all neighbors.

Syntax

show ip ospf virtual-links [**vrf** *vrf-name*] [*area-id neighbor-id*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *area-id* — Identifies the OSPF area whose ranges are being displayed. (Range: IP address or decimal from 0–4294967295)
- *neighbor-id* — Identifies the neighbor's router ID. (Range: Valid IP address)

Default Configuration

Show information for all OSPF Virtual Interfaces.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches. OSPF must be enabled for this command to display the virtual interfaces.

Example

The following example displays the OSPF Virtual Interface information for area 10 and its neighbor.

```
console#show ip ospf virtual-links 10 192.168.2.2
Area ID....................................... 10
Neighbor Router ID............................ 192.168.2.2
Hello Interval................................ 10
Dead Interval................................. 655555
Iftransit Delay Interval...................... 1
Retransmit Interval........................... 5
State......................................... down
Metric........................................ 0
Neighbor State................................ down
Authentication Type........................... MD5
Authentication Key............................ "test123"
Authentication Key ID......................... 100
```

show ip ospf virtual-links brief

Use the **show ip ospf virtual-link brief** command to display the OSPF Virtual Interface information for all areas in the system in table format.

Syntax

show ip ospf virtual-links brief

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

OSPF must be enabled for this command to display the virtual interface information.

Example

The following example displays the OSPF Virtual Interface information in the system.

```
console#show ipv6 ospf virtual-link brief
                       Hello    Dead     Retransmit  Transit
Area ID  Neighbor      Interval Interval Interval    Delay
-------  --------      -------- -------- ----------  -------
0.0.0.2  5.5.5.5       10        40         5           1
```

timers pacing flood

Use the **timers pacing flood** command to adjust the rate at which OSPFv2 sends LS Update packets.

Use the **no** form of the command to return the timer pacing to the default value.

Syntax

timers pacing flood milliseconds

no timers pacing flood

- *milliseconds*—The average time between transmission of LS Update packets. The range is from 5 ms to 100 ms. The default is 33 ms.

Default Configuration

The default pacing between LS Update packets is 33 ms.

Command Mode

OSPFv2 Global Configuration mode

User Guidelines

OSPF distributes routing information in Link State Advertisements (LSAs), which are bundled into Link State Update (LS Update) packets. To reduce the likelihood of sending a neighbor more packets than it can buffer, OSPF rate limits the transmission of LS Update packets. By default, OSPF sends up to 30 updates per second on each interface (1/the pacing interval). Use this command to adjust the LS Update transmission rate.

timers pacing lsa-group

Use the **timers pacing lsa-group** command to tune how OSPF groups LSAs for periodic refresh.

Syntax

timers pacing lsa-group *seconds*

no timers pacing lsa-group

- *seconds*—Width of the window in which LSAs are refreshed. The range for the pacing group window is from 10 to 1800 seconds.

Default Configuration

The default timer pacing is 60 seconds.

Command Mode

OSPFv2 Global Configuration mode, OSPFv3 Global Configuration mode

User Guidelines

OSPF refreshes self-originated LSAs approximately once every 30 minutes. When OSPF refreshes LSAs, it considers all self-originated LSAs whose age is from 1800 to 1800 plus the pacing group size. Grouping LSAs for refresh allows OSPF to combine refreshed LSAs into a minimal number of Link-State packets. Minimizing the number of Link-State packets makes LSA distribution more efficient.

When OSPF originates a new or changed LSA, it selects a random refresh delay for the LSA. When the refresh delay expires, OSPF refreshes the LSA. By selecting a random refresh delay, OSPF avoids refreshing a large number of LSAs at one time, even if a large number of LSAs are originated at one time.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config-router6)#timers pacing lsa-group 90
```

timers spf

Use the **timers spf** command to configure the SPF delay and hold time. Use the no form of the command to reset the numbers to the default value.

Syntax

timers spf *delay-time hold-time*

no timers spf

- *delay-time* — SPF delay time. (Range: 0–65535 seconds)
- *hold-time* — SPF hold time. (Range: 0–65535 seconds)

Default Configuration

The default value for *delay-time* is 5. The default value for *hold-time* is 10.

Command Mode

Router OSPF Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the SPF delay and hold time.

```
console(config-router)#timers spf 20 30
```

OSPFv3 Commands

Dell EMC Networking N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

The Dell Network N1500/N2000/N2100-ON series support limited routing and multicast capabilities. See the Users Configuration Guide section “Feature Limitations and Platform Constants” for supported capabilities.

area default-cost (Router OSPFv3)

Use the **area default-cost** command in Router OSPFv3 Configuration mode to configure the monetary default cost for the stub area. The operator must specify the area id and an integer value between 1-16777215. Use the **no** form of the command to return the cost to the default value. If the area has not been previously created, this command creates the area and then applies the default-cost.

Syntax

area *area-id* **default-cost** *cost*

no area *area-id* **default-cost**

- *areaid* — Valid area identifier.
- *cost* — Default cost. (Range: 1-16777215)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the monetary default cost at 100 for stub area 1.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 default-cost 100
```

area nssa (Router OSPFv3)

Use the **area nssa command** in Router OSPF Configuration mode to configure the specified area ID to function as an NSSA. If the area has not been previously created, this command creates the area and then applies the NSSA distinction. If the area already exists, the NSSA distinction is added or modified. Use the **no** form of the command to remove the NSSA distinction from the area.

Syntax

area *area-id* **nssa** [**no-redistribution**] [**default-information-originate** [**metric** *metric-value*] [**metric-type** *metric-type-value*]] [**no-summary**] [**translator-role** *role*] [**translator-stab-intv** *interval*]

no area *area-id* **nssa** [**no-redistribution**] [**default-information-originate**] [**no-summary**] [**translator-role**] [**translator-stab-intv**]

- *area-id*—Identifies the OSPFv3 stub area to configure. (Range: IP address or decimal from 0–4294967295)
- *metric-value*—Specifies the metric of the default route advertised to the NSSA. (Range: 1–16777214)
- *metric-type-value*—The metric type can be one of the following:
  - A metric type of nssa-external 1 (comparable)
  - A metric type of nssa-external 2 (non-comparable)
- *role*—The translator role where role is one of the following:
  - always - The router assumes the role of the translator when it becomes a border router.
  - candidate - The router to participate in the translator election process when it attains border router status.
- *interval*—The period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router. (Range: 0–3600)

Default Configuration

If no metric is defined, 10 is the default configuration.

The default role is candidate.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures not-so-stubby-area 10 as an NSSA.

```
console(config)#ipv6 router ospf
console(config-router)#area 10 nssa
```

The following example configures the metric value and type for the default route advertised into the NSSA and configures the NSSA so that summary LSAs are not advertised into the NSSA.

```
console(config-router)#area 20 nssa default-info-originate metric 250
metric-type 2 no-summary
```

area nssa default-info-originate (Router OSPFv3 Config)

Use the **area nssa default-info-originate** command in Router OSPFv3 Configuration mode to configure the metric value and type for the default route advertised into the NSSA. The optional metric parameter specifies the metric of the default route. The metric type can be comparable (nssa-external 1) or noncomparable (nssa-external 2). Use the **no** form of the command to return the metric value and type to the default value

Syntax

area *areaid* **nssa default-info-originate** [*metric* [**comparable | non-comparable**]]

no area *areaid* **nssa default-info-originate**

- *areaid* — Valid OSPFv3 area identifier.

- *metric* — Metric value for default route. (Range: 1-16777214)
- **comparable** — Metric Type (nssa-external 1).
- **non-comparable** — Metric Type (nssa-external 2).

Default Configuration

If no metric is defined, 10 is the default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the default metric value for the default route advertised into the NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 nssa default-info-originate
```

area nssa no-redistribute

Use the **area nssa no-redistribute** command in Router OSPFv3 Configuration mode to configure the NSSA ABR so that learned external routes will not be redistributed to the NSSA. Use the **no** form of the command to remove the configuration.

Syntax

area *areaid* **nssa no-redistribute**

no area *areaid* **nssa no-redistribute**

- *areaid* — Valid OSPF area identifier.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the area 1 NSSA ABR so that learned external routes will not be redistributed to the NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 nssa no-redistribute
```

area nssa no-summary

Use the **area nssa no-summary** command in Router OSPFv3 Configuration mode to configure the NSSA so that summary LSAs are not advertised into the NSSA. Use the no form of the command to remove the configuration.

Syntax

area *areaid* **nssa no-summary**

no area *area-id* **nssa no-summary**

- *areaid* — Valid OSPF area identifier.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the area 1 NSSA so that summary LSAs are not advertised into the NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 nssa no-summary
```

area nssa translator-role

Use the **area nssa translator-role** command in Router OSPFv3 Configuration mode to configure the translator role of the NSSA. Use the **no** form of the command to remove the configuration.

Syntax

area *areaid* **nssa translator-role** {**always** | **candidate**}

no area *areaid* **nssa translator-role**

- *areaid* — Valid OSPF area identifier.
- **always —** Causes the router to assume the role of the translator the instant it becomes a border router.
- **candidate —** Causes the router to participate in the translator election process when it attains border router status.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the **always** translator role of the area 1 NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 nssa translator-role always
```

area nssa translator-stab-intv

Use the **area nssa translator-stab-intv** command in Router OSPFv3 Configuration mode to configure the translator stability interval of the NSSA. The stability interval is the period of time that an elected translator continues to perform its duties after it determines that its translator status has been deposed by another router.

Syntax

area *areaid* **nssa translator-stab-intv** *seconds*

no area *areaid* **nssa translator-stab-intv**

- *areaid* — Valid OSPF area identifier.
- *seconds* — Translator stability interval of the NSSA. (Range: 0-3600 seconds)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a translator stability interval of 100 seconds for the area 1 NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 nssa translator-stab-intv 100
```

area range (Router OSPFv3)

Use the **area range** command in Router OSPF Configuration mode to configure a summary prefix for routes learned in a given area. If the area has not been previously created, this command creates the area and then applies the range parameters. There are two types of area ranges. An area range can be configured to summarize intra-area routes. An ABR advertises the range rather than the specific intra-area route as a type 3 summary LSA. Also, an area range can be configured at the edge of an NSSA to summarize external routes reachable within the NSSA. The range is advertised as a type 5 external LSA. Use the **no** form of the command to remove the summary prefix configuration for routes learned in the specified area.

Syntax

area *area-id* **range** *ipv6-prefix/prefix-length* {**summarylink** | **nssaexternallink**} [**advertise** | **not-advertise**]

no area *area-id* range *ipv6-prefix/prefix-length* {**summarylink** | **nssaexternallink**}

- *areaid*—Valid OSPFv3 area identifier.
- *ipv6-prefix/prefix-length*—Valid route prefix.
- **summarylink**—LSDB type
- **nssaexternallink**—LSDB type.
- **advertise**—Allows area range to be advertised.
- **not-advertise**—Suppresses area range from being advertised.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

The LSDB type must be specified by either **summarylink** or **nssaexternallink**, and the advertising of the area range can be allowed or suppressed.

Example

The following example creates an area range for the area 1 NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 range 2020:1::1/64 summarylink
```

area stub

Use the **area stub** command in Router OSPFv3 Configuration mode to create a stub area for the specified area ID. If the area has not been previously created, this command creates the area and then applies the stub distinction. A stub area is characterized by the fact that AS External LSAs are not propagated into the area. Removing AS External LSAs and Summary LSAs can significantly reduce the size of the link state database of routers within the stub area.

Syntax

area *area-id* **stub** [**no summary**]

no area *area-id* **stub** [**no summary**]

- *area-id* — Valid OSPFv3 area identifier.
- **no-summary**—Disable the import of Summary LSAs for the stub area identified by area-id.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example creates a stub area for area 1.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 stub
```

area stub no-summary

Use the **area stub no-summary** command in Router OSPFv3 Configuration mode disable the import of Summary LSAs for the stub area identified by *area-id.*

Syntax

area *area-id* **stub no-summary**

no area *area-id* **stub no-summary**

- *area-id* — Valid OSPFv3 area identifier.
- so-summary — Disable the import of Summary LSAs for the stub area identified by area-id.

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example prevents Summary LSAs from being advertised into the area 1 NSSA.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 stub no-summary
```

area virtual-link

Use the **area virtual-link** command in Router OSPFv3 Configuration mode to create the OSPF virtual interface for the specified *area-id* and *neighbor* router. If the area has not been previously created, this command creates the area and then applies the virtual-link parameters. To remove the link, use the **no** form of the command. Use the optional parameters to configure dead-interval, hello-interval, retransmit-interval and transmit-delay.

Syntax

area *area-id* **virtual-link** *router-id* [**hello-interval** *seconds*] [**retransmit-interval** *seconds*] [**transmit-delay** *seconds*] [**dead-interval** *seconds*]

no area *area-id* **virtual-link** *router-id id* [**hello-interval**] [**retransmit-interval**] [**transmit-delay**] [**dead-interval**]

- *area-id*—Valid OSPFv3 area identifier (or decimal value in the range of 0-4294967295).
- *router-id*—Identifies the Router ID or valid IP address of the neighbor.
- **hello-interval** *seconds*—Number of seconds to wait before sending hello packets to the OSPF virtual interface. (Range: 1–65535)
- **dead-interval** *seconds*—Number of seconds to wait before the OSPF virtual interface on the virtual interface is assumed to be dead. (Range: 1–65535)
- **retransmit-interval** *seconds*—The number of seconds to wait between retransmitting LSAs if no acknowledgment is received. (Range: 0–3600)
- **transmit-delay** *seconds*—Number of seconds to increment the age of the LSA before sending, based on the estimated time it takes to transmit from the interface. (Range: 0–3600)

Default Configuration

Parameter	Default
area-id	No area ID is predefined.
router-id	No router ID is predefined.
hello-interval seconds	10 seconds
retransmit-interval seconds	5 seconds
transmit-delay seconds	1 second
dead-interval seconds	40 seconds

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example creates the OSPF virtual interface for area 1 and its neighbor router.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 virtual-link 2
```

The following example configures a 20-second dead interval, a hello interval of 20 seconds, a retransmit interval of 20 seconds, and a 20-second transmit delay for the OSPF virtual interface on the virtual interface identified by area 1 and its neighbor.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 virtual-link 2 dead-interval 20 hello-interval 20
retransmit-interval 20 transmit-delay 20
```

area virtual-link dead-interval

Use the **area virtual-link dead-interval** command in Router OSPFv3 Configuration mode to configure the dead interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.

Syntax

area *areaid* **virtual-link** *neighbor* **dead-interval** *seconds*

no area *areaid* **virtual-link** *neighbor* **dead-interval**

- *areaid* — Valid OSPFv3 area identifier.
- *neighbor* — Router ID of neighbor.
- *seconds* — Dead interval. (Range: 1-65535)

Default Configuration

40 is the default value for *seconds*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a 20-second dead interval for the OSPF virtual interface on the virtual interface identified by area 1 and its neighbor.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 virtual-link 2 dead-interval 20
```

area virtual-link hello-interval

Use the **area virtual-link hello-interval** command in Router OSPFv3 Configuration mode to configure the hello interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.

Syntax

area *areaid* **virtual-link** *neighbor* **hello-interval** *seconds*

no area *areaid* **virtual-link** *neighbor* **hello-interval**

- *areaid* — Valid OSPFv3 area identifier.
- *neighbor* — Router ID of neighbor.
- *seconds* — Hello interval. (Range: 1-65535)

Default Configuration

10 is the default value for *seconds*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a hello interval of 20 seconds for the OSPF virtual interface on the virtual interface identified by area 1 and its neighbor.

```
console(config)#ipv6 router ospf
```

```
console(config-rtr)#area 1 virtual-link 2 hello-interval 20
```

area virtual-link retransmit-interval

Use the **area virtual-link retransmit-interval** command in Router OSPFv3 Configuration mode to configure the retransmit interval for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.

Syntax

area *areaid* **virtual-link** *neighbor* **retransmit-interval** *seconds*

no area *areaid* **virtual-link** *neighbor* **retransmit-interval**

- *areaid* — Valid OSPFv3 area identifier.
- *neighbor* — Router ID of neighbor.
- *seconds* — Retransmit interval. (Range: 0-3600)

Default Configuration

5 is the default value for *seconds*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures the retransmit interval of 20 seconds for the OSPF virtual interface on the virtual interface identified by area 1 and its neighbor.

```
(config)#ipv6 router ospf
(config-rtr)#area 1 virtual-link 2 retransmit-interval 20
```

area virtual-link transmit-delay

Use the **area virtual-link transmit-delay** command in Router OSPFv3 Configuration mode to configure the transmit delay for the OSPF virtual interface on the virtual interface identified by *areaid* and *neighbor*.

Syntax

area *areaid* **virtual-link** *neighbor* **transmit-delay** *seconds*

no area *areaid* **virtual-link** *neighbor* **transmit-delay**

- *areaid* — Valid OSPFv3 area identifier.
- *neighbor* — Router ID of neighbor.
- *seconds* — Transmit delay interval. (Range: 0-3600)

Default Configuration

1 is the default value for *seconds*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a 20-second transmit delay for the OSPF virtual interface on the virtual interface identified by area 1 and its neighbor.

```
console(config)#ipv6 router ospf
console(config-rtr)#area 1 virtual-link 2 transmit-delay 20
```

default-information originate (Router OSPFv3 Configuration)

Use the **default-information originate** command in Router OSPFv3 Configuration mode to control the advertisement of default routes. Use the **no** form of the command to return the default route advertisement settings to the default value.

Syntax

default-information originate [**always**] [**metric** *metric-value*] [**metric-type type-value**]

no default-information originate [**metric**] [**metric-type**]

- **always**—Always advertise default routes.
- *metric-value*—
- **type-value**—The metric (or preference) value of the default route. (Range: 1–16777214)
- One of the following:

1 External type-1 route.

2 External type-2 route.

Default Configuration

The default metric is none and the default type is 2.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example controls the advertisement of default routes by defining a metric value of 100 and metric type 2.

```
console(config)#ipv6 router ospf
console(config-rtr)#default-information originate metric 100 metric-type 2
```

default-metric

Use the **default-metric** command in Router OSPFv3 Configuration mode to set a default for the metric of distributed routes. Use the **no** form of the command to remove the metric from the distributed routes.

Syntax

default-metric *metric-value*

no default-metric

- *metric-value* — The metric (or preference) value of the default route. (Range: 1–16777214)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets a default of 100 for the metric of distributed routes.

```
console(config)#ipv6 router ospf
console(config-rtr)#default-metric 100
```

distance ospf

The **distance ospf** command sets the preference values of OSPF route types in the router. Lower route preference values are preferred when determining the best route. The type of OSPF route can be intra, inter, external. All the external type routes are given the same preference value. Use the “no” form of this command to reset the preference values to the default.

Syntax

distance ospf {**external** | **inter-area** | **intra-area**} *distance*

no distance ospf {**external** | **inter-area** | **intra-area**} *distance*

- *distance*— Used to select the best path when there are two or more routes to the same destination from two different routing protocols (Range: 1–255).

Default Configuration

The default preference value is 110.

Command Mode

Router OSPF Configuration mode.

Router OSPFv3 Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example sets a route preference value of 100 for intra OSPF in the router.

```
console(config)#ipv6 router ospf
console(config-rtr)#distance ospf intra 100
```

enable

Use the **enable** command in Router OSPFv3 Configuration mode to enable administrative mode of OSPF in the router (active).

Syntax

enable

no enable

Default Configuration

Disabled is the default state.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example enables administrative mode of OSPF in the router (active).

```
console(config)#ipv6 router ospf
console(config-rtr)#enable
```

exit-overflow-interval

Use the **exit-overflow-interval** command in Router OSPFv3 Configuration mode to configure the exit overflow interval for OSPF. It describes the number of seconds after entering Overflow state that a router will wait before attempting to leave the Overflow State. This allows the router to originate non-default AS-external-LSAs again. When set to 0, the router will not leave Overflow State until restarted.

Syntax

exit-overflow-interval *seconds*

no exit-overflow-interval

- *seconds* — Exit overflow interval for OSPF (Range: 0-2147483647)

Default Configuration

0 is the default value for *seconds*.

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the exit overflow interval for OSPF at 100 seconds.

```
console(config)#ipv6 router ospf
console(config-rtr)#exit-overflow-interval 100
```

external-lsdb-limit

Use the **external-lsdb-limit** command in Router OSPFv3 Configuration mode to configure the external LSDB limit for OSPF. If the value is -1, then there is no limit. When the number of non-default AS-external-LSAs in a router's link-state database reaches the external LSDB limit, the router enters overflow state. The router never holds more than the external LSDB limit non-default AS-external- LSAs in it database. The external LSDB limit MUST be set identically in all routers attached to the OSPF backbone and/or any regular OSPF area.

Syntax

external-lsdb-limit *limit*

no external-lsdb-limit

- *limit* — External LSDB limit for OSPF (Range: -1-2147483647)

Default Configuration

-1 is the default value for *limit*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the external LSDB limit at 100 for OSPF.

```
console(config)#ipv6 router ospf
console(config-rtr)#external-lsdb-limit 100
```

ipv6 ospf

Use the **ipv6 ospf** command in Interface Configuration mode to enable OSPF on a router interface or loopback interface.

Syntax

ipv6 ospf

no ipv6 ospf

Default Configuration

Disabled is the default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

This command has no user guidelines.

Example

The following example enables OSPF on VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf
```

ipv6 ospf area

Use the **ipv6 ospf area *areaid*** command in Interface Configuration mode to set the OSPF area to which the specified router interface belongs.

Syntax

ipv6 ospf area *areaid*

no ipv6 ospf area *areaid*

- *areaid* — Is a 32-bit integer, formatted as a 4-digit dotted-decimal number or a decimal value. It uniquely identifies the area to which the interface connects. Assigning an area id which does not exist on an interface causes the area to be created with default values. (Range: 0-4294967295).

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example defines the OSPF area to which VLAN 15 belongs.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf area 100
```

ipv6 ospf cost

Use the **ipv6 ospf cost** command in Interface Configuration mode to configure the cost on an OSPF interface. Use the **no** form of the command to return the cost to the default value.

Syntax

ipv6 ospf cost *interface-cost*

no ipv6 ospf cost

- *interface-cost* — Specifies the cost (link-state metric) of the OSPF interface. (Range: 1–65535)

Default Configuration

10 is the default link-state metric configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example configures a cost of 100.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf cost 100
```

ipv6 ospf dead-interval

Use the **ipv6 ospf dead-interval** command in Interface Configuration mode to set the OSPF dead interval for the specified interface.

Syntax

ipv6 ospf dead-interval *seconds*

no ipv6 ospf dead-interval

- *seconds* — A valid positive integer, which represents the length of time in seconds that a router's Hello packets have not been seen before its neighbor routers declare that the router is down. The value for the length of time must be the same for all routers attached to a common network. This value should be some multiple of the Hello Interval (i.e. 4). (Range: 1-65535)

Default Configuration

40 seconds is the default value of *seconds*.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF dead interval at 100 seconds.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf dead-interval 100
```

ipv6 ospf hello-interval

Use the **ipv6 ospf hello-interval** command in Interface Configuration mode to set the OSPF hello interval for the specified interface.

Syntax

ipv6 ospf hello-interval *seconds*

no ipv6 ospf hello-interval

- *seconds* — A valid positive integer which represents the length of time of the OSPF hello interval. The value must be the same for all routers attached to a network. (Range: 1-65535 seconds)

Default Configuration

10 seconds is the default value of *seconds*.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF hello interval at 15 seconds.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf hello-interval 15
```

ipv6 ospf mtu-ignore

Use the **ipv6 ospf mtu-ignore** command in Interface Configuration mode to disable OSPF maximum transmission unit (MTU) mismatch detection. Use the **no** form of the command to reset mismatch detection to the default value.

Syntax

ipv6 ospf mtu-ignore

no ipv6 ospf mtu-ignore

Default Configuration

The default state is Disabled.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

OSPF Database Description packets specify the size of the largest IP packet that can be sent without fragmentation on the interface. When a router receives a Database Description packet, it examines the MTU advertised by the neighbor. By default, if the MTU is larger than the router can accept, the Database Description packet is rejected and the OSPF adjacency is not established.

Example

The following example disables OSPF maximum transmission unit (MTU) mismatch detection.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf mtu-ignore
```

ipv6 ospf network

Use the **ipv6 ospf network** command in Interface Configuration mode to change the default OSPF network type for the interface. Use the **no** form of the command to return the network setting to the default value.

Syntax

ipv6 ospf network {broadcast | point-to-point}

no ipv6 ospf network

- **broadcast** — The network type is broadcast.
- **point-to-point** — The network type is point-to-point.

Default Configuration

The default state is point-to-point.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode

User Guidelines

Normally, the network type is determined from the physical IP network type. By default all Ethernet networks are OSPF-type broadcast. Similarly, tunnel interfaces default to point-to-point. When an Ethernet port is used as a single large bandwidth IP network between two routers, the network type can be point-to-point since there are only two routers. Using point-to-point as the network type eliminates the overhead of the OSPF designated router election. It is normally not useful to set a tunnel to OSPF network type broadcast.

Example

The following example changes the default OSPF network type to point-to-point.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf network point-to-point
```

ipv6 ospf priority

Use the **ipv6 ospf priority** command in Interface Configuration mode to set the OSPF priority for the specified router interface. Use the **no** form of the command to return the priority to the default value.

Syntax

ipv6 ospf priority *number-value*

no ipv6 ospf priority

- *number-value* — Specifies the OSPF priority for the specified router interface. (Range: 0–255) A value of 0 indicates that the router is not eligible to become the designated router on this network.

Default Configuration

1, the highest router priority, is the default value.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF priority at 50 for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf priority 50
```

ipv6 ospf retransmit-interval

Use the **ipv6 ospf retransmit-interval** command in Interface Configuration mode to set the OSPF retransmit interval for the specified interface.

Syntax

ipv6 ospf retransmit-interval *seconds*

no ipv6 ospf retransmit-interval

- *seconds* — The number of seconds between link-state advertisement retransmissions for adjacencies belonging to this router interface. This value is also used when retransmitting database description and link-state request packets. (Range: 0 to 3600 seconds)

Default Configuration

5 seconds is the default value.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF retransmit interval at 100 seconds.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf retransmit-interval 100
```

ipv6 ospf transmit-delay

Use the **ipv6 ospf transmit-delay** command in Interface Configuration mode to set the OSPF Transmit Delay for the specified interface.

Syntax

ipv6 ospf transmit-delay *seconds*

no ipv6 ospf transmit-delay

- *seconds* — OSPF transmit delay for the specified interface. In addition, it sets the estimated number of seconds it takes to transmit a link state update packet over this interface. (Range: 1 to 3600 seconds)

Default Configuration

No default value.

Command Mode

Interface Configuration (VLAN, Tunnel, Loopback) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the OSPF Transmit Delay at 100 seconds for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 ospf transmit-delay 100
```

ipv6 router ospf

Use the **ipv6 router ospf** command to enable OSPFv3 and enter Router OSPFv3 Configuration mode. Use the **no** form of the command to disable OSPFv3 and remove the OSPFv3 interface and global configuration.

Syntax

ipv6 router ospf [**vrf** ***vrf-name***]

no ipv6 router ospf [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

Use the following command to enable OSPFv3.

```
console(config)#ipv6 router ospf
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

maximum-paths

Use the **maximum-paths** command in Router OSPFv3 Configuration mode to set the number of paths that OSPF can report for a given destination.

Syntax

maximum-paths *maxpaths*

no maximum-paths

- *maxpaths* — Number of paths that can be reported. (Range: 1-2)

Default Configuration

2 is the default value for *maxpaths*.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the number of paths that OSPF can report for a destination to 1.

```
console(config)#ipv6 router ospf
console(config-rtr)#maximum-paths 1
```

nsf

Use this command to enable OSPF graceful restart. Use the **no** form of this command to disable graceful restart.

Syntax

nsf [**ietf**] [**planned-only**]

no nsf [**ietf**]

- **ietf** — This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.
- **planned-only** — This keyword indicates that OSPF should only perform a graceful restart when the restart is planned (i.e., when the restart is a result of the **initiate failover** command).

Default Configuration

Graceful restart is disabled by default

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

Graceful restart works in concert with nonstop forwarding to enable the hardware to continue forwarding IPv6 packets using OSPFv3 routes while a backup unit takes over management unit responsibility. When OSPF executes a graceful restart, it informs its neighbors that the OSPF control plane is restarting, but that it will be back shortly. Helpful neighbors continue to advertise to the rest of the network that they have full adjacencies with the restarting router, avoiding announcement of a topology change and everything that goes with that (i.e., flooding of LSAs, SPF runs). Helpful neighbors continue to forward packets through the restarting router. The restarting router relearns the network topology from its helpful neighbors.

This implementation of graceful restart restarting router behavior is only useful with a router stack. Graceful restart does not work on a standalone, single-unit router.

nsf helper

Use the **nsf-helper** to allow OSPF to act as a helpful neighbor for a restarting router. Use the **no** form of this command to prevent OSPF from acting as a helpful neighbor.

Syntax

nsf helper[**planned-only**]

no nsf helper

- **planned-only** — This keyword indicates that OSPF should only help a restarting router performing a planned restart.

Default Configuration

OSPF may act as a helpful neighbor for both planned and unplanned restarts

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

The grace LSA announcing the graceful restart includes a restart reason. Reasons 1 (software restart) and 2 (software reload/upgrade) are considered planned restarts. Reasons 0 (unknown) and 3 (switch to redundant control processor) are considered unplanned restarts.

nsf ietf helper disable is functionally equivalent to no nsf helper and is supported solely for IS CLI compatibility.

nsf helper strict-lsa-checking

Use the **nsf-helper strict-lsa-checking** command to require that an OSPF helpful neighbor exit helper mode whenever a topology change occurs. Use the “no” form of this command to allow OSPF to continue as a helpful neighbor in spite of topology changes.

Syntax

nsf [**ietf**] **helper strict-lsa-checking**

no nsf [**ietf**] **helper strict-lsa-checking**

- **ietf** —This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.

Default Configuration

A helpful neighbor exits helper mode when a topology change occurs.

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

The restarting router is unable to react to topology changes. In particular, the restarting router will not immediately update its forwarding table; therefore, a topology change may introduce forwarding loops or black holes that persist until the graceful restart completes. By exiting the graceful restart on a topology change, a router tries to eliminate the loops or black holes as quickly as possible by routing around the restarting router.

A helpful neighbor considers a link down with the restarting router to be a topology change, regardless of the strict LSA checking configuration.

nsf restart-interval

Use the **nsf restart-interval** command to configure the length of the grace period on the restarting router. Use the “no” form of this command to revert the grace period to its default.

Syntax

nsf [**ietf**] **restart-interval** *seconds*

no nsf [**ietf**] **restart-interval**

- **ietf** — This keyword is used to distinguish the IETF standard implementation of graceful restart from other implementations. Since the IETF implementation is the only one supported, this keyword is optional.

- *seconds* — The number of seconds that the restarting router asks its neighbors to wait before exiting helper mode. The restarting router includes the restart interval in its grace LSAs (range 1–1800 seconds).

Default Configuration

The default restart interval is 120 seconds.

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

The grace period must be set long enough to allow the restarting router to reestablish all of its adjacencies and complete a full database exchange with each of those neighbors.

passive-interface

Use the **passive-interface** command to set the interface or tunnel as passive. It overrides the global passive mode that is currently effective on the interface or tunnel. Use the “no” form of this command to set the interface or tunnel as non-passive.

Syntax

passive-interface {**vlan** *vlan-id* | **tunnel** *tunnel-id*}

no passive-interface {**vlan** *vlan-id* | **tunnel** *tunnel-id*}

- *vlan-id* — The VLAN number
- *tunnel-id* — Tunnel identifier. (Range: 0–7)

Default Configuration

Passive interface mode is disabled by default.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-router)#passive-interface vlan 1
```

passive-interface default

The **passive-interface default** command enables the global passive mode by default for all interfaces. It overrides any interface level passive mode. Use the "no" form of this command to disable the global passive mode by default for all interfaces. Any interface previously configured to be passive reverts to non-passive mode.

Syntax

passive-interface default

no passive-interface default

Default Configuration

Global passive mode is disabled by default.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console(config-rtr)#passive-interface default
```

redistribute (OSPFv3)

Use the **redistribute** command in Router OSPFv3 Configuration mode to configure the OSPFv3 protocol to allow redistribution of routes from the specified sources.

Syntax

redistribute *protocol* [**metric** *metric-value*] [**tag** *tag-value*] [**route-map** *route-tag*]

no redistribute *protocol*

- *protocol* —One of the following:
  - static—Specifies that static routes are to be redistributed.
  - connected—Specifies that connected routes are to be redistributed.
  - bgp—Specifies BGP originated routes are to be redistributed.
- *metric-value* — Metric value used for default routes. (Range: 0-16777214)
- *tag-value*— Insert the specified tag value into redistributed routes.
- *route-tag*—Filter redistributed routes using the specified route map.

Default Configuration

The default tag value is 0.

There is no default metric or route map configured.

Command Mode

Router OSPFv3 Configuration mode

User Guidelines

When redistributing a route metric, the receiving protocol must understand the metric. The OSPF metric is a cost value equal to 10^8/ link bandwidth in bits/sec. For example, the OSPF cost of GigabitEthernet is $1 = 10^8/10^8 = 1$.

The RIP metric is a hop count with a maximum value of 15. Redistribution of BGP-originated routes is only available on BGP-enabled routers.

Example

The following example configures the OSPFv3 protocol to allow redistribution of routes to connected devices.

```
console(config)#ipv6 router ospf
console(config-rtr)#redistribute connected
```

router-id

Use the **router-id** command in Router OSPFv3 Configuration mode to set a 4-digit dotted-decimal number uniquely identifying the Router OSPF ID.

Syntax

router-id *router-id*

- *router-id* — Router OSPF identifier. (Range: 0-4294967295)

Default Configuration

This command has no default configuration.

Command Mode

Router OSPFv3 Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets a 4-digit dotted-decimal number identifying the Router OSPF ID as 2.3.4.5.

```
console(config)#ipv6 router ospf
console(config-rtr)#router-id 2.3.4.5
```

show ipv6 ospf

Use the **show ipv6 ospf** command to display information relevant to the OSPF router.

Syntax

show ipv6 ospf [**area** *area-id*] [**vrf** ***vrf-name***]

- *area-id* — Identifier for the OSPF area being displayed.
- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

Some of the information below displays only if you enable OSPF and configure certain features. The following fields may be displayed:

Field	Description
Router ID	A 32-bit integer in dotted decimal format identifying the router about which information is displayed. This is a configured value.
OSPF Admin Mode	Shows whether OSPF is administratively enabled or disabled.
External LSDB Limit	Shows the maximum number of non-default external LSAs entries that can be stored in the link-state database.
Exit Overflow Interval	Shows the number of seconds that, after entering OverflowState, as defined by RFC 1765, a router will attempt to leave OverflowState.
AutoCost Ref BW	The configured autocost reference bandwidth. This value is used to determine the OSPF metric on its interfaces. The reference bandwidth is divided by the interface speed to compute the metric.
Default Passive Setting	When enabled, OSPF interfaces are passive by default.
Maximum Paths	Shows the maximum number of paths that OSPF can report for a given destination.
Default Metric	Default metric for redistributed routes.
Default Route Advertise	When enabled, OSPF originates a type 5 LSA advertising a default route.
Always	When this option is configured, OSPF only originates a default route when the router has learned a default route from another source.

Metric	Shows the metric for the advertised default routes. If the metric is not configured, this field is not configured.
Metric Type	Shows whether the metric for the default route is advertised as External Type 1 or External Type 2.
Number of Active Areas	The number of OSPF areas to which the router is attached on interfaces that are up.
ABR Status	Shows whether the router is an OSPF Area Border Router.
ASBR Status	Indicates whether the router is an autonomous system border router. Router automatically becomes an ASBR when it is configured to redistribute routes learned from another protocol. The possible values for the ASBR status is enabled (if the router is configured to redistribute routes learned by other protocols) or disabled (if the router is not configured for the same).
Stub Router	OSPF enters stub router mode, as described in RFC 3137, when it encounters a resource limitation that prevents it from computing a complete routing table. In this state, OSPF sets the link metrics of non-stub links in its own router LSAs to the largest possible value, discouraging other routers from computing paths through the stub router, but allowing other routers to compute routes to destinations attached to the stub router. To restore OSPF to normal operation, resolve the condition that caused the resource overload, then disable and reenable OSPF globally.
External LSDB Overflow	OSPF enters this state when the number of external LSAs exceeds a configured limit, as described in RFC 1765.
External LSA Count	Shows the number of external (LS type 5) link-state advertisements in the link-state database.
External LSA Checksum	Shows the sum of the LS checksums of external link-state advertisements contained in the link-state database.
New LSAs Originated	Shows the number of link-state advertisements that have been originated.
LSAs Received	Shows the number of link-state advertisements received determined to be new instantiations.
LSA Count	The number of LSAs in the link state database.
Maximum Number of LSAs	The limit on the number of LSAs that the router can store in its link state database.

LSA High Water Mark	The maximum number of LSAs that have been in the link state database since OSPF began operation.
Retransmit List Entries	The current number of entries on all neighbors' retransmit lists.
Maximum Number of Retransmit Entries	The maximum number of entries that can be on neighbors' retransmit lists at any given time. This is the sum for all neighbors. When OSPF receives an LSA and cannot allocate a new retransmit list entry, the router does not acknowledge the LSA, expecting the sender to retransmit.
Retransmit Entries High Water Mark	The maximum number of retransmit list entries that have been on all neighbors' retransmit lists at one time.
NSF Support	Whether graceful restart is administratively enabled. Possible values are Support Always, Disabled, or Planned.
NSF Restart Interval	The number of seconds a helpful neighbor allows a restarting router to complete its graceful restart.
NSF Restart Status	Whether the router is currently performing a graceful restart.
NSF Restart Age	The number of seconds until a graceful restart expires. Only non-zero when the router is in graceful restart.
NSF Restart Exit Reason	The reason the previous graceful restart ended. Possible values are Not attempted, In progress, Completed, Timed out, Topology change, and Manual clear.
NSF Helper Support	Whether this router is configured to act as a graceful restart helpful neighbor. Possible values are: Helper Support Always, Disabled, or Planned.
NSF Helper Strict LSA Checking	As a graceful restart helpful neighbor, whether to terminate the helper relationship if a topology change occurs during a neighbor's graceful restart.
Redistributing	This field is a heading and appears only if you configure the system to take routes learned from a non-OSPF source and advertise them to its peers.
Source	Shows source protocol/routes that are being redistributed. Possible values are static, connected, or BGP.
Tag	Shows the decimal value attached to each external route.
Subnets	When this option is not configured, OSPF will only redistribute classful prefixes.

Distribute-List	Shows the access list used to filter redistributed routes.

Example

The following example enables OSPF traps.

```
console#show ipv6 ospf
Router ID...................................... 0.0.0.2
OSPF Admin Mode................................ Enable
ASBR Mode...................................... Disable
ABR Status..................................... Disable
Exit Overflow Interval......................... 0
External LSA Count............................. 0
External LSA Checksum.......................... 0
New LSAs Originated............................ 0
LSAs Received.................................. 0
External LSDB Limit............................ No Limit
Default Metric................................. Not Configured
Maximum Paths.................................. 2
Default Route Advertise........................ Disabled
Always......................................... FALSE
Metric.........................................
Metric Type.................................... External Type 2
NSF Support.................................... Disabled
NSF Restart Interval........................... 120 seconds
NSF Helper Support............................. Always
NSF Helper Strict LSA Checking................. Enabled
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf abr

This command displays the internal OSPFv3 routes to reach Area Border Routers (ABR). This command takes no options.

Syntax

show ipv6 ospf abr [vrf ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

```
console#show ipv6 ospf abr
Type  Router Id  Cost  Area ID   Next Hop                 Next Hop
                                                           Intf
----    --------  ----  --------  -----------------------  -----
INTRA  3.3.3.3   10    0.0.0.1   FE80::211:88FF:FE2A:3CB3  vlan11
INTRA  4.4.4.4   10    0.0.0.1   FE80::210:18FF:FE82:8E1   vlan12
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf area

Use the **show ipv6 ospf area** command to display information about the area.

Syntax

show ipv6 ospf area *areaid* [**vrf** ***vrf-name***]

- *areaid* — Identifier for the OSPF area being displayed.
- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays information about area 1.

```
console#show ipv6 ospf area 1
AreaID....................................... 0.0.0.1
External Routing............................. Import External LSAs
Spf Runs..................................... 0
Area Border Router Count..................... 0
Area LSA Count............................... 0
Area LSA Checksum............................ 0
Stub Mode.................................... Disable
Import Summary LSAs.......................... Enable
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf asbr

The **show ipv6 ospf asbr** command displays the internal OSPFv3 routes to reach Autonomous System Boundary Routes (ASBR). This command takes no options.

Syntax

show ipv6 ospf asbr [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

```
console#show ipv6 ospf asbr
Type   Router Id   Cost  Area ID   Next Hop                Next Hop
```

```
                                                             Intf
----   ---------   ----   --------   ----------------------  -------
INTRA  1.1.1.1     10      0.0.0.1   FE80::213:C4FF:FEDB:6C41   vlan10
INTRA  4.4.4.4     10      0.0.0.1   FE80::210:18FF:FE82:8E1    vlan12
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf border-routers

Use the **show ipv6 ospf** command to display internal OSPFv3 routes to reach Area Border Routers (ABR) and Autonomous System Boundary Routers (ASBR). This command takes no options.

Syntax

show ipv6 ospf border-routers [**vrf** ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf database

Use the **show ipv6 ospf database** command to display information about the link state database when OSPFv3 is enabled.

Syntax

show ipv6 ospf [*area-id*] **database** [**vrf** ***vrf-name***] [{**external** | **inter-area** {**prefix** | **router**} | **link** | **network** | **nssaexternal** | **prefix** | **router** | **unknown** [area | as | **link**]}] [*link-state-id*] [**adv-router** [*router-id*] | **self-originate**]

- *area-id* — Identifies a specific OSPF area for which link state database information will be displayed.
- *vrf-name* — The name of an existing VRF instance.
- **external** — Displays the external LSAs.
- **inter-area** — Displays the inter-area LSAs.
- **link** — Displays the link LSAs.
- **network** — Displays the network LSAs.
- **nssa-external** — Displays NSSA external LSAs.
- **prefix** — Displays intra-area Prefix LSA.
- **router** — Displays router LSAs.
- **unknown** — Displays unknown area, AS or link-scope LSAs.
- *link-state-id* — Specifies a valid link state identifier (LSID).
- **adv-router** — Shows the LSAs that are restricted by the advertising router.
- *router-id* — Specifies a valid router identifier.
- **self-originate** — Displays the LSAs in that are self originated.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

If no parameters are entered, the command displays the LSA headers. Optional parameters specify the type of link state advertisements to display.

The information below is only displayed if OSPF is enabled.

Example

The following example displays information about the link state database when OSPFv3 is enabled.

```
console#show ipv6 ospf database
```

```
                Router Link States (Area 0.0.0.0)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                    0   4      80000034 54BD V6E--R- ----B
2.2.2.2                    0   2      80000044 95A5 V6E--R- ----B

                Network Link States (Area 0.0.0.0)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
2.2.2.2                  636    636   80000001 8B0D V6E--R-

                Inter Network States (Area 0.0.0.0)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                    1   323    80000001 3970
2.2.2.2                    1   322    80000001 1B8A
1.1.1.1                    2   293    80000001 3529
2.2.2.2                    2   375    80000001 FC5E

                Link States (Area 0.0.0.0)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                   634   700  80000008 2D89 V6E--R-
2.2.2.2                   634   689  8000000A 6F82 V6E--R-
2.2.2.2                   635   590  80000001 7782 V6E--R-


                Intra Prefix  States (Area 0.0.0.0)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                     0   1      8000003C 9F31
2.2.2.2                     0   2      8000004D 9126

                Router Link States (Area 0.0.0.1)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                    0   1      8000002E 35AD V6E--R- --V-B
2.2.2.2                    0   0      8000004A D2F3 V6E--R- ----B

                Network Link States (Area 0.0.0.1)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                   634  621    80000001 B9E2 V6E--R-

                Inter Network States (Area 0.0.0.1)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                   16   4      80000001 CA7C
2.2.2.2                   18   3      80000001 B28D

                Link States (Area 0.0.0.1)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
```

```
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                    634   441    80000003 B877 V6E--R-
2.2.2.2                    634   433    80000003 FE6E V6E--R-


                Intra Prefix  States (Area 0.0.0.1)
Adv Router     Link Id         Age   Sequence Csum Options Rtr Opt
-------------- --------------- ----- -------- ---- ------- -------
1.1.1.1                      0   6    8000003A 37C4
2.2.2.2                      0   1    8000004F 439A
1.1.1.1                  10634   434  80000002 440A
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf database database-summary

Use the **show ipv6 ospf database database-summary** command to display the number of each type of LSA in the database and the total number of LSAs in the database.

Syntax

show ipv6 ospf database [**vrf** ***vrf-name***] **database-summary**

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays the number of each type of LSA in the database and the total number of LSAs in the database.

```
console#show ipv6 ospf database database-summary
```

```
OSPF Router with ID (0.0.0.2)
Router database summary
Router........................................ 0
Network....................................... 0
Inter-area Prefix............................. 0
Inter-area Router............................. 0
Type-7 Ext.................................... 0
Link.......................................... 0
Intra-area Prefix............................. 0
Link Unknown.................................. 0
Area Unknown.................................. 0
AS Unknown.................................... 0
Type-5 Ext.................................... 0
Self-Originated Type-5 Ext.................... 0
Total......................................... 0
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf interface

Use the **show ipv6 ospf interface** command to display the information for the IFO object or virtual interface tables.

Syntax

show ipv6 ospf interface [*interface-type interface-number*] [**vrf** ***vrf-name***]

- *interface-type*—The interface type, VLAN, tunnel or loopback
- *interface-number*—The valid interface number, a valid VLAN ID, tunnel identifier (Range: 0–7) or loopback identifier (Range: 0–7).
- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays the information in VLAN 11's virtual interface tables.

```
console#show ipv6 ospf interface vlan 11
IP Address..................................... 11.11.11.11
ifIndex........................................ 1
OSPF Admin Mode................................ Enable
OSPF Area ID................................... 0.0.0.0
Router Priority................................ 1
Retransmit Interval............................ 5
Hello Interval................................. 10
Dead Interval.................................. 40
LSA Ack Interval............................... 1
Iftransit Delay Interval....................... 1
Authentication Type............................ None
Metric Cost.................................... 10 (computed)
OSPF Mtu-ignore................................ Disable
OSPF cannot be initialized on this interface.
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf interface brief

Use the **show ipv6 ospf interface brief** command to display brief information for the IFO object or virtual interface tables.

Syntax

show ipv6 ospf interface brief [vrf ***vrf-name***]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays brief ospf interface information.

```
console#show ipv6 ospf interface brief
                                         Hello Dead  Retrax       LSA
          Admin              Router      Int.  Int.  Int.  Retrax Ack
Interface  Mode    Area ID   Prior. Cost Val.  Val.  Val.  Delay  Intval
--------- -------- --------  ------ ----- ----- ----- ------ ------ -----
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf interface stats

Use the **show ipv6 ospf interface stats** command to display the statistics for a specific interface. The command only displays information if OSPF is enabled.

Syntax

show ipv6 ospf interface stats vlan *vlan-id*

- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the interface statistics for VLAN 5.

```
console>show ipv6 ospf interface stats vlan 5
OSPFv3 Area ID................................ 0.0.0.1
Spf Runs...................................... 265
Area Border Router Count...................... 1
AS Border Router Count........................ 0
Area LSA Count................................ 6
IPv6 Address..................................
FE80::202:BCFF:FE00:3146/1283FFE::2/64
OSPF Interface Events......................... 53
Virtual Events................................ 13
Neighbor Events............................... 6
External LSA Count............................ 0
LSAs Received................................. 660
Originate New LSAs............................ 853
Sent Packets.................................. 1013
Received Packets.............................. 893
Discards...................................... 48
Bad Version................................... 0
Virtual Link Not Found........................ 9
Area Mismatch................................. 39
Invalid Destination Address................... 0
No Neighbor at Source Address................. 0
Invalid OSPF Packet Type...................... 0
  Packet Type             Sent        Received
--------------------      ----------  ----------
Hello                     295          219
Database Description      10            14
LS Request                4              4
LS Update                 521          398
LS Acknowledgment         209          282
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf interface vlan

Use the **show ipv6 ospf interface vlan** command to display OSPFv3 configuration and status information for a specific VLAN.

Syntax

show ipv6 ospf interface {vlan *vlan-id* **| brief** [vrf ***vrf-name***]}

- *vlan-id* — Valid VLAN ID. Range is 1-4093.
- **brief —** Displays a snapshot of configured interfaces.
- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays OSPF interface VLAN information.

```
console#show ipv6 ospf interface vlan 10
IPv6 Address............................ FE80::2FC:E3FF:FE90:44
ifIndex................................. 634
OSPF Admin Mode......................... Enable
OSPF Area ID............................ 0.0.0.1
Router Priority......................... 1
Retransmit Interval..................... 5
Hello Interval.......................... 10
Dead Interval........................... 40
LSA Ack Interval........................ 1
Iftransit Delay Interval................ 1
Authentication Type..................... None
Metric Cost............................. 10  (computed)
OSPF Mtu-ignore......................... Disable
OSPF Interface Type..................... broadcast
State................................... backup-designated-router
Designated Router....................... 1.1.1.1
Backup Designated Router................ 2.2.2.2
Number of Link Events................... 46
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf lsa-group

Use this command to display the number of self-originated LSAs within each LSA group.

Syntax

show ipv6 ospf lsa-group [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.
- Total self-originated LSAs — The number of LSAs the router is currently originating.
- Average LSAs per group — The number of self-originated LSAs divided by the number of LSA groups. The number of LSA groups is the refresh interval (1800 seconds) divided by the pacing interval (configured with `timers pacing lsa-group`) plus two.
- Pacing group limit — The maximum number of self-originated LSAs in one LSA group. If the number of LSAs in a group exceeds this limit, OSPF redistributes LSAs throughout the refresh interval to achieve better balance.
- Groups — For each LSA pacing group, the output shows the range of LSA ages in the group and the number of LSAs in the group.

Command Mode

User Exec, Privileged Exec mode, VRF Configuration

Example

The following shows an example of the command.

```
(R1) #show ipv6 ospf lsa-group

Total self-originated LSAs:  3019
Average LSAs per group:  100
Pacing group limit:  400
Number of self-originated LSAs within each LSA group...


Group Start Age   Group End Age    Count
              0              59       96
             60             119       88
            120             179      102
            180             239       95
```

```
       240              299        95
       300              359        92
       360              419        48
       420              479        58
       480              539       103
       540              599        99
       600              659       119
       660              719       110
       720              779       106
       780              839       122
       840              899       110
       900              959        99
       960             1019       135
      1020             1079       101
      1080             1139        94
      1140             1199       115
      1200             1259       110
      1260             1319       111
      1320             1379       111
      1380             1439        99
      1440             1499       102
      1500             1559        96
      1560             1619       106
      1620             1679       111
      1680             1739       106
      1740             1799        80
      1800             1859         0
      1860             1919         0
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf neighbor

Use the **show ipv6 ospf neighbor** command to display information about OSPF neighbors. If a neighbor IP address is not specified, the output displays summary information in a table. If an interface or tunnel is specified, only the information for that interface or tunnel displays. The information below only displays if OSPF is enabled and the interface has a neighbor.

Syntax

show ipv6 ospf neighbor [**vrf** *vrf-name*] [*interface-id*] [*neighbor-id*]

- *vrf-name* — The name of an existing VRF instance.
- *interface-id*—A valid VLAN identifier or tunnel identifier.

- *neighbor-id*—Valid IP address of the neighbor about which information is displayed.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Examples

The following examples display information about OSPF neighbors, in the first case in a summary table, and in the second in a table specific to tunnel 1.

```
console#show ipv6 ospf neighbor
Router ID Priority Intf Interface    State         Dead
                   ID                              Time
--------- -------- ---- -----------  ------------- ----

console#show ipv6 ospf neighbor interface tunnel 1
IP Address................................... 2.4.6.8
ifIndex...................................... 619
OSPF Admin Mode.............................. Enable
OSPF Area ID................................. 0.0.0.0
Router Priority.............................. 1
Retransmit Interval.......................... 5
Hello Interval............................... 10
Dead Interval................................ 40
LSA Ack Interval............................. 1
Iftransit Delay Interval..................... 1
Authentication Type.......................... None
Metric Cost.................................. 1 (computed)
OSPF Mtu-ignore.............................. Disable
OSPF cannot be initialized on this interface.
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf range

Use the **show ipv6 ospf range** command to display information about the area ranges for the specified area identifier.

Syntax

show ipv6 ospf range *areaid* [**vrf** *vrf-name*]

- *areaid* — Identifies the OSPF area whose ranges are being displayed.
- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays information about the area ranges for area 1.

```
console#show ipv6 ospf range 1
Area ID   IPv6 Prefix/Prefix Length  Lsdb Type       Advertisement
--------- -------------------------  --------------- -------------
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf statistics

Use this command to display information about the 15 most recent Shortest Path First (SPF) calculations. SPF is the OSPF routing table calculation.

Syntax

show ipv6 ospf statistics [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.

Command Mode

User Exec, Privileged Exec mode, VRF Configuration

User Guidelines

The command displays the following information with the most recent statistics displayed at the end of the table.

- Delta T — The time since the routing table was computed. The time is in the format hours, minutes, and seconds (hh:mm:ss).
- Intra — The time taken to compute intra-area routes, in milliseconds.
- Summ — The time taken to compute inter-area routes, in milliseconds.
- Ext — The time taken to compute external routes, in milliseconds.
- SPF Total — The total time taken to compute routes, in milliseconds. The total may exceed the sum of Intra, Summ, and Ext times.
- RIB Update — The time from the completion of the routing table calculation until all changes have been made in the common routing table [the Routing Information Base (RIB)], in milliseconds.
- Reason — The event or events that triggered the SPF. The reason codes are as follows:
  - R: New router LSA.
  - N: New network LSA.
  - SN: New network (inter-area prefix) summary LSA.
  - SA: New ASBR (inter-area router) summary LSA.
  - X: New external LSA.
  - IP: New intra-area prefix LSA.
  - L: New link LSA.

Example

The following shows example CLI display output for the command.

```
(Routing) #show ipv6 ospf statistics
```

```
 Area 0.0.0.0: SPF algorithm executed 10 times

Delta T         Intra       Summ        Ext     SPF Total   RIB Update  Reason

23:32:46           0           0          0            0           0   R, IP
23:32:09           0           0          0            0           0   R, N, IP
23:32:04           0           0          0            0           0   R
23:31:44           0           0          0            0           0   R, N, IP
23:31:39           0           0          0            0           1   R
23:29:57           0           3          7           10         131   R
23:29:52           0          14         29           43         568   SN
04:07:23           0           9         23           33         117   SN
04:07:23           0           9         23           33           117   SN
04:07:18           0           0          0            1           485   SN
04:07:14           0           1          0            1             3    X
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf stub table

Use the show ipv6 ospf stub table command to display the OSPF stub table. The information below will only be displayed if OSPF is initialized on the switch.

Syntax

show ipv6 ospf stub table [**vrf** *vrf-name*]

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays the OSPF stub table.

```
console#show ipv6 ospf stub table
AreaId       TypeofService   Metric Val   Import SummaryLSA
------------ -------------   ----------   -----------------
0.0.0.10          Normal         1             Enable
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf virtual-link

Use the **show ipv6 ospf virtual-link** command to display the OSPF Virtual Interface information for a specific area and neighbor or for all areas in the system.

Syntax

show ipv6 ospf virtual-link [**vrf** *vrf-name*] [*area-id neighbor-id* | brief]

- *vrf-name* — The name of an existing VRF instance.
- *area-id* — Identifies the OSPF area whose virtual interface information is being displayed.
- *neighbor-id* — Router ID of neighbor.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays the OSPF Virtual Interface information for area 1 and its neighbor.

```
console#show ipv6 ospf virtual-link 1 1.1.1.1
Area ID....................................... 1
Neighbor Router ID............................ 1.1.1.1
Hello Interval................................ 10
Dead Interval................................. 40
Iftransit Delay Interval...................... 1
Retransmit Interval........................... 5
State......................................... point-to-point
Metric........................................ 10
Neighbor State................................ Full
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ipv6 ospf virtual-link brief

Use the **show ipv6 ospf virtual-link brief** command to display the OSPFV3 Virtual Interface information for all areas in the system.

Syntax

show ipv6 ospf virtual-link [**vrf** *vrf-name*] **brief**

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes, VRF Configuration

User Guidelines

This command has no user guidelines.

Example

The following example displays the OSPF stub table.

```
console(config)#show ipv6 ospf virtual-link brief
                         Hello      Dead       Retransmit Transit
Area ID     Neighbor     Interval   Interval   Interval   Delay
----------- ----------- ---------- ---------- ---------- --------
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

timers throttle spf

Use the **timers throttle spf** command to throttle the link-state-packets. Use the **no** form of the command to return the configured parameters to their default values.

Syntax

timers throttle spf *spf-start spf-hold spf-maximum*

no timers throttle spf

- *spf-start*—Configures the delay used when no SPF calculation has been scheduled during the current wait interval. (Range: 1–60000 milliseconds)
- *spf-hold*—Configures the initial wait interval. (Range: 1–60000 milliseconds)
- *spf-maximum*—Configures the maximum wait interval. (Range: 1–60000 milliseconds)

Default Configuration

The default value for *spf-start* is 2000 milliseconds.

The default value for *spf-hold* is 5000 milliseconds.

The default value for *spf-maximum* is 5000 milliseconds.

Command Mode

OSPFv3 Configuration mode.

User Guidelines

The **timers throttle** command throttles the generation of link-state packets (LSPs). Receipt of an LSP will initiate an SPF calculation in the router. LSP throttling reduces route flapping and the load on other OSPF routers in the network.

The initial wait interval is set to the value of spf-hold. If an SPF calculation is not initiated during the current wait interval, the next SPF calculation is scheduled *spf-start* milliseconds later. This wait interval is doubled on each subsequent expiry if an SPF calculation is initiated during the interval. Initiating an SPF calculation resets the wait interval to the value of *spf-hold*. The wait interval is not allowed to exceed the value of *spf-maximum*.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config-router6)#timers throttle spf 3000 6000 18000
```

IPv6 Policy-Based Routing Commands

Dell EMC Networking N3000E/N3100E-ON/N3200-ON Series Switches

Use IPv6 Policy-Based Routing commands to configure and view policy-based routing for IPv6.

ipv6 policy route-map

Use this command to identify a route map to use for policy-based IPv6 routing on an interface.

Syntax

ipv6 policy route-map *route-map-name*

no ipv6 policy route-map *route-map-name*

- *route-map-name*—The name of the route map to use for policy-based routing. It must match a route map tag specified by the route-map command

Default Configuration

There are no route maps configured by default.

Command Mode

Interface (VLAN) Configuration mode.

User Guidelines

Policy-based routing must be configured on the VLAN interface that receives the packets, not on the VLAN interface from which the packets are sent. Packets matching a deny route map are routed using the routing table. Policy maps with no set clause are ignored.

When a route-map applied on an interface is changed, i.e. new statements are added to route-map or match or set terms are added/removed from the route map statement, or if any route-map that is applied on an interface is removed, the entire sequence of route-maps needs to be removed from the interface and added back again in order to have the changed route-map configuration be effective.

If the administrator removes match or set terms in a route-map intermittently, the counters corresponding to the removed match term are reset to zero. A route-map statement must contain eligible match/set conditions for policy based routing in order to be applied to hardware.

Valid match conditions are:

```
match ipv4 address <acl>, match mac-list, match length
```

Valid set conditions are:

```
set ipv6 next-hop, set ipv6 default next-hop, set ipv6 precedence
```

A route-map statement must contain at least one of the match and one of the set conditions specified above in order it to be eligible to be applied to hardware. If not, the route-map is not applied to hardware. An ACL referenced in a route-map may not be edited. Instead, create a new ACL with the desired changes and update the route-map with the edited ACL.

Route-maps and DiffServ cannot operate on the same interface due to allocation of conflicting resources. An error is thrown to user if when configuring a route-map on an interface on which DiffServ has been previously configured.

When a route map is configured on a VLAN interface and a DiffServ policy is applied on any individual member port of the same VLAN interface, the port policy (DiffServ) takes priority over the VLAN (route map) policy.

Command History

Command introduced in version 6.6 firmware.

Example

Considering equal-access as a previously configured route-map, the following sequence is an example of how it is applied to an interface.

```
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#ip policy route-map equal-access
```

match ipv6 address

Use this command to specify IPv6 address match criteria for a route map. Use the **no** form of this command to delete a match statement from a route map.

Syntax

match ip address access-list-name [access-list-name]

no match ip address access-list-name [access-list-name]

- **access-list-name**—The access-list name that identifies the named IPv6 ACL. The name can be up to 31 characters in length.

Default Configuration

This command has no default configuration.

Command Mode

Route Map Configuration mode.

User Guidelines

The IPv6 ACL must be configured before it can be linked to a route-map. Specifying an unconfigured IPv6 ACL causes an error. Actions present in an IP ACL configuration are applied along with other actions present in route-map. When an IPv6 ACL referenced by a route-map is removed or rules are added or deleted from that ACL, the configuration is rejected. Policy (DiffServ) takes priority over the VLAN (route map) policy.

Actions in the IP ACL configuration are applied with other actions present in the route-map. If an IP ACL referenced by a route-map is removed or rules are added or deleted from the ACL, the configuration is rejected.

If a list of IP access lists is specified in this command and a packet matches at least one of these access list match criteria, the corresponding set of actions in the route map are applied to the packet. Duplicate IP access list names are ignored.

It is strongly recommended that access lists used in a route map not be reused for normal access list processing. This is because:

- ACLs inherit the priority of the route map. This overrides the priority of the including access group.

- Route maps do not have a implicit deny all at the end of the list. Instead, non-matching packets for a permit route map use the routing table.

Command History

Command introduced in version 6.6 firmware.

Example

The following sequence shows how to create a route-mao with a match clause using an IPv6 ACL and applies the route map to an interface. This example presumes VLAN 10 is already created and ipv6 routing is globally enabled.

```
console(config)#ipv6 enable
console(config)#ipv6 access-list acl2
console(config-ipv6-acl)#permit ipv6 1001::1 any
console(config-ipv6-acl)#exit
console(config)#route-map rm1 permit 40
console(route-map)#match ipv6 address acl2
console(config-route-map)#set ipv6 default next-hop 2001::2
console(config-route-map)#interface vlan 10
console(config-if-vlan10)#ipv6 enable
console(config-if-vlan10)#ipv6 policy route-map rm1
```

set ipv6 next-hop

Use this command to specify an adjacent next-hop router in the path toward the destination to which the packets should be forwarded. If more than one IPv6 address is specified, the first IPv6 address associated with a link up interface is used to route the packets. Use the **no** form of the command to remove a set command from a route map.

Syntax

set ipv6 next-hop { [**interface vlan** *vlan-id link-local-address*] | *ipv6-address* [*ipv6-address*] }

no set ipv6 next-hop { [**interface vlan** *vlan-id link-local-address*] | *ipv6-address* [*ipv6-address*] }

- *ipv6-address*—The IPv6 address of the next hop to which packets are routed. It must be the address of an adjacent router (for example, the next hop must be in a subnet configured on the local router). A maximum of 16 next-hop IPv6 addresses can be specified.

- *vlan-id*—The VLAN over which the IPv6 link-local address may be reached.
- *link-local-address*—The IPv6 link-local address of the adjacent router.

Default Configuration

This command has no default configuration.

Command Mode

Route Map mode.

User Guidelines

The **set ipv6 next-hop** command affects all incoming packet types and is always used if configured and the next hop is resolved. A check is made periodically to see if the next-hop is resolved.

Only one of **set ipv6 next-hop**, **set ipv6 default next-hop**, or **set interface null0** may be specified in a route map. However, a **set ipv6 default next-hop** statement may be configured in a separate route-map statement.

Command History

Command introduced in version 6.6 firmware.

set ipv6 default next-hop

Use this command to specify an adjacent default next-hop router in the path toward the destination to which the packets should be forwarded. Use the **no** form of this command to remove a default next-hop from a route map.

Syntax

set ipv6 default next-hop { [**interface vlan** *vlan-id link-local-address*] | ***ipv6-address*** [***ipv6-address***] }

no set ipv6 default next-hop { [**interface vlan** *vlan-id link-local-address*] | ***ipv6-address*** [***ipv6-address***] }

- ***ipv6-address***—The IPv6 address of the next hop to which packets are routed. It must be the address of an adjacent router (for example, the next hop must be in a subnet configured on the local router). A maximum of 16 next-hop IPv6 addresses can be specified.
- *vlan-id*—The VLAN over which the IPv6 link-local address may be reached.
- *link-local-address*—The IPv6 link-local address of the adjacent router.

Default Configuration

This command has no default configuration.

Command Mode

Route Map mode.

User Guidelines

A packet is routed to the next hop specified by this command only if there is no explicit route to the destination in the routing table. A default route in the routing table is not considered an explicit route for an unknown destination address. If a default route is configured and packets match the policy with a set ipv6 default next-hop action, they will be policy routed.

Only one of **set ipv6 next-hop**, **set ipv6 default next-hop**, or **set interface null0** may be specified in a route map. However, a **set ipv6 next-hop** statement may be configured in a separate route-map statement.

Command History

Command introduced in version 6.6 firmware.

set ipv6 precedence

Use this command to specify the precedence in the IPv6 packet header in the path toward the destination to which the packets should be forwarded. Use the **no** form of this command to remove a precedence setting from a route map.

Syntax

set ipv6 precedence 0-7

no set ipv6 precedence 0-7

Parameter	Description
0	Sets the routine precedence.
1	Sets the priority precedence.
2	Sets the immediate precedence.
3	Sets the Flash precedence.
4	Sets the Flash override precedence.
5	Sets the critical precedence.
6	Sets the internetwork control precedence.
7	Sets the network control precedence.

Default Configuration

This command has no default configuration.

Command Mode

Route Map mode.

User Guidelines

This command rewrites the precedence value in the packet header. It does not alter the treatment of the packet QoS in the local switch. The precedence value set may be used by other QoS services in the network, such as weighted fair queuing (WFQ) or weighted random early detection (WRED).

The set ipv6 precedence clause may be combined with set ipv6 next-hop or set ipv6 default next-hop clause in a route map.

Command History

Command introduced in version 6.6 firmware.

show ipv6 policy

Use this command to show which IPv6 policy route maps are configured on an interface.

Syntax

show ipv6 policy

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Router Discovery Protocol Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Routers can be configured to periodically send router discovery messages to announce their presence to locally attached hosts. The router discovery message advertises one or more IP addresses on the router that hosts can use as their default gateway. Hosts can send a router solicitation message asking any router that receives the message to immediately send a router advertisement, so that the host does not have to wait for the next periodic message.

Router discovery enables hosts to select from among multiple default gateways and switch to a different default gateway if an initially designated gateway goes down.

ip irdp

Use the **ip irdp** command in Interface Configuration mode to enable Router Discovery on an interface. Use the **no** form of the command to disable Router Discovery.

Syntax

ip irdp [**multicast** | **holdtime** *seconds* | **maxadvertinterval** *seconds* | **minadvertinterval** *seconds* | **preference** *number* | **address** *address*]

no ip irdp holdtime

- **multicast**—Configure the address that the interface uses to send the router discovery advertisements to be 224.0.0.1, the all-hosts IP multicast address. Use the **no** form of the command to use 255.255.255.255, the limited broadcast address.
- **holdtime** *seconds*—Integer value in seconds of the holdtime field of the router advertisement sent from this interface. (Range: 4-9000 seconds)
- **maxadvertinterval** *seconds*—Maximum time in seconds allowed between sending router advertisements from the interface. (Range: 4 or the minimum advertisement interval, whichever is greater, and 1800 seconds).

- **minadvertinterval** *seconds*—Minimum time in seconds allowed between sending router advertisements from the interface. (Range: 3 to value of maximum advertisement interval in seconds)
- **preference** *number*—Preference of the address as a default router address, relative to other router addresses on the same subnet. (Range: -2147483648 to 2147483647)
- **address** *address*—IP address for router discovery advertisements. (Range: 224.0.0.1 [all-hosts IP multicast address] or 255.255.255.255 [limited broadcast address])

Default Configuration

- Router discovery is disabled by default.
- 1800 seconds is the default value for holdtime.
- 600 seconds is the default value for maxadvertinterval.
- The minadvertinterval default value is 450.
- The preference default value is 0.
- IP address 224.0.0.1 is the default configuration for address.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

This command has no user guidelines.

Example

The following example enables router discovery on the selected interface.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp
```

ip irdp holdtime

Use the **ip irdp holdtime** command in Interface Configuration mode to configure the value, in seconds, of the holdtime field of the router advertisement sent from this interface. Use the no form of the command to set the time to the default value.

Syntax

ip irdp holdtime *integer*

no ip irdp holdtime

- *integer* — Integer value in seconds of the holdtime field of the router advertisement sent from this interface. The holdtime must be no less than the maximum advertisement interval and cannot be greater than 9000 seconds.

Default Configuration

The holdtime defaults to 3 times the maximum advertisement interval.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The holdtime is the length of time that a host considers the router advertisement valid. After the holdtime expires, a host will no longer use the router as its default gateway.

Example

The following example sets hold time at 2000 seconds for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp holdtime 2000
```

ip irdp maxadvertinterval

Use the **ip irdp maxadvertinterval** command in Interface Configuration mode to configure the maximum time, in seconds, allowed between sending router advertisements from the interface. Use the no form of the command to set the time to the default value.

Syntax

ip irdp maxadvertinterval *integer*

no ip irdp maxadvertinterval

- *integer* — Maximum time in seconds allowed between sending router advertisements from the interface. (Range: 4 or the minimum advertisement interval, whichever is greater, and 1800 seconds)

Default Configuration

600 seconds is the default value.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The default values of the minimum advertisement interval and the holdtime depend on the value of the maximum advertisement interval. Setting the maximum advertisement interval changes the minimum advertisement interval and holdtime if those values are at their defaults; so, the maximum advertisement interval should always be set first. If the minimum advertisement interval has been configured to a non-default value, the maximum advertisement interval cannot be configured to a lower value than the minimum advertisement interval. If the holdtime has been configured to a non-default value, the maximum advertisement interval cannot be configured to a value larger than the holdtime.

Example

The following example sets maximum advertisement interval at 600 seconds for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp maxadvertinterval 600
```

ip irdp minadvertinterval

Use the **ip irdp minadvertinterval** command in Interface Configuration mode to configure the minimum time, in seconds, allowed between sending router advertisements from the interface. Use the no form of the command to set the time to the default value.

Syntax

ip irdp minadvertinterval *integer*

no ip irdp minadvertinterval

- *integer* — Minimum time in seconds allowed between sending router advertisements from the interface. (Range: 3 to value of maximum advertisement interval in seconds)

Default Configuration

The default value is 0.75 times the maximum advertisement interval.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets minimum advertisement interval at 100 seconds for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp minadvertinterval 100
```

ip irdp multicast

To send router advertisements as IP multicast packets, use the **ip irdp multicast** command in Interface Configuration mode. To send router advertisements to the limited broadcast address (255.255.255.255), use the no form of this command.

Syntax

ip irdp multicast

no ip irdp multicast

Default Configuration

Router discovery packets are sent to the all hosts IP multicast address (224.0.0.1) by default.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

If a subnet includes any hosts that do not accept IP multicast packets, send router advertisements to the limited broadcast address.

Example

The following example configures router discovery to send to the limited broadcast address:

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp multicast
```

ip irdp preference

Use the **ip irdp preference** command in Interface Configuration mode to configure the preference of the address as a default router address relative to other router addresses on the same subnet. Use the no form of the command to set the preference to the default value.

Syntax

ip irdp preference *integer*

no ip irdp preference

- *integer* — Preference of the address as a default router address, relative to other router addresses on the same subnet. (Range: -2147483648 to 2147483647)

Default Configuration

0 is the default value.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the ip irdp preference to 1000 for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip irdp preference 1000
```

show ip irdp

Use the **show ip irdp** command to display the router discovery information for all interfaces, or for a specified interface.

Syntax

show ip irdp [**vlan** *vlan-id*]

- *vlan-id* — Valid VLAN ID

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows router discovery information for VLAN 15.

```
console#show ip irdp vlan 15
Interface  Ad Mode  Advertise Address Max Int Min Int Hold Time Preference
---------  -------  ----------------- ------- ------- --------- ----------
vlan15     Enable  224.0.0.1            600     450     1800       0
```

Routing Information Protocol Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000E-ON/N3100-ON/N3200-ON Series Switches

The Routing Information Protocol (RIP) has been a long-standing protocol used by routers for exchanging route information. RIP is a distance vector protocol whereby each route is characterized by the number of gateways, or hops, a packet must traverse to reach its intended destination. Categorized as an interior gateway protocol, RIP operates within the scope of an autonomous system. RIP is a simple protocol. Its usefulness is limited to moderately sized networks whose physical interconnections are of similar type and speed.

Dell EMC Networking routing supports RIPv2 as specified in RFC 2453.

auto-summary

Use the **auto-summary** command in Router RIP Configuration mode to enable the RIP auto-summarization mode. Use the no form of the command to disable auto-summarization mode.

Syntax

auto-summary

no auto-summary

Default Configuration

Disabled is the default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config-router)#auto-summary
```

default-information originate (Router RIP Configuration)

Use the **default-information originate** command in Router RIP Configuration mode to control the advertisement of default routes.

Syntax

default-information originate

no default-information originate

Default Configuration

The default configuration is **no default-information originate**.

Command Mode

Router RIP Configuration mode.

User Guidelines

Only routers that actually have Internet connectivity should advertise a default route. All other routers in the network should learn the default route from routers that have connections out to the Internet.

Example

```
console(config-router)#default-information originate
```

default-metric

Use the **default-metric** command in Router RIP Configuration mode to set a default for the metric of distributed routes. Use the **no** form of the command to return the metric to the default value.

Syntax

default-metric *number-value*

no default-metric

- *number-value* — Metric for the distributed routes. (Range: 1-15)

Default Configuration

Default metric is not configured by default.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets a default of 12 for the metric of distributed routes.

```
console(config-router)#default-metric 12
```

distance rip

Use the **distance rip** command in Router RIP Configuration mode to set the route preference value of RIP in the router. Lower route preference values are preferred when determining the best route. Use the no form of the command to return the preference to the default value.

Syntax

distance rip *integer*

no distance rip

- *integer* — RIP route preference. (Range: 1-255)

Default Configuration

15 is the default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the route preference value of RIP in the router at 100.

```
console(config-router)#distance rip 100
```

distribute-list out

Use the **distribute-list out** command in Router RIP Configuration mode to specify the access list to filter routes received from the source protocol. Use the no form of the command to remove the access list from the specified source protocol.

Syntax

distribute-list *accesslistname* **out** {**bgp** | **ospf** | **static** | **connected**}

no distribute-list *accesslistname* **out** {**bgp** | **ospf** | **static** | **connected**}

- *accesslistname* — The name used to identify the existing ACL. The range is 1-31 characters.
- **bgp** — Apply the specified access list when BGP is the source protocol.
- **ospf** — Apply the specified access list when OSPF is the source protocol.
- **static** — Apply the specified access list when packets come through a static route.
- **connected** — Apply the specified access list when packets come from a directly connected route.

Default Configuration

This command has no default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

The access list has an implicit deny all, so it is advisable to have a permit statement somewhere on the access list.

The BGP parameter is only available in firmware versions enabled for BGP.

Example

The following example elects access list ACL40 to filter routes received from the source protocol.

```
console(config-router)#distribute-list ACL40 out static
```

enable

Use the **enable** command in Router RIP Configuration mode to reset the default administrative mode of RIP in the router (active). Use the no form of the command to disable the administrative mode for RIP.

Syntax

enable

no enable

Default Configuration

Enabled is the default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config-router)#enable
```

hostroutesaccept

Use the **hostroutesaccept** command in Router RIP Configuration mode to enable the RIP hostroutesaccept mode. Use the no form of the command to disable the RIP hostroutesaccept mode.

Syntax

hostroutesaccept

no hostroutesaccept

Default Configuration

Enabled is the default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config-router)#hostroutesaccept
```

ip rip

Use the **ip rip** command in Interface Configuration mode to enable RIP on a router interface. Use the no form of the command to disable RIP on the interface.

Syntax

ip rip

no ip rip

Default Configuration

Disabled is the default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config-if-vlan2)#ip rip
console(config-if-vlan2)#no ip rip
```

ip rip authentication

Use the **ip rip authentication** command in Interface Configuration Mode to set the RIP Version 2 Authentication Type and Key for the specified VLAN. Use the no form of the command to return the authentication to the default value.

Syntax

ip rip authentication {**none** | {**simple** *key*} | {**encrypt** *key key-id*}}

no ip rip authentication

- none—Do not use RIP authentication on the VLAN.
- simple—Use simple authentication on the VLAN.
- *key* — Authentication key for the VLAN. (Range: 16 bytes or less)
- encrypt — Use MD5 encryption for the RIP interface.
- *key-id* — Authentication key identifier for authentication type encrypt. (Range: 0-255)

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the RIP Version 2 Authentication Type and Key for VLAN 11.

```
console(config-if-vlan11)#ip rip authentication encrypt pass123 35
```

ip rip receive version

Use the **ip rip receive version** command in Interface Configuration mode to configure the interface to allow RIP control packets of the specified version(s) to be received. Use the no form of the command to return the version to the default value.

Syntax

ip rip receive version {**rip1** | **rip2** | **both** | **none**}

no ip rip receive version

- **rip1** — Receive only RIP version 1 formatted packets.
- **rip2** — Receive only RIP version 2 formatted packets.
- **both** — Receive packets from either format.
- **none** — Do not allow any RIP control packets to be received.

Default Configuration

Both is the default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example allows no RIP control packets to be received by VLAN 11.

```
console(config-if-vlan11)#ip rip receive version none
```

ip rip send version

Use the **ip rip sent version** command in Interface Configuration mode to configure the interface to allow RIP control packets of the specified version to be sent. Use the no form of the command to return the version to the default value.

Syntax

ip rip send version {rip1 | rip1c | rip2 | none}

no ip rip send version

- rip1 — Send RIP version 1 formatted packets.
- rip1c — Send RIP version 1 compatibility mode, which sends RIP version 2 formatted packets via broadcast.
- rip2 — Send RIP version 2 using multicast.
- none — Do not allow any RIP control packets to be sent.

Default Configuration

RIP2 is the default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example allows no RIP control packets to be sent by VLAN 11.

```
console(config-if-vlan11)#ip rip send version none
```

redistribute (RIP)

The **redistribute** command configures RIP protocol to redistribute routes from the specified sources. If the source protocol is OSPF, there are five possible match options.

Syntax

redistribute ospf [**metric** *integer*] [**match** [**internal**] [**external 1**] [**external 2**] [**nssa-external 1**] [**nssa-external 2**]]

no redistribute [**ospf | bgp | static | connected**]

redistribute {**bgp | connected | static**} [**metric** *integer*]

- metric *integer* — Specifies the metric to use when redistributing the route. Range: 0-15.
- match internal — Adds internal matches to any match types presently being redistributed.
- match external 1 — Adds routes imported into OSPF as Type-1 external routes into any match types presently being redistributed.
- match external 2 — Adds routes imported into OSPF as Type-2 external routes into any match types presently being redistributed.
- match nssa-external 1 — Adds routes imported into OSPF as NSSA Type-1 external routes into any match types presently being redistributed.
- match nssa-external 2 — Adds routes imported into OSPF as NSSA Type-2 external routes into any match types presently being redistributed.
- **static** — Redistributes static routes.
- **bgp** — Redistributes BGP originated routes.
- **connected** — Redistributes directly-connected routes.

Default Configuration

metric *integer* — not configured
match — internal

Command Mode

Router RIP Configuration mode.

User Guidelines

When redistributing a route metric, the receiving protocol must understand the metric. The OSPF metric is a cost value equal to 10^8/ link bandwidth in bits/sec. For example, the OSPF cost of GigabitEthernet is $1 = 10^8/10^8 = 1$.

The RIP metric is a hop count with a maximum value of 15.

Dell EMC Networking RIP does not support sending a tag value. Redistribution of BGP-originated routes is only available on BGP-enabled routers. Redistribution of BGP-originated routes into RIP is not recommended.

Example

```
console(config-router)#redistribute ospf metric 10 match nssa-external 1
console(config-router)#redistribute connected metric 1
```

router rip

Use the **router rip command** in Global Configuration mode to enter Router RIP mode.

Syntax

router rip

Default Configuration

RIP is globally enabled by default. RIP is not enabled on any interfaces by default.

Command Mode

Global Configuration mode.

User Guidelines

Use the **enable** and **no enable** commands in router RIP mode to enable and disable RIP globally.

Example

The following example enters Router RIP mode.

```
console(config)#router rip
console(config-router)#
```

show ip rip

Use the **show ip** rip command to display information relevant to the RIP router.

Syntax

show ip rip

Default Configuration

The command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays information relevant to the RIP router.

```
console#show ip rip
RIP Admin Mode................................ Enable
Split Horizon Mode............................ Simple
Auto Summary Mode............................. Enable
Host Routes Accept Mode....................... Enable
Global route changes.......................... 0
Global queries................................ 0
Default Metric................................ 12
Default Route Advertise....................... 0
Redistributing................................
Source........................................ Connected
Metric........................................ 2
Distribute List............................... Not configured
Redistributing................................
Source........................................ ospf
Metric........................................ 10
Match Value................................... 'nssa-external 1'
Distribute List............................... Not configured
```

show ip rip interface

Use the **show ip rip interface** command to display information related to a particular RIP interface.

Syntax

show ip rip interface vlan *vlan-id*

- *vlan-id* — Valid VLAN ID.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays information related to the VLAN 15 RIP interface.

```
console#show ip rip interface vlan 15
Interface.................................... 15
IP Address................................... -----
Send version................................. RIP-2
Receive version.............................. Both
RIP Admin Mode............................... Disable
Link State................................... -----
Authentication Type.......................... MD5
Authentication Key........................... "pass123"
Authentication Key ID........................ 35
Bad Packets Received......................... -----
Bad Routes Received.......................... -----
Updates Sent................................. -----
```

show ip rip interface brief

Use the **show ip rip interface brief** command to display general information for each RIP interface. For this command to display successful results routing must be enabled per interface (i.e. ip rip).

Syntax

show ip rip interface brief

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays general information for each RIP interface.

```
console#show ip rip interface brief
                         Send     Receive     RIP       Link
Interface  IP Address    Version  Version     Mode       State
---------- ----------    -------- ----------- --------- ----------
vlan1      0.0.0.0       RIP-2    Both        Disable    Down
vlan2      0.0.0.0       RIP-2    Both        Disable    Down
```

split-horizon

Use the **split-horizon** command in Router RIP Configuration mode to set the RIP split horizon mode. Use the no form of the command to return the mode to the default value.

Syntax

split-horizon {**none** | **simple** | **poison**}

no split-horizon

- **none** — RIP does not use split horizon to avoid routing loops.
- **simple** — RIP uses split horizon to avoid routing loops.
- **poison** — RIP uses split horizon with poison reverse (increases routing packet update size).

Default Configuration

Simple is the default configuration.

Command Mode

Router RIP Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example does not use split horizon.

```
console(config-router)#split-horizon none
```

Tunnel Interface Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking provides for the creation, deletion, and management of tunnel interfaces. They are dynamic interfaces that are created and deleted by user configuration.

Tunnel interfaces are used for the following purposes.

- IPv4 tunnels
- IPv6 tunnels

Each router interface (port or VLAN interface) may have associated tunnel interfaces. Each interface can have multiple tunnel interfaces. There is no set limit to the number of tunnel interfaces associated with a router interface.

To support the IPv4 to IPv6 transition, Dell EMC Networking supports configured tunnels (RFC 4213) and automatic 6to4 tunnels (RFC 3056). 6to4 tunnels are automatically formed for IPv4 tunnels carrying IPv6 traffic. The automatic tunnels IPv4 destination address is derived from the 6to4 IPv6 address of the tunnel's next hop. Dell EMC Networking can act as a 6to4 border router that connects a 6to4 site to a 6to4 domain. The border router sends and receives tunneled traffic from routers in the 6to4 domain that include other 6to4 border routers and 6to4 relay routers.

NOTE: The N3208PX-ON models do not support 6to4 tunnel interfaces.

interface tunnel

Use the **interface tunnel** command in Global Configuration mode to enter the interface configuration mode for a tunnel.

Syntax

interface tunnel *tunnel-id*

no interface tunnel *tunnel-id*

- *tunnel-id* — Tunnel identifier. (Range: 0–7)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example enables the interface configuration mode for tunnel 1.

```
console(config)#interface tunnel 1
console(config-if-tunnel1)#
```

show interfaces tunnel

Use the **show interfaces tunnel** command to display the parameters related to tunnel such as tunnel mode, tunnel source address and tunnel destination address.

Syntax

show interfaces tunnel [*tunnel-id*]

- *tunnel-id* — Tunnel identifier. (Range: 0–7)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following examples show the parameters related to an individual tunnel and to all tunnel interfaces.

```
console#show interfaces tunnel 1
Interface Link Status......................... down
MTU size...................................... 1480 bytes

console#show interfaces tunnel
TunnelId    Interface     TunnelMode  SourceAddress   DestinationAddress
--------    ---------     ----------  -------------    ----------------
1           tunnel 1      IPv6OVER4   10.254.25.14    10.254.25.10
2           tunnel 2      IPv6OVER4                   10.254.20.10
```

tunnel destination

Use the **tunnel destination** command in Interface Configuration mode to specify the destination transport address of the tunnel.

Syntax

tunnel destination *ip-address*

no tunnel destination

- *ip-addr*ess — Valid IPv4 address.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (Tunnel) mode.

User Guidelines

This command has no user guidelines.

Example

The following example specifies the destination transport address of tunnel 1.

```
console(config)#interface tunnel 1
console(config-if-tunnel1)#tunnel destination 10.1.1.1
```

tunnel mode ipv6ip

Use the **tunnel mode ipv6ip** command in Interface Configuration mode to specify the mode of the tunnel.

Syntax

tunnel mode ipv6ip [6to4]

no tunnel mode

- **6to4** — Sets the tunnel mode to automatic.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (Tunnel) mode.

User Guidelines

This command has no user guidelines.

Example

The following example specifies ipv6ip mode for tunnel 1.

```
console(config)#interface tunnel 1
console(config-if-tunnel1)#tunnel mode ipv6ip
console(config-if-tunnel1)#tunnel mode ipv6ip 6to4
```

tunnel source

Use the **tunnel source** command in Interface Configuration mode to specify the source transport address of the tunnel, either explicitly or by reference to an interface.

Syntax

tunnel source {*ip-address* | *interface-type interface-number*}

no tunnel source

- *ip-address*—Valid IPv4 address.

- *interface-type*—Valid interface type. VLAN is the only type supported.
- *interface-number*—Valid interface number.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (Tunnel) mode.

User Guidelines

This command has no user guidelines.

Example

The following example specifies VLAN 11 as the source transport address of the tunnel.

```
console(config)#interface tunnel 1
console(config-if-tunnel1)#tunnel source vlan 11
```

Unicast Reverse Path Forwarding Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Unicast Reverse Path Forwarding (uRPF) is a powerful security tool that helps limit the problems that are caused by malformed or spoofed IP source addresses by discarding IP packets that lack a verifiable IP source address. For example, DoS attacks like Smurf and Tribe Flood Network (TFN) forge or rapidly change source IP addresses to cause a flood of useless packets that choke the network. Unicast RPF deflects such attacks by forwarding only packets that have source addresses that are valid and consistent with the IP routing table. This defensive action protects the network of the ISP, its customer, and the rest of the Internet.

Dell EMC Networking supports two uRPF modes:

- Strict Mode: The path to the source IP address must be through the *same* interface as that on which the packet arrived.
- Loose mode: The path to the source IP address can be through any interface on the device. The packet need not need to arrive on the same routing interface to which the source IP route lookup is resolved in order to pass the uRPF check.

system urpf enable

Use the **system urpf enable** command to globally enable uRPF checking of routes. Use the **no** form of the command to disable uRPF checking.

Syntax

system urpf enable

no system urpf enable

Default Configuration

By default uRPF checking is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables the uRPF feature in hardware. When the uRPF check is enabled, the route table is checked for source and destination IP match in parallel. For this reason, the route table capacity is reduced once this feature is enabled. A message to this effect is displayed to the user. This command enables the mode for both v4 and v6.

This command also causes the IP routing to be disabled and re-enabled if it was enabled prior to issuing the command.

uRPF supports two modes of source IP check:

- Strict mode – The path to the source IP address must be through the SAME interface as that on which the packet arrived.
- Loose mode – The path to the source IP address can be through any interface on the device.

The allowed default option, when used in conjunction with loose mode, considers the default route (if present) in the routing table if the specified prefix is not found.

The allowed default option, when used in conjunction with strict mode, passes the uRPF check only if the packet arrives on the interface(s) where the default route is learned.

uRPF checks do not work for multicast packets or for link-local IPv6 addresses.

uRPF checks are not performed on a BOOTP/DHCP packet (SIP is 0.0.0.0 and DIP is FF.FF.FF.FF).

uRPF logs missed uRPF checks in the system log.

Unicast RPF loose mode may be used on an uplink interface which has a default route associated with it. For example, a single–homed environment with symmetric routing meets this requirement.

Unicast RPF strict mode may be used on interfaces for which all packets received on an interface are guaranteed to originate from the subnet assigned to the interface. For example, a subnet composed only of end stations fulfills this requirement. Likewise, an access layer network or a branch office where there is only one path into and out of the network meets the requirement.

In general, uRPF should be deployed on the downstream interfaces, preferably at the edge of the network. The further downstream uRPF is deployed, the more granularity the operator will have in identifying spoofed addresses.

Command History

Command introduced in version 6.6 firmware.

Example

```
console#configure
console(config)#system urpf enable
Warning! Enabling the system uRPF mode toggles the global routing mode in all
VRFs, disrupting the L3 forwarding plane and control plane for few seconds.
Enabling this mode also reduces the Route Table capacity.
```

ip verify unicast source

Use the **ip verify unicast source** command to enable loose uRPF checks on an interface. Use the **no** form of the command to disable uRPF checks on the interface.

Syntax

ip verify unicast source reachable-via {any | rx} [allow-default]

no ip verify unicast source reachable-via

- any—The uRPF verification mode is set to loose. In any mode, a check is performed to see if the source address is reachable in the routing table and when found the packet is forwarded.
- rx—The uRPF verification mode is set to strict. In rx mode, a check is performed to see if the source address is reachable in the routing table via the same interface as to where the packet was received and when both these conditions are met the packet is forwarded.
- allow-default—Include IP addresses not specifically contained in the routing table.

When allow-default is set in loose mode (any), if the source IP address is not found but a default route is present in the table, the uRPF check will pass.

When allow-default is set in strict mode (rx), it will prevent the incoming packet's source IP address to have a route out of a different interface than received. The strict mode option with the default route is used typically on the upstream interface.

Default Configuration

By default uRPF checking is disabled on interfaces.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

In **any** mode, a check is performed to see if the source address is reachable in the routing table and, if found, the packet is forwarded.

In **rx** mode, a check is performed to see if the source address is reachable in the routing table via the same interface on which the packet was received. If both conditions are met, the packet is forwarded.

The **allow-default** option can be set in conjunction with strict and loose modes. It will include IP addresses not specifically contained in the routing table in the uRPF check. In loose mode, if the source ip address is not found but a default route is present in the table, the uRPF check will allow the packet to be routed. In strict mode, it will drop incoming packets where the route to the packets source IP address is on an interface other than the interface on which the packet was received. The strict mode option with the allow-default option is used typically on upstream interfaces.

Command History

Command introduced in version 6.6 firmware.

Example

```
console#configure
console(config)#system urpf enable
console(config)#interface gi1/0/7
console(config-Gi1/0/7)#routing
```

```
console(config-Gi10/7)#ip verify unicast source reachable-via rx
console(config-Gi10/7)#no ip verify unicast source reachable-via
```

Virtual Router Commands

Dell EMC Networking N3000E-ON/N3100-ON/N3200-ON Series Switches

Dell EMC Networking VRF is an implementation of Virtual Routing and Forwarding (VRF). Virtual Routing and Forwarding allows multiple independent instances for the forwarding plane to exist simultaneously. This allows the administrator to segment the network without incurring the costs of multiple routers. Each VRF operates as an independent VPN. The IP addresses assigned to each VPN may overlap. Static route leaking to and from the global instance is supported. VRF associated VLANs may not overlap with other VRF instances.

The following capabilities are supported for Dell EMC Networking VRFs:

- Static routing (including route leaking)
- OSPF (IPv4 only)
- ARP
- Ping
- VRRP
- Trace route
- DHCP relay (IP helper)

VRF configuration follows the same configuration steps as the default routing instance with two additional steps: creating the VRF instance and associating VLANs to the instance. Existing commands that have been enabled for VRF accept an additional VRF instance identifier (name). VRF names can be up to 32 characters in length. If a VRF instance identifier is not used in the command, it applies to the global routing instance by default.

To create a VRF and enable OSPF routing in the VRF:

1. Create the VLAN instances associated to the VRF. It is recommended that a VLAN numbering scheme be developed to allow for future growth and to assist in the easy recognition of which VLANs are associated to which VRFs.
2. In global config mode, create the pool of VLANs.

```
console#configure terminal
console(config)#vlan 100-109
```

```
console(config-vlan100-109)#exit
```

3 Assign the VLAN to an interface.

```
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#switchport access vlan 100
console(config-if-Gi1/0/1)#exit
```

4 Create the VRF and enable routing.

```
console(config)#ip vrf red
console(config-vrf-red)#ip routing
console(config-vrf-red)#exit
```

5 Assign IP addresses to the interfaces.

```
console(config)#interface vlan 100
console(config-if-vlan100)#ip address 192.168.0.1 /24
```

6 Put the VLAN interface into the VRF.

```
console(config-if-vlan100)#ip vrf forwarding red
console(config-if-vlan100)#exit
```

7 Routing interface moved from Default router instance to red router instance.

8 Enable OSPF on the VRF, assign a network, and enable OSPF for the VRF

```
console(config)#router ospf vrf red
console(Config-router-vrf-red)#network 192.168.0.0 0.0.0.255 area 0
console(Config-router-vrf-red)#router-id 192.168.0.253
console(Config-router-vrf-red)#redistribute connected
console(Config-router-vrf-red)#enable
console(Config-router-vrf-red)#exit
```

Commands in this Section

This section explains commands which are exclusive to VRFs. Other commands such as **ip routing** may also be executed in VRF configuration mode.

description

This optional command assigns descriptive text to the VRF instance.

Syntax

description *text*

- text—Descriptive text. Enclose the description in quotes if embedded blanks are desired.

Default Configuration

No descriptive text is assigned.

Command Mode

Virtual Router Configuration

User Guidelines

There are no user guidelines for this command.

Example

The following example shows the assignment of descriptive text to a VRF.

```
console(config)#ip vrf Red
console(config-vrf-Red)#description “Backbone to Gateway”
console(config-vrf-Red)#exit
```

ip vrf

This command creates a virtual router with a specified name and enters Virtual Router Configuration mode. If the virtual router instance already exists, it simply enter virtual router configuration mode. This command optionally reserves the number of routes allowed as well as sets the maximum limit on the number of routes for a virtual router instance, in the total routing table space for the router, provided there is enough free space in the router's total routing table.

Syntax

ip vrf *vrf-name*

no ip vrf *vrf-name*

- *vrf-name*—The name of a VRF. The length of the VRF name is limited to 15 alphanumeric characters. The following special characters are not allowed in the name: % : spaces

  The following characters are allowed in the VRF name provided they are escaped (preceded) with a backslash (\): & \ `) (< > “

Default Configuration

A single global VRF is created when routing is enabled.

Command Mode

Global Configuration mode

User Guidelines

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Up to 12 VRFs may be configured on the N3000-ON, N3100-ON, and N3200-ON. If sufficient resources requested by the VRF instance, such as routes, are not available to create the router instance, a warning is shown and the VRF is not created.

The ARP table, among others, is a shared resource and is not allocated or partitioned on a VRF basis. Global commands such as **arp cachesize** still limit the physical router's shared resources.

Example

The following example creates two virtual router instances. The routing in the virtual router instance is enabled only when the **ip routing** command is issued at the virtual router level.

```
(Console) (Config)#ip vrf Red
(Console) (Config-vrf-Red)#ip routing
(Console) (Config-vrf-Red)#exit
(Console) (Config)#ip vrf Blue
(Console) (Config-vrf-Blue)#ip routing
(Console) (Config-vrf-Blue)#exit
```

ip vrf forwarding

This command associates an interface with a VRF instance. Use the **no** form of the command to associate the interface with the global routing table.

Syntax

ip vrf forwarding *vrf-name*

no ip vrf forwarding

- *vrf-name*—The name of the VRF with which to associate the interface.

Default Configuration

All interfaces are members of the global routing instance.

Command Mode

Interface (VLAN) Configuration mode, Interface Range (VLAN) Configuration mode, Interface (Loopback) Configuration mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

L3 configuration on an interface, including the IP address, is retained when the interface migrated to a new VRF instance. A interface may be migrated from the global routing instance to a VRF or from any non-global VRF instances as well.

Example

The following example shows the configuration of two VRFs (Red and Blue) for IPv4 routing. Both VRFs will operate over two trunk ports (te1/0/1-2) on their respective VLANs (100 and 200).

```
console(config)#ip vrf Red
console(config-vrf-Red)#ip routing
console(config-vrf-Red)#exit
console(config)#ip vrf Blue
console(config-vrf-Blue)#ip routing
console(config-vrf-Blue)#exit
console(config)#vlan 100,200
console(config-vlan100,200)#exit
console(config)#interface range te1/0/1-2
console(config-if)#switchport mode trunk
console(config-if)#exit
console(config)#interface vlan 100
console(config-if-vlan100)#ip vrf forwarding Red
console(config-if-vlan100)#exit
console(config)#interface vlan 200
console(config-if-vlan100)#ip vrf forwarding Blue
console(config-if-vlan100)#exit
```

maximum routes

This command reserves the number of routes allowed and sets the maximum limit on the number of routes for a virtual router instance in the total routing table space for the router, provided there is enough free space in the router's total routing table.

Syntax

maximum routes {*limit* | **warn** *threshold*}

no maximum routes [warn]

- *limit*—Reserve this number of routes for the VRF instance.
- *threshold* —The percentage of total routes over which the router issues a warning that the router has allocated the specified number of routes. Range 1-100.

Default Configuration

A VRF is limited by the number of unreserved routes available.

Command Mode

Virtual Router Configuration mode

User Guidelines

Use the **no maximum routes** command to reset the limit to the default (unlimited).

Use the **no maximum routes warn** command to reset the threshold limit to the default.

A VRF instance cannot exceed the configured number of routes, nor may other VRFs utilize the resources allocated to a VRF if a limit is specified for the VRF. The maximum number of routes depends on the platform and the selected SDM template. Refer to the Platforms Constants table in the Users Configuration Guide for the maximum routes available for the selected combination of platform and SDM template. If a size larger than the total routing table size is given, the size is silently truncated to the maximum routing table size.

Example

The following example reserves 100 routes for VRF Red.

```
console(config)#ip vrf Red
console(config-vrf-Red)#ip routing
console(config-vrf-Red)#maximum routes 100
console(config-vrf-Red)#exit
```

show ip vrf

This command shows the interfaces associated with a VRF instance.

Syntax

show ip vrf [**interfaces**]

show ip vrf [*vrf-name]* [**detail**]

- **interfaces**—Displays the interfaces associated with the VRF.
- *vrf-name*—The name of the VRF for which information is displayed. If no VRF is specified, all VRFs are shown. The VRF name must match the configured VRF name exactly, including capitalization.
- **detail**—Displays detailed information regarding the VRF.

Default Configuration

This command has no default configuration.

Command Mode

Exec mode, Privileged Exec mode, and all show modes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

If no VRF name is given, the global routing instances and all other VRF instances are shown.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Example

```
console(config)#show ip vrf
Number of VRs.........3
Name      Identifier     Route Distinguisher
--------- -------------- -------------------
Red            2         2:200
Blue           4         4:400
Green          3         3:300
console(config)#show ip vrf Red detail

VRF Identifier.................... 1
Description....................... Test network
Route Distinguisher............... 2:200
Maximum Routes.................... 512
Warning-only...................... TRUE

Route table size.................. 2
Number of interfaces.............. 2

Interfaces
-----------
Vl10
Lo1

Export VPN route-target communities
    None

Import VPN route-target communities
    None


console(Config)#show ip vrf Red
VRF Identifier.......... 2
Description............ "India office bangalore"
Route Distinguisher..... 2:200
Maximum Routes.......... 512
Warning-only........... TRUE
```

show ipv6 vrf

Use this command to show the interfaces associated with an IPv6 VRF.

Syntax

show ipv6 vrf [*vrf-name*]

- **interfaces**—Displays the interfaces associated with the VRF.

- *vrf-name*—The name of the VRF for which information is displayed. If no VRF is specified, all VRFs are shown. The VRF name must match the configured VRF name exactly, including capitalization.
- **detail**—Displays detailed information regarding the VRF.

Default Configuration

There are no IPv6 VRFs by default.

Command Mode

User Exec mode, Privileged Exec mode, and all show modes

User Guidelines

The VRF identified in the parameter must have been previously created, or an error is returned.

If no VRF name is given, the global routing instances and all other VRF instances are shown.

This command is only available on the N3000/N3100/N3200 switches.

Command History

Command introduced in version 6.7.0 firmware.

Virtual Router Redundancy Protocol Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

An end station running IP needs to know the address of its first hop router. While some network administrators choose to install dynamic router discovery protocols such as DHCP, others prefer to statically allocate router addresses. If the router identified by such a statically allocated address goes down, the end station loses connectivity. The Virtual Router Redundancy Protocol (VRRP) is designed to provide backup for the failing router without requiring any action on the part of the end station. It is based on the concept of having more than one router recognize the same IP address. One of the routers is elected the primary router and handles all traffic sent to the specified virtual router IP address. If the primary router fails, one of the backup routers is elected in its place and starts handling traffic sent to the address. This change is transparent to end stations.

VRRP increases the availability of the default path without requiring configuration of dynamic routing or router discovery protocols on every end station.

Multiple virtual routers can be defined on a single router interface.

Pingable VRRP Interface

RFC 3768 specifies that a router may only accept IP packets sent to the virtual router's IP address if the router is the address owner. In practice, this restriction makes it more difficult to troubleshoot network connectivity problems. When a host cannot communicate, it is common to ping (send an ICMP Echo Request) the host's default gateway to determine whether the problem is in the first hop of the path to the destination. When the default gateway is a virtual router that does not respond to pings, the operator cannot use this troubleshooting technique. Because of this, it has been common for VRRP implementations to respond to pings, in spite of the prohibition in the RFC. The IETF has recognized the issue, and a draft revision of the VRRP

RFC defines a new configuration option that allows the router to accept any packet sent to a VRRP address, regardless of whether the VRRP Primary is the address owner.

The Pingable VRRP Interface feature, when enabled, allows the VRRP primary to respond to both fragmented and unfragmented ICMP echo requests packets destined to a VRRP address (or addresses). A virtual router in backup state discards these. For any packet destined to a VRRP address (or addresses), the VRRP primary responds with VRRP address as the source IPv4 address and VRMAC as the source MAC address. A configuration option controls whether the router responds to Echo Requests sent to a VRRP IP address.

Dell EMC Networking firmware includes a separate configuration option that controls whether the router responds to ICMP Echo Requests. When Echo Replies are disabled using that option, the VRRP primary does not respond to Echo Requests, even if this new option is enabled.

VRRP Route/Interface Tracking

The VRRP Route/Interface Tracking feature extends the capability of the Virtual Router Redundancy Protocol (VRRP) to allow tracking of specific route/interface IP states, within the router, that can alter the priority level of a virtual router for a VRRP group. Exception to this is, if that VRRP group is the IP address owner, and, in that case, its priority is fixed at 255 and cannot be reduced through the tracking process.

VRRP Route/Interface Tracking provides a way to ensure the best VRRP router is primary for the group by altering VRRP priorities to the status of tracked objects, such as IP interface or IP route states. In the process of altering the VRRP priorities the priority must not go below 1 or above the configured priority.

NOTE: Note that the primary-only switches on a priority change if preempt is enabled.

Interface Tracking

For interface tracking, VRRP is a routing event client. When a routing interface goes up or down (or routing is disabled globally, implying all routing interfaces are down), VRRP checks if the interface is tracked. If so, it adjusts the priority. Interface tracking is useful for tracking interfaces that are not configured for VRRP. Only IP interfaces are tracked.

Route Tracking

The network operator may perform this task to track the reachability of an IP route. A tracked route is considered up when a routing table entry exists for the route and the route is accessible. For route tracking, make VRRP a best route client of RTO. When a tracked route is added or deleted, change the priority. For simplicity, routes are not distinguished with the next hop interface that has VRRP enabled. So VRRP Route Tracking can ignore route modifications.

Virtual Router Redundancy Protocol Commands

ip vrrp

Use the **ip vrrp** command in Global Configuration mode to enable the administrative mode of VRRP for the router. Use the **no** form of the command to disable the administrative mode of VRRP for the router.

Syntax

ip vrrp

no ip vrrp

Default Configuration

VRRP is disabled by default.

Command Mode

Global Configuration mode.

User Guidelines

This command has no user guidelines.

Example

The following example enables VRRP protocol on the router.

```
console(config)#ip vrrp
```

vrrp accept-mode

Use the **vrrp accept-mode** command in Interface (VLAN) Configuration mode to enable the VRRP Primary to accept ping packets sent to one of the virtual router's IP addresses from an external device. Use the **no** form of the command to disable responding to ping packets.

Syntax

vrrp *vrid* **accept-mode**

no vrrp *vrid* **accept-mode**

- vrid — Virtual router identification. (Range: 1-255)

Default Configuration

The default configuration is disabled.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The VRRP IP address is not pingable from within the switch.

vrrp authentication

Use the **vrrp authentication** command in Interface Configuration mode to set the authentication details value for the virtual router configured on a specified interface. Use the **no** form of the command to return the authentication type to the default value.

Syntax

vrrp group authentication {none | simple *key*}

no vrrp group authentication

- *group*—The virtual router identifier. (Range: 1-255)
- **none**—Indicates authentication type is none.
- **simple**—Authentication type is a simple text password.
- *key*—The key for simple authentication. (Range: String values)

Default Configuration

None is the default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the authorization details value for VRRP router group 5 on VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#vrrp 2 authentication simple test123
```

vrrp description

Use the **vrrp description** command in Interface Configuration mode to assign a description to the Virtual Router Redundancy Protocol (VRRP) group. To remove the description, use the **no** form of the command.

Syntax

vrrp group description *text*

no vrrp group description

- *group*—The virtual router identifier. (Range: 1-255)
- *text*—Description for the virtual router group up to 80 characters.

Default Configuration

No description is present.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command accepts any printable characters for the name other than a question mark. Descriptions containing spaces must be enclosed in quotes.

Example

The following example creates virtual router group 5 on VLAN 15 and configures its description.

```
console(config)#interface vlan 15
console(config-if-vlan15)#vrrp 5
console(config-if-vlan15)#vrrp 5 description "Sales and Marketing"
```

vrrp ip

Use the **vrrp ip** command in Interface Configuration mode to enable VRRP and set the virtual router IP address value for an interface. Use the **no** form of the command remove the secondary IP address. It is not possible to remove the primary IP address once assigned. Remove the VRRP group instead.

Syntax

vrrp *group* **ip** *ip-address* [**secondary**]

no vrrp *group* **ip** *ip-address* **vlan secondary**

- *group*—The virtual router identifier. (Range: 1-255)
- *ip-address*—The IP address of the virtual router.
- **secondary**—Designates the virtual router IP address as a secondary IP address on an interface.

Default Configuration

VRRP is not configured on the interface.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The virtual router IP addresses must be a valid host address on the local subnet based on the IP address and subnet mask configured on the VLAN interface. The VRRP IP address cannot be either the broadcast address or a network address. To configure vrrp, perform the following steps:

1. Enable ip routing in global configuration mode.
2. Enable ip vrrp globally.
3. Set an IP address on the desired interface where VRRP is to be configured.
4. Configure the VRRP group ID on the selected interface.
5. Set the virtual router ID and address on the selected interface.
6. Enable VRRP on the interface using the **vrrp mode** command.

Example

The following example configures VRRP on VLAN 15.

```
console#configure
console(config)#vlan 15
console(config-vlan)#interface vlan 15
console(config-if-vlan15)#ip address 192.168.5.1 255.255.255.0
console(config-if-vlan15)#vrrp 20
console(config-if-vlan15)#vrrp 20 ip 192.168.5.1
console(config-if-vlan15)#vrrp 20 mode
console(config)#ip routing
console(config)#ip vrrp
```

vrrp mode

Use the **vrrp mode** command in Interface Configuration mode to enable the virtual router configured on an interface. Enabling the status field starts a virtual router. Use the no form of the command to disable the virtual router.

Syntax

vrrp *vr-id* **mode**

no vrrp *vr-id* **mode**

- *vr-id* — The virtual router identifier. (Range: 1-255)

Default Configuration

Disabled is the default configuration.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example enables the virtual router for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#vrrp 5 mode
```

vrrp preempt

Use the **vrrp preempt** command in Interface Configuration mode to set the preemption mode value for the virtual router configured on a specified interface. Use the **no** form of the command to disable preemption mode.

Syntax

vrrp *group* **preempt** [**delay** ***seconds***]

no vrrp *group* **preempt**

- *group*—The virtual router identifier. (Range: 1-255)
- *seconds*—The number of seconds the VRRP router will wait before issuing an advertisement claiming primary ownership.

Default Configuration

Enabled is the default configuration. Delay defaults to 0 seconds.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

As per the VRRP RFC, when preemption is enabled, the backup router discards the advertisements until the primary-downtimer starts. This feature requires immediate sending of advertisements when the preemption case occurs and the delay is 0. This is a violation according to the RFC 3768. Delay, if configured, will cause the VRRP router to wait the specified number of seconds before issuing an advertisement claiming primary ownership.

Example

The following example sets the preemption mode value for the virtual router for VLAN 15.

```
console(config)#interface vlan 15
console(config-if-vlan15)#vrrp 5 preempt
```

vrrp priority

Use the **vrrp priority** command in Interface Configuration mode to set the priority value for the virtual router configured on a specified interface. Use the **no** form of the command to return the priority to the default value.

Syntax

vrrp *group* **priority** *level*

no vrrp *group* **priority** ***level***

- *group* — The virtual router identifier. (Range: 1-255)
- *level* — Priority value for the interface. (Range: 1-254)

Default Configuration

Priority has a default value of 100.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

The VRRP router with the highest numerical value for priority will become the VR primary. When the VRRP priorities are equal, the router with the numerically highest IP address will win the election and become primary. If the VRRP router is the owner of the VR IP address, its priority will be 255, and this value cannot be changed.

Example

The following example sets the priority value for the virtual router 5 on VLAN 15.

```
console(config-if-vlan15)#vrrp 5 priority 20
```

vrrp timers advertise

Use the **vrrp timers advertise** command in Interface Configuration mode to set the frequency, in seconds, that an interface on the specified virtual router sends a virtual router advertisement. Use the **no** form of the command to return the advertisement frequency to the default value.

Syntax

vrrp *group* **timers advertise** *interval*

no vrrp *group* **timers advertise** ***interval***

- *group* — The virtual router identifier. (Range: 1-255)
- *interval* — The frequency at which an interface on the specified virtual router sends a virtual router advertisement. (Range: 1-255 seconds)

Default Configuration

Interval has a default value of 1.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example sets the frequency at which the VLAN 15 virtual router 5 sends a virtual router advertisement.

```
console(config-if-vlan15)#vrrp 5 timers advertise 10
```

vrrp timers learn

Use the **vrrp timers learn** command in Interface Configuration mode to configure the router, when it is acting as backup virtual router for a Virtual Router Redundancy Protocol (VRRP) group, to learn the advertisement interval used by the primary virtual router. Use the **no** form of the command to prevent the router from learning the advertisement interval from the primary virtual router.

Syntax

vrrp *group* **timers learn**

no vrrp *group* **timers learn**

- *group* — The virtual router identifier. (Range: 1-255)

Default Configuration

Timer learning is disabled by default and the router uses the configured advertisement.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following configures VLAN 15 virtual router to learn the advertisement interval used by the primary virtual router.

```
console(config-if-vlan15)#vrrp 5 timers learn
```

vrrp track interface

Use the **vrrp track interface** command in Interface Configuration mode to alter the priority of the VRRP router based on the availability of its interfaces. It is useful for tracking interfaces that are not configured for VRRP. Only routing interfaces may be tracked. A tracked interface is up if routing on that interface is up. Otherwise, the tracked interface is down.

When the tracked interface is down, or the interface has been removed from the router, the priority of the VRRP router will be decremented by the value specified in the priority argument. When the interface is up for the IP protocol, the priority will be incremented by the priority value.

A VRRP configured interface can track more than one interface. When a tracked interface goes down, then the priority of the router will be decreased by 10 (default priority decrement) for each downed interface. The default priority decrement is changed using the priority argument. The default priority of the virtual router is 100, and the default decrement priority is 10. By default, no interfaces are tracked. If you specify the interface to be tracked without giving the priority, which is optional, then the default priority will be used.

Use the **no** form of this command to remove the interface from the tracked list or to restore the priority decrement to its default. When removing an interface from the tracked list, the priority is incremented by the decrement value if that interface is down.

Syntax

vrrp *group* **track interface vlan** *vlan-id* [**decrement** *priority*]

no vrrp *group* **track interface vlan** *vlan-id*

- *group*—The virtual router identifier. (Range: 1-255)
- **vlan** *vlan-id*—Valid VLAN ID.
- *priority*—Priority decrement value for the tracked interface. (Range: 1-254)

Default Configuration

No interfaces are tracked. The default decrement priority is 10.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

This command has no user guidelines.

Example

The following example adds VLAN 2 to the virtual router tracked list (with a priority decrement value of 20.)

```
(config-if-vlan10)#vrrp 1 track interface vlan 2 decrement 20
```

vrrp track ip route

Use the **vrrp track ip route** command to track the route reachability. When the tracked route is deleted, the priority of the VRRP router is decremented by the value specified in the priority argument. When the tracked route is added, the priority is incremented by the same. A VRRP configured interface can track more than one route. When a tracked route goes down, the priority of the router is decreased by 10 (default priority decrement) for each downed route. By default no routes are tracked. If we specify just the route to be tracked without specifying the optional parameter, then the default priority will be set.

Use the **no** form of this command to remove the route from the tracked list or to restore the priority decrement to its default. When removing a tracked IP route from the tracked list, priority should be incremented by the decrement value if the route is not reachable.

Syntax

vrrp *group* track ip route *ip-address/prefix-length* [**decrement** *priority*]

no vrrp *group* track ip route *ip-address/prefix-length*

- *group*—The virtual router identifier. (Range: 1–255).
- *ip-address/prefix-length*—Specifies the route to be tracked.
- *priority*—Priority decrement value for the tracked route. (Range: 1–254).

Default Configuration

There are no routes tracked by default.

The default decrement priority is 10.

Command Mode

Interface Configuration (VLAN) mode.

User Guidelines

There are no user guidelines for this command.

Example

The following example adds the route 2.2.2.0/24 to the virtual router tracked list (with a priority decrement value of 20).

```
console(config-if-vlan10)#vrrp 1 track ip route 2.2.2.0/24 decrement 20
```

show vrrp

Use the **show vrrp** command in User Exec or Privileged Exec mode to display the global VRRP configuration and status as well as the brief or detailed status of one or all VRRP groups.

Syntax

show vrrp [**brief** | *group*]

- *group*—The virtual router group identifier. Range 1-255.
- **brief**—Provide a summary view of the VRRP group information.

Default Configuration

Show information on all VRRP groups.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays detailed VRRP status.

```
console# show vrrp

Admin Mode..................................... Enable
Router Checksum Errors......................... 0
Router Version Errors.......................... 0
Router VRID Errors............................. 0

Vlan 7 - Group 1
Primary IP Address............................. 192.168.5.55
VMAC Address................................... 0000.5E00.0101
Authentication Type............................ None
Priority....................................... 60
Configured Priority............................ 100
Advertisement Interval (secs).................. 10
Accept Mode.................................... Enable
Pre-empt Mode.................................. Enable
Pre-empt Delay................................. Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Timers Learn Mode.............................. Enable
Description....................................
Track Interface................................ vlan 3
Track Interface State.......................... Down
Track Interface DecrementPriority ............ 20
Track Route (pfx/len) ......................... 10.10.10.0/24
Track Route Reachable ......................... False
Track Route DecrementPriority ................. 20

Vlan 7 - Group 2
Primary IP Address............................. 192.168.5.65
VMAC Address................................... 0000.5E00.0202
Authentication Type............................ None
Priority....................................... 60
Configured Priority............................ 100

Advertisement Interval (secs).................. 10
Accept Mode ................................... Enable
Pre-empt Mode.................................. Enable
Pre-empt Delay................................. 0
Administrative Mode............................ Enable
State.......................................... Initialized
Timers Learn Mode.............................. Disable
Description ...................................
```

```
Track Interface............................... vlan 3
Track Interface State ........................ Down
Track Interface DecrementPriority ............ 20
Track Route (pfx/len) ........................ 10.10.10.0/24
Track Route Reachable ........................ False
Track Route DecrementPriority ................ 20

console#show vrrp brief
Interface Grp Prio IP Address     Mode    State
--------- --- ---- -------------- ------  ------------
V1 1      2    60 0.0.0.0        Disable Initialize
V1 2      5    70 192.168.5.55   Enable  Initialize
```

show vrrp interface

Use the **show vrrp interface** command in User Exec or Privileged Exec mode to display all configuration information and VRRP router statistics of a virtual router configured on a specific interface.

Syntax

show vrrp interface {**brief** | **vlan** *vlan-id* [**stats**]}

- **brief**—Display summary information about each virtual router configured on the switch.
- **stats**—Display the statistical information about each virtual router configured on the VLAN.
- *vlan-id*—Display information about each virtual router configured on the VLAN. Valid interface type (VLAN) and interface number (vlan-id).

Default Configuration

Show information for each group in the specified interface.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays all configuration information about the VLAN 15 virtual router.

```
console#show vrrp interface vlan 15
Vlan 7 - Group 1
Primary IP Address........................... 192.168.5.55
VMAC Address................................ 0000.5E00.0101
Authentication Type.......................... None
Priority..................................... 100
Configured Priority.......................... 100
Advertisement Interval (secs)................ 10
Accept Mode.................................. Disable
Pre-empt Mode................................ Enable
Pre-empt Delay............................... 0
Administrative Mode.......................... Enable
State........................................ Initialized
Timers Learn Mode............................ Disable
Description.................................. GoodStuff
```

The following example displays all configuration information about the virtual router on the selected interface.

```
console#show vrrp interface brief
Interface VRID IP Address     Mode    State
--------- ---- -------------- ------  ------------
vlan1     2    0.0.0.0        Disable Initialize
vlan2     5    192.168.5.55   Enable  Initialize
```

The following example displays all statistical information about the VLAN 15 virtual router.

```
console#show vrrp interface vlan 15 stats
Vlan 15 - Group 5
UpTime......................... 0 days 0 hrs 0 mins 0 secs
Protocol..................................... IP
State Transitioned to Primary................ 0
Advertisement Received....................... 0
Advertisement Interval Errors................ 0
Authentication Failure....................... 0
IP TTL Errors................................ 0
Zero Priority Packets Received............... 0
Zero Priority Packets Sent................... 0
Invalid Type Packets Received................ 0
Address List Errors.......................... 0
Invalid Authentication Type.................. 0
Authentication Type Mismatch................. 0
Packet Length Errors......................... 0
```

Virtual Router Redundancy Protocol v3 Commands

Dell EMC Networking N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

VRRPv3 provides address redundancy for both IPv4 and IPv6 router addresses. VRRPv3 support is similar to VRRP support. Table 6-3 provides a summary of the differences.

Table 6-3. VRRPv2 and VRRPv3 Differences

VRRPv2	VRRPv3
Supports redundancy to IPv4 addresses.	Supports redundancy to IPv4 and IPv6 addresses.
Supports authentication.	Does not support authentication.
No concept of link-local address in IPv4 address space.	For IPv6 addresses, VRRP IP contains the link-local IPv6 address too.
The interval time used for sending VRRP Advertisement packets is in seconds.	The interval time is in the order of centiseconds.
VRRP MAC address format is 00-00-5E-00-01-{VRID}	VRRP MAC address format for IPv6 VR IP is 00-00-5E-00-02-{VRID}
SNMP MIB RFC according to 2787. The counters are 32-bit ones.	SNMP MIB RFC as per RFC 6527. The counters are 64-bit ones.

NOTE: Note the following:

- To enable VRRP on the device, use the ip vrrp command. This command enables VRRP (v2 or v3, whichever version is the configured version) and makes it operational.
- A command is available to configure debugging for VRRP packets. For information, see debug ip vrrp.

fhrp version vrrp v3

Use the **fhrp version vrrp v3** command to enable Virtual Router Redundancy Protocol version 3 (VRRPv3) configuration on the switch. To disable the VRRPv3 and possibly enable VRRPv2, use the **no** form of this command.

Syntax

fhrp version vrrp v3

no fhrp version vrrp v3

Default Configuration

VRRPv3 is not enabled by default.

Command Mode

Global Configuration mode

User Guidelines

When VRRPv3 is enabled, VRRP version 2 is disabled, the VRRP operational data is reset and VRRPv3 configuration is applied.

When VRRPv3 is in use, VRRP version 2 is disabled. If the **no fhrp version vrrp v3** command is issued, VRRPv3 is disabled, VRRPv2 is enabled if configured, the VRRP operational data is reset and VRRPv2 configuration is applied.

VRRPv2 and VRRPv3 are not compatible. Do not use both VRRPv2 and VRRPv3 in a network.

Command History

Command introduced in version 6.6 firmware.

vrrp

Use the **vrrp** command to create a Virtual Router Redundancy Protocol version 3 (VRRPv3) group and enter VRRPv3 Group Configuration mode. To remove the VRRPv3 group, use the **no** form of this command.

Syntax

vrrp *group-id* **address-family {ipv4 | ipv6}**

no vrrp *group-id* **address-family {ipv4 | ipv6}**

- *group-id*—Virtual router group number. The range is from 1 to 255.
- **address-family**—Specifies the address-family for this VRRP group.
- **ipv4**—(Optional) Specifies IPv4 address.
- **ipv6**—(Optional) Specifies IPv6 address.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN) mode

User Guidelines

To use the **no vrrp** *group-id* **address-family** {**ipv4** | **ipv6**} command, disable the virtual router with the **shutdown** command in the corresponding VRRP config mode.

VRRPv2 and VRRPv3 are not compatible. Do not use both VRRPv2 and VRRPv3 together in a network.

Command History

Command introduced in version 6.6 firmware.

show vrrp

This commands displays information about the status and configuration details for a given Virtual Router Redundancy Protocol version 3 (VRRPv3) group configured on the specified interface for a specified IP address family.

Syntax

show vrrp {ipv4 | ipv6} [**vlan** *vlan-id vr-id*]

- **ipv4**—(Optional) Indicates the Virtual router group belongs to the IPv4 address family.

- **ipv6**—(Optional) Indicates the Virtual router group belongs to the IPv6 address family.
- **vlan** *vlan-id*—(Optional) Indicates the VLAN number to which the Virtual router belongs.
- *vr-id*—(Optional) VRRPv3 Virtual router group number. The range is from 1 to 255.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Example

```
console#show vrrp ipv4 vlan 3 1

Virtual IP address............................. 1.1.1.9
Secondary IP Address(es)...................... 1.1.1.4
............................................... 1.1.1.5
............................................... 1.1.1.6
Virtual MAC Address............................ 00:00:5e:00:01:01
Priority....................................... 0
Configured Priority............................ 111
Advertisement Interval......................... 222 centisec
Pre-empt Mode.................................. Enable
Accept Mode.................................... Enable
Administrative Mode............................ Enable
State.......................................... Initialized
Primary Router IP / Priority................... 1.1.1.3 (local) / 100
Primary Advertisement interval................. 1000 centisec
Primary Down interval.......................... 3000 centisec

Track Interface State Decrement-Priority
--------------- ----- ------------------
```

```
V3             Down  222

Track Route(pfx/len)   Reachable  Decrement-Priority
---------------------  ---------  ------------------
14.14.14.0/24          True       14
```

accept-mode

Use this command to control whether a virtual router in primary state will accept packets addressed to the address owner's Virtual IP address as its own if it is not the Virtual IP address owner. By default this mode is disabled. To disable this function, use the **no** form of this command.

Syntax

accept-mode

no accept-mode

Default Configuration

This command is disabled by default.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to enable accept-mode:

```
console(config-if-vrrp)#accept-mode
```

preempt

Use this command to configure the virtual router to preemptively take over as primary virtual router for a Virtual Router Redundancy Protocol version 3 (VRRPv3) group if it has higher priority than the current primary virtual router. To disable preemption, use the **no** form of the command.

Syntax

preempt [**delay minimum** *centiseconds*]

no preempt

- **delay minimum** *centiseconds*—(Optional) Number of seconds that the device will delay before issuing an advertisement claiming primary ownership. The default delay is 0 centiseconds. The valid range is 0 to 3600 centiseconds.

Default Configuration

This command is enabled by default. The default delay is 0 centiseconds.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

By default, the device being configured with this command will take over as primary virtual router for the group if it has a higher priority than the current primary virtual router. Configure a delay to cause the VRRP device to wait the specified number of centiseconds before issuing an advertisement claiming primary ownership.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to enable preemption with a 15 centisecond delay interval:

```
console(config-if-vrrp)# preempt delay minimum 15
```

priority

Use this command to set the priority level of the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group. The priority level controls which device becomes the primary virtual router. To set the priority to the default, use the **no** form of this command.

Syntax

priority *level*

no priority

- *level*—Priority of the device within the VRRP group. The range is from 1 to 254.

Default Configuration

The default priority is 100.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

Use this command to control which device is selected to become the primary virtual router in an election. The numerically larger priority is selected as the primary device. In the case of a tie, the higher IP address is used to select the primary.

Command History

Command introduced in version 6.6 firmware.

Example

The following example configures the switch with a priority of 254:

```
console(config-if-vrrp)#priority 254
```

timers advertise

Use this command to configure the interval between successive advertisements by the primary virtual router in a Virtual Router Redundancy Protocol version 3 (VRRPv3) group. To restore the default value, use the **no** form of this command.

Syntax

timers advertise *centiseconds*

no timers advertise

- *centiseconds*—Time interval between successive advertisements by the primary virtual router. The unit of the interval is in centiseconds. The valid range is 1 to 4095 centiseconds.

Default Configuration

The default interval is 100 centiseconds.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

Advertisements sent by the primary virtual router communicate the state and priority of the current primary virtual router. The VRRP **timers advertise** command configures the time between successive advertisement packets and the time before other routers declare the primary router to be down. VRRP backup routers learn timer values from the primary router advertisements. The timers configured on the primary router always override any other timer settings that are used for calculating the primary down time interval on VRRP backup routers.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to configure the primary virtual router to send advertisements every 50 centiseconds.

```
console(config-if-vrrp)#timers advertise 50
```

shutdown

Use the shutdown command to disable a Virtual Router Redundancy Protocol version 3 (VRRPv3) group configuration.

Syntax

shutdown

no shutdown

Default Configuration

VRRPv3 Groups are disabled by default.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

Use the **no shutdown** command to update the virtual router state after completing configuration.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to enable a VRRP group:

```
console(config-if-vrrp)#no shutdown
```

address

Use this command to set the primary or secondary IP address of the switch within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group. To remove the secondary address, use the **no** form of this command.

Syntax

address *ip-address* [**primary** | **secondary**]

no address *ip-address* **secondary**

- *ip-address*—IPv4 or IPv6 address, it can be specified in one of the following formats: *ipv4-address, ipv6-link-local-address, ipv6-address/prefix-len.*
- **primary**—(Optional) Set primary IP address of the VRRPv3 group.
- **secondary**—(Optional) Set additional IP address of the VRRPv3 group.

Default Configuration

No address is configured by default. If the primary or secondary option is not specified, the primary IP address is set.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

The Virtual IPv6 Primary address should be a link-local address only. When a global IPv6 address is given as a primary address for the VRRP IP then the config fails with the following error message – "`Error! Primary virtual IPv6 address should be a link-local address only.`" Removing the Primary virtual IP (IPv4 or IPv6) is not allowed. The Primary virtual IP of a Virtual Router can only be modified. The secondary virtual IP can be removed using the **no** form of the command.

VRRPv3 for IPv6 requires that a primary virtual link-local IPv6 address is configured to allow the group to operate. After the primary link-local IPv6 address is established on the group, it is possible to add a secondary global addresses.

Use the **no shutdown** command to update the virtual router state after completing configuration.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to configure and enable a virtual IPv4 address for a VRRP group:

```
console(config)#fhrp version vrrp v3
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#vrrp group 1 address-family ipv4
console(config-if-vrrp)# address 101.1.0.10 primary
console(config-if-vrrp)#no shutdown
```

track interface

Use this command to configure tracking of an IP interface for the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group. To disable interface tracking, use the **no** form of the command.

Syntax

track interface vlan *vlan-id* [bfdneighbor ***ip-address***] [decrement ***number***]

no track interface vlan *vlan-id* [bfdneighbor ***ip-address***] [decrement ***number***]

- *vlan-id*—VLAN ID of the VLAN interface.
- ip-address — The IPv4 or IPv6 address of a neighbor to be tracked for reachability using a BFD session.
- *number*—(Optional) Amount by which the priority is decremented.

Default Configuration

Tracking is not enabled by default.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

Once IP interface tracking is configured, the VRRPv3 feature receives notifications when the IP interface changes state. The decrement option decreases the priority of the switch within a VRRPv3 group by the specified value when a route becomes unavailable.

Use the bfdneighbor option to track the reachability to the uplink next hop address. If BFD tracking is enabled, a BFD session is created with the BFD destination IP using the configured IP address. VRRPv3 receives notification when the BFD session state changes. The decrement option can be used to decrease the priority of the device within the VRRPv3 group when the BFD session goes down. Similarly, the priority is increased when the BFD session comes up. The default decrement is 10.

The overall state of a track object is only when both the interface and BFD session are up. The increment and decrement is performed based on the overall state of the track object.

Command History

Command introduced in version 6.6 firmware. BFD tracking introduced in version 6.7.0 firmware.

Example

The following example shows how to enable tracking of an IP interface for the device within a Virtual Router Redundancy Protocol (VRRPv3) group:

```
console(config-if-vrrp)#track interface vlan 10
```

track ip route

Use the **track ip route** command to configure tracking of the IP route for the device within a Virtual Router Redundancy Protocol (VRRPv3) group. To disable object tracking, use the **no** form of this command.

Syntax

track ip route *ip-address/prefix-len* [**decrement** *number*]

no track ip route *ip-address/prefix-len* [**decrement** *number*]

- *ip-address/prefix-len*—Prefix and prefix length of the route to be tracked.
- *number*—(Optional) Amount by which the priority is decremented. The range is 1–254.

Default Configuration

Tracking is not enabled by default.

Command Mode

VRRPv3 Group Configuration mode

User Guidelines

Once interface tracking is enabled, the VRRPv3 feature receives notifications when an interface changes state. The decrement option decreases the priority of the switch within a VRRPv3 group by the specified value when an interface goes down.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how to set IP address of the device within a Virtual Router Redundancy Protocol (VRRPv3) group:

```
console(config-if-vrrp)#track ip route 2001::1/64 secondary
```

clear vrrp statistics

Use this command to clear VRRP statistical information for given interface of the device within a Virtual Router Redundancy Protocol version 3 (VRRPv3) group and IP address family.

Syntax

clear vrrp statistics [{*ipv4*| *ipv6*} **vlan** *vlan-id* ***vr-id***]

- *ipv4*—(Optional) Indicates the Virtual router group belongs to an IPv4 address family.
- *ipv6*—(Optional) Indicates the Virtual router group belongs to an IPv6 address family.
- vlan *vlan-id*—(Optional) Indicates the VLAN number to which the Virtual router belongs.
- *vr-id*—(Optional) Virtual router group number. The range is from 1 to 255.

Default Configuration

Tracking is not enabled by default.

Command Mode

Privileged Exec mode

User Guidelines

If the **clear vrrp statistics** command is issued without the optional arguments, then the global statistics for all virtual routers (both IPv4 and IPv6) are reset.

If the optional arguments are specified, the statistics are reset for the virtual router corresponding to the given (IP address family, interface and VR-ID) combination.

Command History

Command introduced in version 6.6 firmware.

Example

The following example shows how clear all the Virtual Router Redundancy Protocol (VRRP) statistics:

```
console#clear vrrp statistics
```

show vrrp statistics

This command displays statistics for a selected Virtual Router Redundancy Protocol version 3 (VRRPv3) group or displays the global statistics.

Syntax

show vrrp statistics [{*ipv4*| *ipv6*} **vlan** *vlan-id* ***vr-id***]

- *ipv4*—(Optional) Indicates the Virtual router group belongs to an IPv4 address family.
- *ipv6*—(Optional) Indicates the Virtual router group belongs to an IPv6 address family.
- vlan *vlan-id*—(Optional) Indicates the VLAN number to which the Virtual router belongs.
- *vr-id*—(Optional) Virtual router group number. The range is from 1 to 255.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If the **show vrrp statistics** command is issued without the optional arguments, then the global statistics are displayed.

If the optional arguments are specified, the statistics are displayed for the virtual router corresponding to the given (IP address family, interface and VR-ID) combination.

Command History

Command introduced in version 6.6 firmware.

Example

```
console#show vrrp statistics ipv6 vlan 11  2

Primary Transitions........................... 2
New Primary Reason............................ Priority
Advertisements Received....................... 64
Advertisements Sent........................... 12
Advertisement Interval Errors................. 0
IP TTL Errors................................. 1
Last Protocol Error Reason.................... Version Error
Zero Priority Packets Received................ 0
Zero Priority Packets Sent.................... 1
Invalid Type Packets Received................. 0
Address List Errors........................... 2
Packet Length Errors.......................... 4
Row Discontinuity Time........................ 0 days 0 hrs 0 mins 0 secs
Refresh Rate (in milliseconds)................ 0

console#show vrrp statistics

Router Checksum Errors........................ 2
Router Version Errors......................... 3
Router VRID Errors............................ 4
Global Statistics Discontinuity Time.......... 0 days 0 hrs 0 mins 0 secs
```

7

Switch Management Commands

Switch management commands are applicable to all Dell EMC Networking. This section of the document contains the following Utility command topics:

Application Deployment	DHCP Client Commands	PHY Diagnostics Commands	SYSLOG Commands
Auto-Install Commands	DHCP Server Commands	Power Over Ethernet Commands	System and Stack Management Commands
CLI Macro Commands	DHCPv6 Server Commands	RMON Commands	Telnet Server Commands
Clock Commands	HiveAgent Commands	Serviceability Commands	Time Ranges Commands
Command Line Configuration Scripting Commands	IP Addressing Commands	Sflow Commands	USB Flash Drive Commands
CLI Output Filtering Commands	Line Commands	SNMP Commands	User Interface Commands
Configuration and Image File Commands	MACsec Commands	SupportAssist Commands	Web Server Commands

Application Deployment

This section contains commands to manage Dell-supplied or end-user generated applications.

application install

Use the **application install** command to install or remove an application.

Syntax

application install *filename* [**start-on-boot**] [**auto-restart**] [**cpu-sharing** *percent*] [**max-megabytes** *max-megabytes*]

no application install *filename*

- *filename* — Name of the file containing the executable or script that is started as a Linux process for the application.
- **start-on-boot** — Start the application every time the switch boots up. Takes affect on the subsequent reboot after set. Omit this keyword from the command to disable starting application at boot time.
- **auto-restart** — Automatically restart the application's process(es) if they stop running. Omit this keyword from the command to disable automatic restart of the application.
- **cpu-sharing** — CPU share allocated to this application. Expressed as a percentage between 0 and 99. If 0 is specified, the application process(es) are not limited. If this keyword is not specified, the default value is used. The default is 0.
- *max-megabytes* — Set the maximum memory resource that the application process(es) are allowed to consume. Expressed as megabytes between 0 and 200. If 0 is specified, the application process(es) are not limited. If this keyword is not specified, the default value is used. The default is 0.

Default Configuration

By default, no applications are installed.

Command Mode

Global Configuration

User Guidelines

Application names may be up to 16 characters in length.

The name specified in the application-name parameter must match the filename output of the show application command exactly. Application names are case sensitive.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)#no application install support-assist
This action will terminate the support-assist agent and remove it permanently
from the switch. Are you sure you wish to continue (Y/N):
```

application start

Use the **application start** command to schedule an application for immediate execution on the management unit in the stack.

Syntax

application start *application-name*

- *application-name* — The name of the application as shown in the **show application** command output.

Default Configuration

By default, no applications are installed.

Command Mode

Privileged Exec mode

User Guidelines

Applications must be downloaded and installed prior to scheduling execution with the **application start** command.

Application names may be up to 16 characters in length.

The name specified in the application-name parameter must match the filename output of the **show application** command exactly. Application names are case sensitive.

Example

```
console#application start support-assist
```

Command History

Introduced in version 6.3.0.1 firmware. Example added in the 6.4 release.

application stop

Use the **application stop** command to stop an application if the application is executing on the management unit in the stack.

Syntax

application stop *application-name*

- *application-name* — The name of the application as shown in the **show application** command output.

Default Configuration

By default, no applications are started.

Command Mode

Privileged Exec mode

User Guidelines

Applications must be downloaded and installed prior to scheduling execution.

Application names may be up to 16 characters in length.

The name specified in the application-name parameter must match the filename output of the **show application** command exactly. Application names are case sensitive.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#application stop support-assist
This action will terminate the support-assist agent. Are you sure you wish to
continue (Y/N):
```

show application

Use the **show application** command to display installed applications and optionally display application files.

Syntax

show application [**files**]

- **files** — Displays the files present in the application directory of the switch's file system. These applications may or may not be installed.

Default Configuration

By default, no applications are present in the file system.

Command Mode

Global Configuration

User Guidelines

Applications must be downloaded and installed prior to displaying.

The **show application** command displays the following information:

Parameter	Definition
filename	Name of the application
start-on-boot	Yes or No stating if the application is configured to start on boot
auto-restart	Yes or No stating if the application is configured to restart when the application process ends

Max-CPU-Util	Configured application CPU utilization limit expressed as a percentage. “None” if unlimited.
Max-memory	Configured application memory limit in megabytes. “None” if unlimited.

The **show application files** command format displays the following information:

Parameter	Definition
filename	Name of the application file.
File size	Number of bytes the file occupies in the file system.
Directory Size	Number of bytes for all the files in the application directory.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)#show application
OpEN application table contains 2 entries.

Name             StartOnBoot AutoRestart CPU Sharing Max Memory
---------------- ----------- ----------- ----------- ----------
SupportAssist     Yes         Yes         0           0
hiveagent         Yes         No          0           0
```

Auto-Install Commands

Auto-Install provides automatic update of the image and configuration of Dell EMC Networking devices on boot up from a TFTP server as controlled by received DHCP options. It plays a critical role in the Dell EMC Networking offering of touchless or low-touch provisioning, in which configuration and imaging of a device is greatly simplified. This is highly desirable as device can be setup with minimum interaction from a skilled technician.

In Dell EMC Networking devices, Auto-Install provides for network-based auto-configuration and auto-imaging. Other aspects provide support for auto-configuration and auto-imaging from attached devices.

Auto-Install is available on Dell EMC Networking devices as per the specification listed below.

Auto-Install features in this release include:

1. Support download of image from TFTP server using DHCP option 125. The image update can result in a downgrade or upgrade of the firmware on the switch or stack of switches.
2. Support for automatic download of a configuration file from a TFTP server when the device is booted with no saved configuration file located in designated storage. This release extends the designated storage to USB flash drives. In previous releases, the only supported storage was the device's embedded flash or non-volatile memory.
3. Support for automatic download of an image from a TFTP server in the following situations:
   a. When the device is booted with no saved configuration found in the designated storage areas.
   b. When the device is booted with a saved configuration that has Auto-Install enabled.
4. Support for the Auto-Install process from a TFTP server operationally enabling the DHCP client on designated management interfaces during the Auto-Install process. The end user configuration remains unchanged. Management interfaces include the out-of-band interface or routing interfaces in a saved config.

boot auto-copy-sw

Use the **boot auto-copy-sw** command to enable or disable Stack Firmware Synchronization.

Use the **no** form of the command to disable Stack Firmware Synchronization.

Syntax

boot auto-copy-sw

no boot auto-copy-sw

Default Configuration

Stack firmware synchronization is disabled by default.

Command Mode

Global Config

User Guidelines

The configuration on the primary switch controls the stack as if it is a single switch. No configuration steps need to be taken on the member switches to synchronize the firmware.

boot auto-copy-sw allow-downgrade

Use the **boot auto-copy-sw allow-downgrade** command to enable automatic downgrade of the firmware version on a stack member if the firmware version on the manager is older than the identified firmware version.

Use the **no** form of the command to disable downgrading the image.

Syntax

boot auto-copy-sw allow-downgrade

no boot auto-copy-sw allow-downgrade

Default Configuration

The default value **is enabled.**

Command Mode

Global Configuration

User Guidelines

The configuration on the management unit in the stack controls the stack as if it is a single switch. A stack member with a different version of firmware is not allowed to join the stack. No configuration steps need to be taken on the member switches to downgrade the firmware version. Configuration migration during a downgrade is not assured. The operator should ensure that the configuration can be downgraded before allowing the downgrade to occur or otherwise take steps to reconfigure the switches.

Downgrade of the firmware version is also supported for firmware images discovered during DHCP provisioning or during the Auto-Install process. If this command is enabled and a downgrade version of firmware is found, the management unit in the stack will downgrade itself and all stack members.

During a downgrade, meta-data regarding the stack configuration is not migrated. For example, Ethernet ports configured as stacking ports will revert to the default Ethernet configuration during a downgrade. When this occurs, the stack will be split into individual switches, each of which must have the relevant Ethernet ports individually configured as stacking before the stack can be reconstituted.

boot host auto-reboot

Use the **boot host auto-reboot** command in Global Configuration mode to enable rebooting the device with no administrative intervention when a new firmware version is successfully downloaded using the Auto-Install process. Use the **no** form of this command to disable rebooting the device. Auto-install successfully downloads a new firmware version.

Syntax

boot host auto-reboot

no boot host auto-reboot

Default Configuration

The default value is enabled.

Command Mode

Global Configuration mode

User Guidelines

The configuration on the primary switch controls the stack as if it is a single switch. No configuration steps need to be taken on the member switches to enable rebooting the member switches after auto-install downloads a new firmware version.

Example

```
console#
console#configure
console(config)#boot host auto-reboot
console(config)#no boot host auto-reboot
```

boot host auto-save

Use the **boot host auto-save** command in Global Configuration mode to enable automatically saving the downloaded configuration on the switch. Use the **no** form of this command to disable automatically saving the downloaded configuration on the switch.

Syntax

boot host auto-save

no boot host auto-save

Default Configuration

The default value is disabled.

Command Mode

Global Configuration mode

User Guidelines

A configuration file (CLI commands) may be downloaded during the Auto-Install process via DHCP configuration or via UCSB configuration. Refer to the DHCP and USB Auto-Configuration topic in the *User's Configuration Guide* for more information.

Example

```
console#
console#configure
console(config)#boot host auto-save
console(config)#no boot host auto-save
```

boot host dhcp

Use the **boot host dhcp** command in Global Configuration mode to enable Auto-Install and Auto Configuration on the switch. When a switch boots with a saved startup configuration that includes this command, the Auto-Install process is triggered. Use the **no** form of this command to disable Auto-Install on the next reboot if the reboot occurs with a saved startup configuration. If you give this command while the Auto-Install process is running, the Auto-Install process terminates. The Auto-Install process has an internal timer that retries failed installations for ten minutes.

Syntax

boot host dhcp

no boot host dhcp

Default Configuration

The default value is Enabled.

Command Mode

Global Configuration.

User Guidelines

This command has no user guidelines

Example

```
console#
console#configure
console(config)#boot host dhcp
console(config)#no boot host dhcp
```

boot host retry-count

The **boot host retry-count** command sets the number of attempts to download a configuration. Use the **no** form of this command to reset the number of attempts to download a configuration to the default.

Syntax

boot host retry-count *count*

no boot host retry-count

- *count* —The number of attempts to download a configuration (Range: 1–6).

Default Configuration

The default number of configuration download attempts is 6.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines

Example

```
console#
console#configure
console(config)#boot host retry-count 5
console(config)#no boot host retry-count
```

show auto-copy-sw

Use the **show auto-copy-sw** command to display Stack Firmware Synchronization configuration status.

Syntax

show auto-copy-sw

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The show switch command also displays the switch firmware synchronization status.

Example

```
console#show auto-copy-sw

Stack Firmware Synchronization

Synchronization:        Enabled
SNMP Trap status:       Enabled
Allow Downgrade:        Enabled
```

show boot

Use the **show boot** command to display the auto install configuration and the status.

Syntax

show boot

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show boot
Auto-Install Mode............................. Enabled
AutoInstall Operational Mode.................. Disabled
Auto-Install State............................ AutoInstall is completed.

The host retry count value is: 6
Auto Save mode is Disabled
Auto Reboot mode is Enabled.
```

CLI Macro Commands

CLI Macros provides a convenient way to save and distribute common configurations. A CLI macro is a set of the CLI commands having a unique name. When a CLI macro is applied, the CLI commands contained within the macro are executed and added to the Running Configuration File. When the macro is applied to an interface, the existing configuration is not lost; the new commands are added configuration.

A CLI Macro may have keywords (variables) which are replaced by values provided when the macro is applied (up to 3 keywords per macro). Macros can be applied to specific interfaces, a range of interfaces, or the global configuration.

There are two types of Macros:

- Built-In Macros, or Default Macros – the predefined macros which cannot be changed or deleted.
- User-Defined Macros, or Custom Macros – the macros which allow the operator to bundle some prerequisites or global configurations as a macro and then apply them to one or more interfaces at a time, which can then be copied or used by other switches. Up to 50 user-defined macros are supported.

The software includes 6 built-in macros:

- profile-global, the global configuration, used to enable RSTP and loop guard.
- profile-desktop, the interface configuration, for increased network security and reliability when connecting a desktop device, such as a PC, to a switch port.
- profile-phone, the interface configuration, used when connecting a desktop device such as a PC with an IP Phone to a switch port.
- profile-switch, the interface configuration, used when connecting an access switch and a distribution switch or between access switches.
- profile-router, the interface configuration, used when connecting the switch and a WAN router.
- profile-wireless, the interface configuration, used when connecting the switch and a wireless access point.

- profile-compellent-nas, the interface configuration, used when connecting the switch to a Dell Compellent NAS.

macro name

Use the **macro name** command in Global Configuration mode to create a user-defined macro. Use the **no** form of the command to delete a macro.

Syntax

macro name *name*

no macro name *name*

- *name*—The name of the macro. A macro name can consist of any printable characters, including blanks and excluding question marks. A macro name may be up to 31 characters in length. Embed the name in quotes if a blank is desired in the name. Use the **no** form of the command to delete a macro.

Default Configuration

The following macros are defined by default and may not be deleted or altered:

Macro Context	Name	Service
global	profile-global	Set DSCP mappings and enable RSTP.
interface	profile-desktop	Configure port security and spanning-tree portfast for a desktop user.
interface	profile-phone	Enable an interface for the Voice VLAN service.
interface	profile-switch	Configure a trunk mode port for a switch.
interface	profile-router	Configure a trunk mode port for a router.
interface	profile-wireless	Configure a port for connection to a wireless AP.

Macro Context	Name	Service
global	profile-compellent-nas	Configure a port for connection to a Compellent NAS.

Command Mode

Global Configuration mode

User Guidelines

The predefined macros are useful in globally configuring the switch or a specific interface in the configuration context indicated. The macros contain a short series of commands with suggested settings for the switch or interface when used in a particular type of service.

Macros consist of text commands with one command per line. Enter the commands and terminate macro input mode by entering a single at sign (@) on a line by itself.

A macro may utilize up to 3 parameters. Parameters are text strings that begin with a dollar sign ($). Parameters are substituted by specifying the parameter on the command line when the macro is applied.

Macros may be applied to a specific interface, a range of interfaces, or to the global configuration. Up to 50 user-defined macros may be configured.

macro global apply

Use the **macro global apply** command in Global Configuration mode to apply a macro.

Syntax

macro global apply ***macro-***name [*parameter value*] [*parameter value*] [*parameter value*]

- *macro-name*—The name of the macro.
- *parameter*—The name of the parameter recognized by the macro. The parameter must begin with a dollar sign ($).
- *value*—The string to be substituted within the macro for the specified parameter name.

Default Configuration

No parameters are substituted unless supplied on the command line.

Command Mode

Global Configuration mode

User Guidelines

Commands applied are additive in nature. That is, they do not remove existing configuration information by default.

macro global trace

Use the **macro global trace** command in Global Configuration mode to apply and trace a macro. The trace command will display each line of the macro as it is executed and list any errors encountered.

Syntax

macro global trace ***macro-****name* [*parameter value*] [*parameter value*] [*parameter value*]

- *macro-name*—The name of the macro.
- *parameter*—The name of the parameter recognized by the macro. The parameter must begin with a dollar sign ($).
- *value*—The string to be substituted within the macro for the specified parameter name.

Default Configuration

No parameters are substituted unless supplied on the command line.

Command Mode

Global Configuration mode

User Guidelines

The line number of the first error encountered is printed. The script is aborted after the first error.

Commands applied are additive in nature. That is, they do not remove existing configuration information by default.

macro global description

Use the **macro global description** command in Global Configuration mode to append a line to the global macro description. Use the **no** form of the command to clear the description.

Syntax

macro global description *line*

- *line*—The macro description. All text up to the new line is included in the description.

Default Configuration

There is no description by default.

Command Mode

Global Configuration mode

User Guidelines

This command is intended to give the administrator an easy way to remember which macros have been applied globally. All text up to the new line is included in the description. The line is appended to the global description.

macro apply

Use the **macro apply** command in Interface Configuration mode to apply a macro.

Syntax

macro apply *macro-name* [*parameter value*] [*parameter value*] [*parameter value*]

- *macro-name*—The name of the macro.
- *parameter*—The name of the parameter recognized by the macro. The parameter must begin with a dollar sign ($).

- *value*—The string to be substituted within the macro for the specified parameter name.

Default Configuration

No parameters are substituted unless supplied on the command line.

Command Mode

Interface Configuration mode

User Guidelines

Commands applied are additive in nature. That is, they do not remove existing configuration information by default.

macro trace

Use the **macro trace** command in Interface Configuration mode to apply and trace a macro. The command will display each line of the macro as it is executed and list any errors encountered.

Syntax

macro trace *macro-name* [*parameter value*] [*parameter value*] [*parameter value*]

no macro name *name*

- *macro-name*—The name of the macro.
- *parameter*—The name of the parameter recognized by the macro. The parameter must begin with a dollar sign ($).
- *value*—The string to be substituted within the macro for the specified parameter name.

Default Configuration

No parameters are substituted unless supplied on the command line.

Command Mode

Interface Configuration mode

User Guidelines

The line number of the first error encountered is printed. The script is aborted after the first error.

Commands applied are additive in nature. That is, they do not remove existing configuration information by default.

macro description

Use the **macro description** command in Interface Configuration mode to append a line to the macro description. Use the **no** form of the command to clear the description.

Syntax

macro description *line*

- *line*—The macro description. All text up to the new line is included in the description.

Default Configuration

There is no description by default.

Command Mode

Interface Configuration mode

User Guidelines

This command is intended to give the administrator an easy way to remember which macros have been applied to an interface. All text up to the new line is included in the description. The line is appended to the interface description.

show parser macro

Use the **show parser macro** command to display information about defined macros.

Syntax

show parser macro [*brief* **|** *description* [*interface interface-id*] **|** *name macro*

- *brief*—Shows the list of defined macros and their type.
- *description*—Shows the macro descriptions.
- *name*—Shows an individual macro, including its contents.
- *macro*—The name of the macro to display.
- *interface-id*—The interface for which to show the macro description.

Default Configuration

No parameters are substituted unless supplied on the command line.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Clock Commands

Real-time Clock

The Dell EMC Networking supports a real-time clock that maintains the system time across reboots. The system time is used to timestamp messages in the logging subsystem as well as for the application of time based ACLs. The administrator has the ability to configure and view the current time, time zone, and summer time settings.

The earliest date that can be configured is Jan 1, 2010.

Simple Network Time Protocol

The Simple Network Time Protocol (SNTP) is widely used for synchronizing network resources. SNTP Version 4 is described in RFC 2030. SNTP is an adaptation of the Network Time Protocol (RFC 1305) useful for situations where the full performance of NTP is not justified. SNTP can operate in unicast mode (point-to-point) or broadcast mode (point-to-multipoint). Various NTP implementations can operate as either a client or a server. To an NTP or SNTP server, NTP and SNTP clients are indistinguishable. Likewise, to an NTP or SNTP client, NTP and SNTP servers are indistinguishable. Furthermore, any version of NTP is compatible with any other version of NTP. Dell EMC Networking SNTP implements the client side of SNTP.

Support for IPv6 address configuration is provided to the existing SNTP client. The end user can configure either an IPv4 or IPv6 address or a host name for an SNTP server among the list of servers. In unicast mode, one of the servers from the list is selected as the active server to be used for polling based on priority and configured order. The servers are treated alike independent of IPv4 or IPv6 or hostname address formats. At any given point of time, the client operates in unicast or broadcast mode. In broadcast mode, SNTP client listens on the well known multicast group address 224.0.1.1 (reserved for NTP) for server packets from IPv4 networks on port number 123. On IPv6 networks, the SNTP client listens to the link-local scoped IANA multicast address ff02::101 (reserved for SNTP) for server packets on port number 123. The client logic to handle packet contents doesn't change with support for IPv6 networks.

show sntp configuration

Use the **show sntp configuration** command to show the configuration of the Simple Network Time Protocol (SNTP).

Syntax

show sntp configuration

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Loopback interfaces are not supported on the N1100-ON Series switches.

Example

The following example displays the current SNTP configuration of the device.

```
console#show sntp configuration

Polling interval: 64 seconds
MD5 Authentication keys:
Authentication is not required for synchronization.
Trusted keys: No trusted keys
No trusted keys.
Unicast clients: Disable

Unicast servers:
Server          Key             Polling         Priority     Source Interface
--------------  -----------     -----------     ---------- ----------------
10.27.128.21    Disabled        Enabled         1             Loopback 1
```

show sntp server

Use the show sntp server command to display the preconfigured SNTP servers. The configured servers can be either IPv4 or IPv6 format.

Syntax

show sntp server

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

```
console#show sntp server

Server Host Address:                2001::01
Server Type:                        IPv6
Server Stratum:                     2
Server Reference Id:                NTP Srv: 158.108.96.32
Server Mode:                        Server
Server Maximum Entries:             3
Server Current Entries:             2

SNTP Servers
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Host Address: 2001::01
Address Type: IPv6
Priority: 1
Version: 4
Port: 123
Last Update Time: Dec 22 11:10:00 2009
Last Attempt Time: Dec 22 11:10:00 2009
Last Update Status: Success
Total Unicast Requests: 955
Failed Unicast Requests: 1

Host Address: 3.north-america.pool.ntp.org
Address Type: DNS
Priority: 1
Version: 4
Port: 123
```

```
Last Update Time: Dec 22 07:30:31 2009
Last Attempt Time: Dec 22 07:32:41 2009
Last Update Status: Server Unsynchronized
Total Unicast Requests: 157
Failed Unicast Requests: 2
```

show sntp status

Use the **show sntp status** command to show the status of the Simple Network Time Protocol (SNTP).

Syntax

show sntp status

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Examples

The following example shows the status of the SNTP.

```
console#show sntp status
Client Mode:                        Unicast
Last Update Time:                   Mar  8 18:43:56 2017
Unicast servers:
Server          Status                  Last response
--------------- ----------------------- --------------------------
pool.ntp.org    Success                 18:43:56 Mar 8 2017
23.101.187.68   Other                   00:00:00 Jan 1 1970
```

sntp authenticate

Use the **sntp authenticate** command in Global Configuration mode to require server authentication for received Network Time Protocol (NTP) traffic. To disable the feature, use the **no** form of this command.

Syntax

sntp authenticate

no sntp authenticate

Default Configuration

No authentication.

Command Mode

Global Configuration mode

User Guidelines

The command is relevant for both Unicast and Broadcast.

Example

The following example, after defining the authentication key for SNTP, grants authentication.

```
console(config)# sntp authentication-key 8 md5 ClkKey
console(config)# sntp trusted-key 8
console(config)# sntp authenticate
```

sntp authentication-key

Use the **sntp authentication-key** command in Global Configuration mode to define an authentication key for Simple Network Time Protocol (SNTP). To remove the authentication key for SNTP, use the **no** form of this command.

Syntax

sntp authentication-key *key-number* **md5** *value*

no sntp authentication-key *number*

- *key-number*—number (Range: 1–4294967295)

- *value*—value (Range: 1-8 characters)

Default value

No authentication is defined.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Examples

The following examples define the authentication key for SNTP.

```
console(config)# sntp authentication-key 8 md5 04080605
console(config)# sntp trusted-key 8
console(config)# sntp authenticate
```

sntp broadcast client enable

Use the **sntp broadcast client enable** command in Global Configuration mode to enable a Simple Network Time Protocol (SNTP) Broadcast client. To disable an SNTP Broadcast client, use the **no** form of this command.

Syntax

sntp broadcast client enable

no sntp broadcast client enable

Default Configuration

The SNTP Broadcast client is disabled.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enables a Simple Network Time Protocol (SNTP) Broadcast client.

```
console(config)# sntp broadcast client enable
```

sntp client poll timer

Use the **sntp client poll timer** command in Global Configuration mode to set the polling time for the Simple Network Time Protocol (SNTP) client. To return to the default settings, use the **no** form of this command.

Syntax

sntp client poll timer *seconds*

no sntp client poll timer

- *seconds* — Polling interval. (Range: 64-1024 seconds, in powers of 2, i.e., 64, 128, 256, 512 or 1024.)

Default Configuration

The default polling interval is 64 seconds.

Command Mode

Global Configuration mode

User Guidelines

If a user enters a value which is not an exact power of two, the nearest power-of-two value is applied.

Example

The following example sets the polling time for the Simple Network Time Protocol (SNTP) client to 1024 seconds.

```
console(config)# sntp client poll timer 1024
```

sntp server

Use the **sntp server** command in Global Configuration mode to configure an SNTP server address or a host name. The server address can be either an IPv4 address or an IPv6 address. Use the **no** form of this command to unconfigure an SNTP server address or a host name.

Syntax

sntp server {*ip-address* | *ipv6-address* | *hostname*} [**priority** priority] [**key** key_id] [**poll**]

no sntp server {*ip-address* | *ipv6-address* | *hostname*}

- *ip-address* — IP address of the server.
- *hostname* — Hostname of the server. (Range: 1-256 characters)
- priority—The relative priority of the SNTP server (Range 1-8).
- poll—Enable SNTP server polling.
- key_id—The index of the authentication key to send to the SNTP server (Range 1-4294967295).

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The SNTP authentication parameter is an MD5 checksum sent to the NTP server. The key index identified in the **sntp server** command should be configured with the **sntp authentication-key** command.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. A maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Example

The following example configures the device to accept Simple Network Time Protocol (SNTP) traffic from the server at IP address 192.1.1.1.

```
console(config)# sntp server 192.1.1.1
```

sntp source-interface

Use the **sntp source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted SNTP packets. Use the **no** form of the command to revert to the default IP address.

Syntax

sntp source-interface {**loopback** *loopback-id* | **vlan** *vlan-id*}

no sntp source-interface

- *loopback-id* — A loopback interface identifier.
- *vlan-id* — A VLAN identifier.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for SNTP packets. This is either the IP address assigned to the VLAN from which the SNTP packet originates or the out-of-band interface IP address.

Command Mode

Global Configuration

User Guidelines

The source interface must have an assigned IP address (either manually or via another method such as DHCP). This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#sntp source-interface vlan 1
```

sntp trusted-key

Use the **sntp trusted-key** command in Global Configuration mode to authenticate the identity of a system to which Simple Network Time Protocol (SNTP) will synchronize. To disable authentication of the identity of the system, use the **no** form of this command.

Syntax

sntp trusted-key *key-number*

no sntp trusted-key *key-number*

- *key-number* — Key number of authentication key to be trusted. (Range: 1–4294967295)

Default Configuration

No keys are trusted.

Command Mode

Global Configuration mode

User Guidelines

This command is relevant for both received Unicast and Broadcast.

Example

The following defines SNTP trusted-key.

```
console(config)# sntp authentication-key 8 md5 ClkKey
console(config)# sntp trusted-key 8
console(config)# sntp authenticate
```

sntp unicast client enable

Use the **sntp unicast client enable** command in Global Configuration mode to enable a client to use Simple Network Time Protocol (SNTP) predefined Unicast clients. To disable an SNTP Unicast client, use the **no** form of this command.

Syntax

sntp unicast client enable

no sntp unicast client enable

Default Configuration

The SNTP Unicast client is disabled.

Command Mode

Global Configuration mode

User Guidelines

Use the **sntp server** command to define SNTP servers.

Examples

The following example enables the device to use Simple Network Time Protocol (SNTP) to request and accept SNTP traffic from servers.

```
console(config)# sntp unicast client enable
```

clock set

Use the **clock set** command to manually set the system time.

Syntax

clock set {<hh:mm:ss> | <mm/dd/yyyy>}

Default Configuration

The system time is local.

Command Mode

Global Configuration

User Guidelines

It is advisable to set both the time and date.

Examples

```
console(config)#clock set 19:20:31
console(config)#clock set 04/01/2019
```

clock timezone hours-offset

Use the **clock timezone** [h**ours-offset**] [minutes *minutes-offset*] [**zone** *acronym*] command to set the offset to Coordinated Universal Time (UTC). If the optional parameters are not specified, they will be read as either '0' or '\0, as appropriate.

Syntax

clock timezone hours-offset [**minutes** *minutes-offset*] [**zone** *acronym*]

- *hours-offset* — Hours difference from UTC. (Range: –12 to +13)
- *minutes-offset* — Minutes difference from UTC. (Range: 0–59)
- *acronym* — The acronym for the time zone. (Range: Up to four characters)

Command Mode

Global Configuration

Default Value

No default setting

User Guidelines

No specific guidelines

Example

```
console(config)#clock timezone -5 minutes 30 zone IST
```

no clock timezone

Use the **no clock timezone** command to reset the time zone settings.

Syntax

no clock timezone

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

This command has no specific user guidelines.

Example

```
console(config)#no clock timezone
```

clock summer-time recurring

Use the **clock summer-time recurring** {**usa** | **eu** | {*week day month hh:mm week day month hh:mm*}} [**offset** *offset*] [**zone** *acronym*] command to set the summertime offset to UTC recursively every year. If the optional parameters are not specified, they are read as either '0' or '\0', as appropriate.

Syntax

clock summer-time recurring {**usa** | **eu** | {*week day month hh:mm week day month hh:mm*}} [**offset** *offset*] [**zone** *acronym*]

- *week* — Week of the month. (Range: 1–5, first, last)
- *day* — Day of the week. (Range: The first three letters by name; sun, for example.)
- *month* — Month. (Range: The first three letters by name; jan, for example.)
- *hh:mm* — Time in 24-hour format in hours and minutes. (Range: hh: 0–23, mm: 0–59)

- *offset* — Number of minutes to add during the summertime. (Range:1–1440)
- *acronym* — The acronym for the time zone to be displayed when summertime is in effect. (Range: Up to four characters)

Default Value

No default setting

Command Mode

Global Configuration

User Guidelines

No specific guidelines

Examples

```
console(config)# clock summer-time recurring 1 sun jan 00:10 2 mon mar 10:00
offset 1 zone ABC
```

clock summer-time date

Use the **clock summer-time date** {{date|month}|{month|date}} *year hh:mm* {{date|month}|{month|date}} *year hh:mm* [**offset** *offset*] [**zone** *acronym*] command to set the summertime offset to UTC. If the optional parameters are not specified, they are read as either '0' or '\0', as appropriate.

Syntax

clock summer-time date {**date** | **month**} {**month** | **date**} *year hh:mm* {**date** | **month**} {**month** | **date**} *year hh:mm* [**offset** *offset*] [**zone** *acronym*]

- *date* — Day of the month. (Range: 1–31)
- *month* — Month. (Range: The first three letters by name; jan, for example.)
- *year* — Year. (Range: 2000–2097)
- *hh:mm* — Time in 24-hour format in hours and minutes. (Range: hh: 0–23, mm: 0–59)
- *offset* — Number of minutes to add during the summertime. (Range: 1–1440)

- *acronym* — The acronym for the time zone to be displayed when summertime is in effect. (Range: Up to four upper or lower case alphabetic characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

No specific guidelines

Examples

```
console(config)# clock summer-time date 1 Apr 2014 02:00 28 Oct 2014 02:00
offset 60 zone EST
```

or

```
console(config)# clock summer-time date Apr 1 2014 02:00 Oct 28 2014 02:00
offset 60 zone EST
```

no clock summer-time

Use the **no clock summer-time** command to reset the summertime configuration.

Syntax

no clock summer-time

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

No specific guidelines

Example

```
console(config)#no clock summer-time
```

show clock

Use the **show clock** command to display the time and date from the system clock. Use the **show clock detail** command to show the time zone and summertime configuration.

Syntax

show clock [**detail**]

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows the time and date only.

```
console# show clock
15:29:03 PDT(UTC-7) Jun 17 2014
Time source is SNTP
```

The following example shows the time, date, timezone, and summertime configuration.

```
console# show clock detail
15:29:03 PDT(UTC-7) Jun 17 2014
Time source is SNTP
Time zone:
Acronym is PST
Offset is UTC-7
Summertime:
Acronym is PDT
Recurring every year.
```

```
Begins at first Sunday of April at 2:00.
Ends at last Sunday of October at 2:00.
Offset is 60 minutes.
```

The following example displays the time and date from the system clock

```
console>show clock
15:29:03 Jun 17 2014
Time source is SNTP
```

Command Line Configuration Scripting Commands

The Configuration Scripting feature allows the user to generate text-formatted files representing the current system configuration. These configuration script files can be uploaded to a computer and edited, then downloaded to the system and applied to the system. This feature allows the flexibility of creating command configuration scripts that can be applied to several switches with minor or no modifications.

Commands applied from a script are additive in nature. That is, they modify, but do not automatically replace the current configuration. Any valid command can be placed in a script, including show commands.

Scripts execute in Privileged Exec mode. The script author must add a command (configure) in order to enter Global Configuration mode.

script apply

Use the **script apply** command to apply the commands in the script to the switch.

Syntax

script apply *scriptname*

- *scriptname* — Name of the script file to apply. (Range 1–31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example applies the *config.scr* script to the switch.

```
console#script apply config.scr
```

script delete

Use the **script delete** command to delete a specified script.

Syntax

script delete {*scriptname* | **all**}

- *scriptname* — Script name of the file being deleted. (Range 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example deletes all scripts from the switch.

```
console#script delete all
```

script list

Use the **script list** command to list all scripts present on the switch as well as the remaining available space.

Syntax

script list

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example displays all scripts present on the switch.

```
console#script list
Configuration Script Name Size(Bytes)
-------------------------------- -----------
0 configuration script(s) found.
2048 Kbytes free.
```

script show

Use the **script show** command to display the contents of a script file.

Syntax

script show *scriptname*

- *scriptname* — Name of the script file to be displayed. (Range: 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example displays the contents of the script file *config.scr*.

```
console#script show config.scr
interface gigabitethernet 1/0/1
ip address 176.242.100.100 255.255.255.0
exit
```

script validate

Use the **script validate** command to validate a script file by parsing each line in the script file.The validate option is intended for use as a tool in script development. Validation identifies potential problems though it may not identify all problems with a given script.

Syntax

script validate *scriptname*

- *scriptname* — Name of the script file being validated. (Range: 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example validates the contents of the script file *config.scr*.

```
console#script validate config.scr
```

CLI Output Filtering Commands

show *xxx*|include "*string*"

The `command xxx` is executed and the output is filtered to only show lines containing the "`string`" match. All other non-matching lines in the output are suppressed.

Syntax

show *xxx*|include "*string*"

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Example

The following shows an example of the CLI command.

```
(Routing) #show running-config | include "spanning-tree"

spanning-tree configuration name "00-02-BC-42-F9-33"
spanning-tree bpduguard
spanning-tree bpdufilter default
```

show *xxx*|include "*string*" exclude "*string2*"

The command `xxx` is executed and the output is filtered to only show lines containing the "`string`" match and not containing the "`string2`" match. All other non-matching lines in the output are suppressed. If a line of output contains both the include and exclude strings then the line is not displayed.

Syntax

show xxx|include “string” exclude “string2”

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Example

The following shows example of the CLI command.

```
(Routing) #show running-config | include "spanning-tree" exclude
"configuration"

spanning-tree bpduguard
spanning-tree bpdufilter default
```

show *xxx*|exclude “*string*”

The command `xxx` is executed and the output is filtered to show all lines not containing the `"string"` match. Output lines containing the `"string"` match are suppressed.

Syntax

show xxx|exclude “string”

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Example

The following shows an example of the CLI command.

```
(Routing) #show interface 0/1

Packets Received Without Error................. 0
Packets Received With Error.................... 0
Broadcast Packets Received..................... 0
Receive Packets Discarded...................... 0
Packets Transmitted Without Errors............. 0
Transmit Packets Discarded..................... 0
Transmit Packet Errors......................... 0
Collision Frames............................... 0
Time Since Counters Last Cleared............... 281 day 4 hr 9 min 0 sec

(Routing) #show interface 0/1 | exclude "Packets"

Transmit Packet Errors......................... 0
Collision Frames............................... 0
Time Since Counters Last Cleared............... 20 day 21 hr 30 min 9 sec
```

show *xxx*|begin "*string*"

The command `xxx` is executed and the output is filtered to show all lines beginning with and following the first line containing the "`string`" match. All prior lines are suppressed.

Syntax

show xxx|begin "string"

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Example

The following shows an example of the CLI command.

```
(Routing) #show port all | begin "1/1"

1/1          Enable                       Down   Disable N/A    N/A
1/2          Enable                       Down   Disable N/A    N/A
1/3          Enable                       Down   Disable N/A    N/A
1/4          Enable                       Down   Disable N/A    N/A
1/5          Enable                       Down   Disable N/A    N/A
1/6          Enable                       Down   Disable N/A    N/A

(Routing) #
```

show *xxx*|section "*string*"

The command `xxx` is executed and the output is filtered to show only lines included within the section(s) identified by lines containing the "`string`" match and ending with the first line containing the default end-of-section identifier (i.e. "exit").

Syntax

show xxx|section "string"

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Example

The following shows an example of the CLI command.

```
(Routing) #show running-config | section "interface 0/1"

interface 0/1
no spanning-tree port mode
exit
```

show *xxx*|section "*string*" "*string2*"

The command `xxx` is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "`string`" match and ending with the first line containing the "`string2`" match. If multiple sessions matching the specified string match criteria are part of the base output, then all instances are displayed.

Syntax

show xxx|section "string" "string2"

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

show *xxx*|section "*string*" include "*string2*"

The command `xxx` is executed and the output is filtered to only show lines included within the section(s) identified by lines containing the "`string`" match and ending with the first line containing the default end-of-section identifier (i.e. "exit") and that include the "`string2`" match. This type of filter command could also include "`exclude`" or user-defined end-of-section identifier parameters as well.

Syntax

show xxx|section "string" include "string2"

Default Configuration

This command has no default configuration.

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.6.0 firmware.

Configuration and Image File Commands

File System Commands

CLI commands allow the user to show the contents of the current directory in the flash file system (**dir** command). These files may also be deleted from the flash using the **delete** command or renamed with the **rename** command. Also, the syntax of the **copy** command has been changed slightly to add additional flash targets and sources for the above commands.

Command Line Interface Scripting

The configuration scripting feature allows the user to save the current Dell EMC Networking configuration in text format. To modify the configuration script file, follow these procedures:

1. Upload the file to a personal computer.
2. Edit the file.
3. Download the file to a Dell EMC Networking switch.
4. Apply it to the Dell EMC Networking system. With this feature in place, the Dell EMC Networking administrator has the flexibility of creating configuration scripts and then applying the scripts to several devices.

boot system

Use the **boot system** command to specify the system image that the device loads at startup.

Syntax

boot system [unit-id] [active|backup]

- **unit-id**—Unit to be used for this operation. If absent, command executes on this node.
- **active**—Boot from the currently active image.
- **backup**—Boot from the backup image.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Use the **show bootvar** command to find out which image is the active image.

Example

```
console#boot system ?

<unit>                   Unit to be used for this operation. If absent,
                         command executes on this node.
active                   Marks the given image as active for subsequent
                         re-boots.
backup                   Marks the given image as active for subsequent
                         re-boots.

console#show version

Machine Description............... Dell Networking Switch
System Model ID................... N4032
Machine Type...................... Dell Networking N4032
Serial Number..................... X00-32C-10
Manufacturer...................... 0xbc00
Burned In MAC Address............. 001E.C9F0.0039
System Object ID.................. 1.3.6.1.4.1.674.10895.3042
CPU Version....................... XLP308L
SOC Version....................... BCM56842_A1
HW Version........................ 1
CPLD Version...................... 17

unit active      backup      current-active next-active
---- ----------- ----------- -------------- --------------
1    6.0.0.1     6.0.0.0     6.0.0.1        6.0.0.1
```

clear config

Use the **clear config** command to restore the switch to the default configuration.

Syntax

clear config

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example restores the switch to its default configuration.

```
console#clear config
```

copy

Use the **copy** command to copy files within the switch and to upload and download files from and to the switch.

Syntax

copy *source-url destination-url* [source out-of-band]

<table>
<tr><th>Parameter</th><th colspan="2">Description</th></tr>
<tr><td rowspan="15">source-url</td><td colspan="2">The location URL or or reserved keyword of the source file being copied. (Range: 1-160 characters.)</td></tr>
<tr><td colspan="2">List of valid source parameters for uploading from the switch:</td></tr>
<tr><td>backup-config</td><td>Uploads Backup Config file.</td></tr>
<tr><td>active|backup</td><td>Uploads code file.</td></tr>
<tr><td>log-files</td><td>Uploads the system logs.</td></tr>
<tr><td>operational-log</td><td>Uploads Operational Log file.</td></tr>
<tr><td>running-config</td><td>Uploads system config file.</td></tr>
<tr><td>script <filename></td><td>Uploads Configuration Script file.</td></tr>
<tr><td>startup-config</td><td>Uploads Startup Config file.</td></tr>
<tr><td>startup-log</td><td>Uploads Startup Log file.</td></tr>
<tr><td>application filename</td><td>Uploads a PYTHON application.</td></tr>
<tr><td>core-dump filename</td><td>Uploads a Core Dump file.</td></tr>
<tr><td>crashlog [crashlog# | kernel crashlog# | data crashlog#] [unit unit#]</td><td>A crash log file on the management unit in the stack or a stack member.</td></tr>
<tr><td colspan="2">Valid source URLs for downloading to the switch:</td></tr>
<tr><td colspan="2">tftp://{ipaddress | hostname}/filepath/filename
scp://{user@ipaddresss | hostname}/filepath/filename
sftp://{user@ipaddress | hostname}/filepath/filename
ftp://{user@ipaddress | hostname}/filepath/filename
flash://filepath/filename
usb://filepath/filename</td></tr>
</table>

Parameter	Description	
destination-url	The URL or reserved keyword of the destination file. (Range: 1-160 characters.	
	List of valid destination parameters for downloading to the switch:	
	application [filename]	Download a PYTHON application.
	backup-config	Downloads a backup config file using FTP, SFTP, or TFTP.
	ca-root [*index*]	A Certificate Authority (CA) root or intermediate X.509 PEM-encoded certificate file. The contents of the source URL are copied into the *CAindex*.pem file on the switch. The optional index can range from 1-8. If no index is given, the certificate is placed in the CA.pem file.
	client-key[*index*]	A client private key file. The contents of the source URL are copied into the client*index*.key file on the switch. The optional index can range from 1-8. If no index is specified, the private key is placed into the client.key file.
	client-ssl-crt[*index*]	A client certificate file. The contents of the source URL are copied into the client*index*.pem file on the switch. The optional index can range from 1-8. If no index parameter is specified, the certificate is placed in the client.pem file.
	active|backup	Downloads an image file by FTP, SFTP, or TFTP.
	onie-fw-update	An ONIE firmware update file.
	openflow-ssl-ca-cert	A signed Certificate Authority (CA) root or intermediate certificate file. The contents of the source URL are copied into the of-cacert.pem file on the switch.
	openflow-ssl-priv-key	An OpenFlow client private key file. The contents of the source URL are copied into the of-privkey.pem file on the switch.

<table>
<tr><th>Parameter</th><th colspan="2">Description</th></tr>
<tr><td rowspan="8">destination-url
(cont.)</td><td>openflow-ssl-cert</td><td>An OpenFlow client certificate file. The contents of the source URL are copied into the of-cert.pem file on the switch.</td></tr>
<tr><td>script</td><td>Downloads a configuration script by FTP, SFTP, or TFTP.</td></tr>
<tr><td>sshkey-dsa</td><td>Downloads the ssh RSA key file to the switch.</td></tr>
<tr><td>sshkey-rsa</td><td>Downloads the ssh DSA key file to the switch.</td></tr>
<tr><td>startup-config</td><td>Downloads a startup configuration file using FTP or TFTP.</td></tr>
<tr><td>ias-users</td><td>Downloads the ias-users database file.</td></tr>
<tr><td colspan="2">Valid destination URLs for uploading from the switch:</td></tr>
<tr><td colspan="2">tftp://{ipaddress | hostname}/filepath/filename
ftp://<user>@<ipaddr|hostname>/<path>/<filename>
scp://{user@ipaddresss | hostname}/filepath/filename
sftp://{user@ipaddress | hostname}/filepath/filename
flash://filename
usb://filepath/filename</td></tr>
<tr><td>source out-of-band</td><td colspan="2">Use out-of-band source IP address.</td></tr>
</table>

The following list describes syntax keywords.

- *source-url* — The location URL or reserved keyword of the source file being copied. (Range: 1–160 characters.)
- *destination-url* — The URL or reserved keyword of the destination file. (Range: 1–160 characters.)
- *ipaddr* — The IPv4 or IPv6 address of the server.
- *hostname* — Hostname of the server. (Range: 1–256 characters). The command allows spaces in the host name when specified in double quotes. Each label in the host name is limited to 63 characters.

- *filepath* — The path to the file on the server or USB drive or an absolute or relative path on the switch. This is an optional parameter that should only be entered if needed.
- *filename* — The name of the file on the server or USB drive (source-url). The filename parameter is required for the tftp, ftp, scp, sftp, flash and usb destination URLs. For an application, if the optional filename parameter is given for an archive in the destination url, it must have a .tar or .tgz extension. If the destination filename is not given, the filename is extracted from the source url. If the filename has a .tar or .tgz extension, the archive is unpacked in the user-apps directory and deleted after unpacking. If there is an error during unpacking, the file is deleted anyway. If the file name does not include a .tar or .tgz extension, it is simply copied into the user-apps directory as is.
- *username* — The user name for logging into the remote server via SSH.
- *crashlog#*—Indicates the index of the log on the local or remote unit (Range 0-4). Index 0 indicates the most recent crash log. Index 4 specifies the oldest crash log.
- *unit*—Indicates the stack unit number from which to retrieve the log. If no unit is specified, the file is copied from the management unit in the stack.
- *kernel*—Only copies the kernel crash log.
- *data*—Only copies the crash summary data.

The following table lists and describes reserved keywords.

Reserved Keyword	**Description**
application	Represents an application.
running-config	Represents the current running configuration file.
startup-config	Represents the startup configuration file.
startup-log	Represents the startup SYSLOG file. This can only be the source of a copy operation.
operational-log	Represents the operational SYSLOG file. This can only be the the source of a copy operation.
script *scriptname*	Represents a CLI script file.

Reserved Keyword	Description
active|backup	Represents the software image file. When “backup” is the target of a copy command, it refers to the backup image. When “active” is the source of a copy command, it refers to the active image. If the switch is the destination, the file will be distributed to all units in the stack.
ftp:	Source or destination URL for an FTP network server. The syntax for this alias is ftp:*//ipaddr/filepath/filename image*.
tftp:	Source or destination URL for a TFTP network server. The syntax for this alias is tftp:[[*//location*]*/directory*]*/filename*. An out-of-band IP address can be specified as described in the User Guidelines.
usb:	Source or destination URL for a file on a mounted USB file system.
flash:	Source or destination URL for the switch flash-based file system.
backup-config	Represents the backup configuration file.
unit	Indicates which unit in the stack is the target of the copy command.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

When copying files from the switch, match a source URL with a destination URL. URLs may not exceed 160 characters in length, including filename, file path, hostname, ip address, user, and reserved keywords. When copying firmware onto the switch in a stacked configuration, use the **show sfs** and **show version** commands to check the status of stack firmware synchronization prior to a reboot.

When copying scripts to the switch, use the script <filename> target syntax. Internally, all scripts, including the startup-config and backup-config, are stored with a header. The header is added when the script is downloaded to the switch and removed when the script is uploaded from the switch. Using the flash://<filename> syntax as the target or source bypasses adding of the script header, ensuring that when a script is applied on the switch which was previously copied to the switch using the flash://<filename> syntax, a syntax error will result.

Script download performs syntax checking of downloaded scripts. If a syntax error is detected, the user is prompted to save the file. If no error is detected, the file is saved using the target file name.

Downloaded scripts are executed from privileged exec mode and should contain a **configure** command as the first line of the script in order to enter global configuration mode.

To configure TLS to use a particular CA root certificate with a client certificate and client key for connecting to a SYSLOG server, all three of the files must have the same index as is configured for the SYSLOG server.

If a CA root certificate, client certificate, or client key file is downloaded with no index specified, it becomes the default set of certificates/key file for TLS used when connecting to any SYSLOG server not configured with an index.

CA Root certificates may be self signed or signed by a certificate authority.

Applications may be installed on the switch in the user-apps directory. To copy a single application to the switch, use the **copy <source-url> application** syntax where the source-url identifies a single file. The switch will extract the application file name from the source-url.

To copy a package of related application files to the switch, tar the files into an archive (compressed or uncompressed). The switch will unpack the tar ball in the user-apps directory, and remove the downloaded archive file.

Applications in the user-apps directory may be overwritten by the copy command to support ease of installing new versions of applications. There is no warning if a file is overwritten. Application developers must embed version information in their application file names if they wish to support multiple versions of applications on the switch.

When copying files to or from a USB stick, do not remove the USB stick during file transfer. Use the **unmount** command to cleanly detach the USB stick before physical removal. After running the **unmount** command, the USB stick must be physically removed and re-inserted before accessing again.

An ONIE firmware image may be copied onto the management unit in the stack using the onie-fw-update destination URL. ONIE firmware updates are distributed to the stack member automatically and are executed on stack reboot. The management unit in the stack requires at least 10 minutes after the image has been copied on to the primary to distribute the images across the stack.

Examples

Example – Backing up the running-config

```
console#copy running-config backup-config
This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Configuration saved!
```

Example – Downloading new code to the switch

```
console#copy tftp://10.27.9.99/jmclendo/N3000-ONv6.0.1.3.stk backup


Transfer Mode.................................. TFTP
Server IP Address.............................. 10.27.9.99
Source File Path............................... jmclendo/
Source Filename................................ N3000-ONv6.0.1.3.stk
Data Type...................................... Code
Destination Filename........................... backup

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

File transfer in progress. Management access will be blocked for the duration
of the transfer. please wait...


TFTP Code transfer starting...

17128797 bytes transferred...
File contents are valid. Copying file to flash...
```

```
Attempting to send the STK file to other units in the stack...


File transfer operation completed successfully.
console#show bootvar

Image Descriptions

 active :
 backup :


 Images currently available on Flash

unit  active       backup       current-active     next-active
----- ------------ ------------ ----------------- -----------------
1     6.0.0.8      6.0.1.3       6.0.0.8           6.0.0.8
```

After the file transfer completes, use the boot system command to select the new image to run.

Example – Downloading and applying ias users file

```
console#copy tftp://10.131.17.104/aaa_users.txt ias-users
Transfer Mode.................................. TFTP
Server IP Address.............................. 10.131.17.104
File Path...................................... ./
File Name...................................... aaa_users.txt
Data Type...................................... IAS Users
Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

File transfer operation completed successfully.

Validating and updating the users to the IAS users database.

Updated IAS users database successfully.
```

Example – Script Download

```
console#copy tftp://10.27.9.99/jmclendo/max-acl.scr script maxacl.scr
```

Example – USB copy operations

```
console#copy usb:/start-config startup-config
console#copy operational-log usb://olog.txt
console#copy usb://backup-config.txt backup-config
console#copy active usb://image1.stk
```

```
console#copy flash://crashlogs/crash.0 usb://crash.0
```

Example – Crash Log

This example copies the most recent crash log from stack unit 5 to the TFTP server located at 10.27.9.99. The crash dump is transferred to the TFTP server into subdirectory ~/jcm and is named crashlog.txt

```
console#copy core-dump 0 unit 5 tftp://10.27.9.99/jcm/crashlog.txt
```

Example – Application Install

Install a single application file named hiveagent_pr_s into the user-apps directory:

```
console#copy tftp://172.25.122.22/hiveagent_pr_s application
```

Install an application package:

On the source device (a Linux workstation is shown here), perform the following steps (aggregates hiveagent_pr hiveagent_pr_s into a compressed tar ball ha.tgz):

```
linux>tar czf ha.tgz hiveagent_pr hiveagent_pr_s
```

On the switch, issue the following command:

```
console#copy tftp://172.25.122.22/ha.tgz application
```

See what files are installed:

```
console#show application files


OpEN application process directory contents:

          62 SupportAssist
       53926 ah_ha.conf
       53926 ah_ha.conf_s
       74062 hiveagent
     1143002 hiveagent_pr
     1143002 hiveagent_pr_s
       10517 sa-main.pyc
        2544 saCommitUpl.pyc
        3461 saGetConfig.pyc
        4465 saGlobal.pyc
       12464 saSendChunk.pyc
```

```
         3729 saStartUpl.pyc
         8707 saSubmitTop.pyc
        16358 saUtil.pyc

Total bytes for all files = 2530225


console#dir user-apps

Attr  Size(bytes)          Creation Time        Name
 drwx                1168 Jul 25 2016 12:23:33 .
 drwx                4088 Jul 25 2016 12:23:44 ..
 -rwx               53926 May 05 2016 12:17:12 ah_ha.conf
  -rw                8707 Jul 19 2016 13:44:01 saSubmitTop.pyc
  -rw                2544 Jul 19 2016 13:44:01 saCommitUpl.pyc
  -rw               16358 Jul 19 2016 13:44:01 saUtil.pyc
  -rw               10517 Jul 19 2016 13:44:00 sa-main.pyc
  -rw               12464 Jul 19 2016 13:44:01 saSendChunk.pyc
  -rw                4465 Jul 19 2016 13:44:01 saGlobal.pyc
 -rwx               74062 May 05 2016 12:17:12 hiveagent
  -rw                3729 Jul 19 2016 13:44:01 saStartUpl.pyc
 -rwx             1143002 May 05 2016 12:17:12 hiveagent_pr_s
 -rwx                  62 Jul 19 2016 13:44:02 SupportAssist
  -rw                3461 Jul 19 2016 13:44:01 saGetConfig.pyc
 -rwx               53926 May 05 2016 12:17:12 ah_ha.conf_s
 -rwx             1143002 May 05 2016 12:17:12 hiveagent_pr

Total Size: 215265280
Bytes Used: 2535481
Bytes Free: 212729799
```

Example – ONIE FW image update

```
dhcp-10-27-22-34#copy tftp://10.27.22.22/pq925679/onie-firmware.bin onie-fw-
update

Transfer Mode.................................. TFTP
Server IP Address.............................. 10.27.22.22
Source File Path............................... pq925679/
Source Filename................................ onie-firmware.bin
Data Type...................................... onie-fw-update

Warning: Continuing with this command will stage an ONIE Firmware update.

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y
```

```
File transfer in progress. Management access will be blocked for the duration
of the transfer. Please wait...

TFTP ONIE Firmware update transfer starting...
Purging all pending firmware updates.
Removing pending firmware update: onie-fw-update.bin
Staging firmware update: /mnt/onie-boot/onie/tools/bin/onie-fw-update.bin

29103991 bytes transferred

Attempting to send the ONIE update image to other units in the stack...
```

Command History

Description and options revised in 6.3.5 release. Onie-fw-update parameter introduced in version 6.7.0 firmware.

delete

Use the **delete** command to delete files from flash. Files cannot be deleted from the USB device.

Syntax

delete {*filename* | **backup** | **backup-config** | **startup-config** | **core-dump-file** {*file-name* | **all**}

- *filename* — Name of the file to be deleted.
- **backup**—Deletes the backup.
- **backup-config**—Deletes the backup configuration.
- **startup-config**—Deletes the startup configuration.
- **core-dump-file** *file-name* - Delete the specified core dump file
- **core-dump-file all** – Delete all core dump files.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The file name may optionally include the path to the file, e.g., **delete crashlogs/crash.0**.

Example

```
console#delete file1.scr
Delete file1.scr (Y/N)?y
```

dir

Use the **dir** command to print the contents of the flash file system or of a subdirectory.

Syntax

dir [subdir]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

```
console#dir

Attr  Size(bytes)  Creation Time         Name
drwx         2640  Feb 02 2022 00:26:43  .
drwx            0  Feb 19 2014 15:22:53  ..
-rw-           96  Jan 28 2022 23:05:45  snmpOprData.cfg
-rw-          156  Jan 01 1970 00:03:14  dh512.pem
-rw-     14363703  Jan 22 2022 03:36:08  image1
-rw-     18335232  Dec 31 2021 01:03:06  image2
-rw-           64  Oct 03 2029 01:46:00  logNvmSave.bin
-rw-        37549  Jan 01 1970 00:03:02  xacl1.scr
-rw-          245  Jan 01 1970 00:03:14  dh1024.pem
drwx          160  Dec 30 2021 03:24:26  user-apps
```

```
-rw-            0  Jan 28 2022 23:05:12  olog0.txt
-rw-         2497  Jan 21 2022 22:37:38  fastpath.cfg

Total Size: 1001914368
Bytes Used: 128319488
Bytes Free: 873594880
```

erase

Use the **erase** command to erase the startup configuration, the backup configuration, or the backup image, or a Dell-supplied application.

Syntax

erase {**filename** | **startup-config** | **backup** | **backup-config** | **application** ***filename***}

- **filename**—The name of a file on the flash drive.
- **startup-config**—Erases the contents of the startup configuration file.
- **backup**—Erase the backup image.
- **backup-config**—Erases the backup configuration.
- **application** *filename*—Erases a Dell-supplied application.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command is not supported on USB drives.

filedescr

Use the **filedescr** command to add a description to a switch image. Use the **no** version of this command to remove the description from the filename.

Syntax

filedescr {**active** | **backup**} *description*

no filedescr {**active** | **backup**}

- **active** | **backup**—Image file.
- *description*—Block of descriptive text. (Range: 0-128 characters)

Default Configuration

No description is attached to the active or backup image.

Use the show bootvar command to display the image description.

Command Mode

Privileged Exec mode

User Guidelines

The description accepts any printable characters except a question mark. Enclose the string in double quotes to include spaces within the description. The surrounding quotes are not used as part of the description. The CLI does not filter illegal combinations of characters on entry and may accept entries up to the first illegal character or reject the entry entirely.

Command History

Updated in version 6.3.0.1 firmware.

Example

The following example attaches a file description to the active image.

```
console#filedescr active "backedup on 03-22-05"
```

rename

Use the **rename** command to rename a file present in flash.

Syntax

rename *source dest*

- *source* — Source file name

- *dest* — Destination file name

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Renaming the image1 or image2 files may cause the switch to not boot.

Example

```
console#rename file1.scr file2.scr
```

show backup-config

Use the **show backup-config** command to display the contents of the backup configuration file.

Syntax

show backup-config

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows backup-config data.

```
console#show backup-config
```

```
!Current Configuration:
!System Description "Dell Networking N4032, 6.0.0.0, Linux 2.6.32.9"
!System Software Version 6.0.0.0
!Cut-through mode is configured as disabled
!
configure
slot 1/0 1    ! Dell Networking N4032
stack
member 1 1    ! N4032
exit
interface vlan 1
exit
snmp-server engineid local 800002a203001122334455
exit
```

show bootvar

Use the **show bootvar** command in User Exec mode to display the active system image file that the device loads at startup.

Syntax

show bootvar [*unit*]

- *unit* —Unit number.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the active system image file that the device loads at startup.

```
console(config)#show bootvar
```

```
Image Descriptions

 active :
 backup :


 Images currently available on Flash

unit  active       backup       current-active    next-active
----- ------------ ------------ ----------------- -----------------
1     6.0.0.0      9.25.16.57   6.0.0.0           6.0.0.0
```

show running-config

Use the **show running-config** command to display the contents of the currently running configuration file, including banner configuration.

NOTE: All non-default configurations for the Captive Portal branding images and encoded Unicode are not displayed via the standard show running-config command. If desired, you can view this data in the script files or by using the all mode for the show running-config command. In addition, please note that this non-readable data is contained and displayed at the end of the script files.

Syntax

show running-config [**all** | **interface** *interface-id* [**all**] |*scriptname*]

- **all**—Display or capture the complete configuration, including settings equal to the defaults.
- *interface-id*—An interface identifier (logical or Ethernet). Limits the display to the specified interface.
- *scriptname*—If the optional *scriptname* is provided, the output is redirected to a script file.

NOTE: If you issue the **show running-config** command from a serial connection, access to the switch through remote connections (such as Telnet) is suspended while the output is being generated and displayed.

Default Configuration

By default, the **show running-config** command displays non-default values. Default configuration values are suppressed in the output. Use the **all** parameter to display both default and non-default values.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

This example shows the truncated output for the configuration of interface Gi1/0/1. Since the **all** parameter is given, both the non-default and the default values are shown.

```
console#show running-config interface gi1/0/1 all

speed auto
storm-control broadcast level 5
storm-control broadcast level 5
no storm-control broadcast
storm-control multicast level 5
storm-control multicast level 5
no storm-control multicast
storm-control unicast level 5
no storm-control unicast
lacp port-priority 1
lacp timeout long
no classofservice trust
cos-queue min-bandwidth 0 0 0 0 0 0 0
traffic-shape 0 Kbps
no switchport voice detect auto
no ip dhcp snooping trust
no ip dhcp snooping log-invalid
no dhcp l2relay
no dhcp l2relay trust
no ip dhcp snooping limit
no ipv6 dhcp snooping trust
no ipv6 dhcp snooping log-invalid
no ipv6 dhcp snooping limit
no ip verify source
no ipv6 verify source
no ip arp inspection trust
no ip arp inspection limit
```

show startup-config

Use the **show startup-config** command to display the startup configuration file contents.

Syntax

show startup-config

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the contents of the startup-config file.

```
console(config)#show startup-config

!Current Configuration:
!System Description “Dell Networking N4064F, 6.1.0.1, Linux 2.6.32.9"
!System Software Version 6.1.0.1
!Cut-through mode is configured as disabled
!
configure
slot 1/0 5    ! Dell Networking N4064F
slot 1/1 8    ! Dell 10GBase-T Card
stack
member 1 4    ! N4064F
exit
interface vlan 1
exit
snmp-server engineid local 800002a203000277994433
exit
```

write

Use the **write** command to copy the running configuration image to the startup configuration.

Syntax

write

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command is equivalent to the **copy running-config startup-config** command functionally.

Example

```
console#write
```

DHCP Client Commands

Dell EMC Networking switches support an embedded DHCP client. Any IP interface can use DHCP to obtain an IP address. The DHCP client can run on multiple interfaces simultaneously.

For IPv4, an IP interface can either use manually configured addresses or be enabled for DHCP. The options are mutually exclusive. When the operator enables DHCPv4 on an IP interface, all manually configured IP addresses on that interface are removed from the running configuration. When the operator configures an IP address, the system automatically releases any IPv4 address assigned by a DHCP server and disables DHCPv4 on the interface.

For IPv6, DHCP can coexist with configured addresses. The operator may enable DHCPv6 and configure IPv6 addresses on the same interface. Only a single in-band interface can be configured as a DHCPv6 client.

DHCP is disabled by default on all in-band interfaces.

The DHCP client retains an IP address even if the IP interface goes down. The client does not attempt to renew its IP address until the lease expires, regardless of changes in link state.

The operator may renew or release an IP address at any time using the new release dhcp and renew dhcp CLI commands (or web or SNMP equivalents).

When an IPv6 address is leased from a DHCP server, the address has a mask length of 128. A local route for the network is only installed if the router receives and accepts IPv6 router advertisements on the interface. Because router advertisements are not accepted on a routing interface, a leased IPv6 address on a routing interface is not necessarily useful.

release dhcp

Use the **release dhcp** command to force the DHCPv4 client to release a leased address.

Syntax

release dhcp *interface-id*

- *interface-id*—Any valid VLAN interface. See Interface Naming Conventions for interface representation.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

The DHCP client sends a DHCP RELEASE message telling the DHCP server that it no longer needs the IP address, and that the IP address can be reassigned to another client. The interface method does not change and will still be DHCP even after issuing this command. To lease an IP address again, issue either the **renew dhcp** *interface-id* command below or **ip address dhcp (Interface Configuration)** command in interface mode. If the IPv4 address on the interface was not assigned by DHCP, then the command fails and displays the following error message: `Error! Interface does not have a DHCP originated address.`

The release dhcp option is applicable only for IP interfaces and not for the Out-of-Band port. Use the **ip address (Out-of-Band) none** command on the Out-of-Band interface to clear a DHCP-acquired address.

Example

```
console#release dhcp vlan 2
```

renew dhcp

Use the **renew dhcp** command to force the DHCP client to immediately renew an IPv4 address lease.

Syntax

renew dhcp {*interface-id* **|** **out-of-band**}

- *interface-id*—Any valid IP interface. See Interface Naming Conventions for interface representation.
- **out-of-band**—Keyword to identify the out-of-band interface. The DHCP client renews the leased address on this interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

If the interface has a leased IPv4 address when this command is issued, the DHCP client sends a DHCP REQUEST message telling the DHCP server that it wants to continue using the IP address. If DHCP is enabled on the interface, but the interface does not currently have an IPv4 address (for example, if the address was previously released), then the DHCP client sends a DISCOVER to acquire a new address. If DHCP is not enabled on the interface, then the command fails and displays the following error message:

```
DHCP is not enabled on this interface
```

The renew dhcp option is applicable only for IP interfaces and not for the Out-of-Band port. Use the **ip address out-of-band none** command on the Out-of-Band interface to clear a DHCP-acquired address.

Examples

The first example is for IP interfaces.

```
console#renew dhcp vlan 2
```

The second example is for an out-of-band port.

```
console#renew dhcp out-of-band
```

show dhcp lease

Use the **show dhcp lease** command to display IPv4 addresses leased from a DHCP server.

Syntax

show dhcp lease [**interface** {**out-of-band** | **vlan** *vlan-id*}]

- **out-of-band**—The out-of-band interface.
- **vlan-id**—The VLAN identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command lists all IPv4 addresses currently leased from a DHCP server on an IP interface. This command only applies to IP interfaces. To see the IPv4 address leased on the out-of-band interface, use the command Maximum Next Hops.............................. 16 **out-of-band**.

This command output provides the following information.

Term	Description
IP address, Subnet mask	The IP address and network mask leased from the DHCP server.
DHCP Lease server	The IPv4 address of the DHCP server that leased the address.
State	State of the DHCPv4 Client on this interface.
DHCP transaction id	The transaction ID of the DHCPv4 Client.
Lease	The duration that the IP address was leased by the server.
Renewal	The time when the next DHCP renew Request is scheduled to renew the leased IP address.
Rebind	The time when the DHCP Rebind process is scheduled.
Retry count	Number of times the DHCPv4 client sent a DHCP REQUEST message to which the server did not respond.

Examples

The following example shows the output from this command when the device has leased two IPv4 addresses from the DHCP server.

```
console#show dhcp lease
IP address: 10.27.22.186 on interface Vl1
Subnet mask: 255.255.252.0
   DHCP lease server: 10.27.192.22, State: 5 Bound
   DHCP transaction id: 0xc9e6803a
```

```
Lease: 2 days 23 hrs 47 mins 24 secs
Renewal: 1 days 11 hrs 47 mins 24 secs
Rebind: 2 days 14 hrs 47 mins 24 secs
Retry count: 0
```

DHCP Server Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

DHCP is based on the Bootstrap Protocol (BOOTP). It also captures the behavior of BOOTP relay agents and DHCP participants can inter operate with BOOTP participants.

The host RFC's standardize the configuration parameters which can be supplied by the DHCP server to the client. After obtaining parameters via DHCP, a DHCP client should be able to exchange packets with any other host in the Internet. DHCP is based on a client-server model.

DHCP consists of the following components:

- A protocol for delivering host-specific configuration parameters from a DHCP server to a host.
- A mechanism for allocation of network addresses to hosts.

DHCP offers the following features and benefits:

- It supports the definition of "pools" of IP addresses that can be allocated to clients by the server. Many implementations use the term **scope** instead of **pool**.
- Configuration settings like the subnet mask, default router, DNS server, that are required to make TCP/ IP work correctly can be passed to the client using DHCP.
- DHCP is supported by most TCP/ IP routers this allows it to allocate an IP address according to the subnet the original request came from. This means that a single DHCP server can be used in multiple subnets and that there is no need to reconfigure a client that changed subnets.
- Addresses can be leased out for a specific duration after which they need to be explicitly renewed. This allows DHCP to reclaim expired addresses and put them back into the unallocated pool.
- Internet access cost is greatly reduced by using automatic assignment as Static IP addresses are considerably more expensive to purchase than are automatically allocated IP addresses.

- Using DHCP a centralized management policy can be implemented as the DHCP server keeps information about all the subnets. This allows a system operator to update a single server when configuration changes take place.

ip dhcp pool

Use the **ip dhcp pool** command in Global Configuration mode to define a DHCP address pool that can be used to supply addressing information to DHCP clients. Upon successful completion, this command puts the user into DHCP Pool Configuration mode. Use the **no** form of the command to remove an address pool definition.

Syntax

ip dhcp pool [*pool-name*]

no ip dhcp pool [*pool-name*]

- *pool-name*—The name of an existing or new DHCP address pool. The pool name can be up to 31 characters in length and can contain the following characters: a-z, A-Z, 0-9, '-', '_', ' '. Enclose the entire pool name in quotes if an embedded blank is to appear in the pool name.

Default Configuration

The command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This capability requires the DHCP service to be enabled. Enable the DHCP service using the **service dhcp** command. Dell EMC Networking supports dynamic, automatic, and manual address assignment. Dynamic address assignment leases an address to the client for a limited period of time. Automatic assignment assigns a permanent address to a client. Manual (static) assignment simply conveys an address assigned by the administrator to the client.

In DHCP Pool Configuration mode, the administrator can configure the address space and other parameters to be supplied to DHCP clients. By default, the DHCP server assumes that all addresses specified are available for assignment to clients. Use the ip dhcp excluded-address command in Global Configuration mode to specify addresses that should never be assigned to DHCP clients.

To configure a dynamic DHCP address pool, configure the following pool properties using the listed DHCP pool commands:

- Address pool subnet and mask – network
- Client domain name – domain-name
- Client DNS server – dns-server
- NetBIOS WINS Server – netbios-name-server
- NetBIOS Node Type – netbios-node-type
- Client default router – default-router
- Client address lease time – lease

Administrators may also configure manual bindings for clients using the **host** command in DHCP Pool Configuration mode. This is the most often used for DHCP clients for which the administrator wishes to reserve an ip address, for example a computer server or a printer. A DHCP pool can contain automatic or dynamic address assignments or a single static address assignment.

To configure a manual address binding, configure the pool properties using the DHCP pool commands listed below. It is only necessary to configure a DHCP client identifier or a BOOTP client MAC address for a manual binding. To configure a manual binding, the client identifier or hardware address must be specified before specifying the host address.

- DHCP client identifier – client-identifier
- BOOTP client MAC address – hardware-address
- Host address – host
- Client name (optional) – client-name

Examples

Example 1 – Manual Address Pool

```
console(config)#service dhcp
console (config)#ip dhcp pool "Printer LP32 R1-101"
console(config-dhcp-pool)#client-identifier 00:23:12:43:23:54
console(config-dhcp-pool)#host 10.1.1.1 255.255.255.255
console(config-dhcp-pool)#client-name PRT_PCL_LP32_R1-101
```

Example 2 – Dynamic Address Pool

```
console(config)#service dhcp
console(config)#ip dhcp pool "Windows PCs"
console(config-dhcp-pool)#network 192.168.21.0 /24
console(config-dhcp-pool)#domain-name power-connect.com
console(config-dhcp-pool)#dns-server 192.168.22.3 192.168.23.3
console(config-dhcp-pool)#netbios-name-server 192.168.22.2 192.168.23.2
console(config-dhcp-pool)#netbios-node-type h-node
console(config-dhcp-pool)#lease 2 12
console(config-dhcp-pool)#default-router 192.168.22.1 192.168.23.1
```

bootfile

Use the **bootfile** command in DHCP Pool Configuration mode to set the name of the image for the DHCP client to load. Use the no form of the command to remove the bootfile configuration. Use the show ip dhcp pool command to display pool configuration parameters.

Syntax

bootfile *filename*

no bootfile

- *filename*—The name of the file for the DHCP client to load.

Default Configuration

There is no default bootfile filename.

Command Mode

DHCP Pool Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config-dhcp-pool)#bootfile ntldr
```

clear ip dhcp binding

Use the **clear ip dhcp binding** command to remove automatic DHCP server bindings.

Syntax

clear ip dhcp binding [* {[vrf ***vrf-name*** | pool ***name***] [***ip-address***]}]

- * — Clear all automatic dhcp bindings.
- vrf-name — The name of an existing VRF instance.
- ***ip-address*** — Clear a specific binding.

Default Configuration

The command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

```
console#clear ip dhcp binding 1.2.3.4
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

clear ip dhcp conflict

Use the **clear ip dhcp conflict** command to remove DHCP server address conflicts. Use the show ip dhcp conflict command to display address conflicts detected by the DHCP server.

Syntax

clear ip dhcp conflict {ip-address | *}

- *—Clear all automatic dhcp bindings.

- **ip-address**—Clear a specific address conflict.

Default Configuration

The command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

```
console#clear ip dhcp conflict *
```

client-identifier

Use the **client-identifier** command in DHCP Pool Configuration mode to identify a Microsoft DHCP client to be manually assigned an address. Use the **no** form of the command to remove the client identifier configuration.

Syntax

client-identifier *unique-identifier*

no client-identifier

- *unique-identifier*—The identifier of the Microsoft DHCP client. The client identifier is specified as 7 bytes of the form XX:XX:XX:XX:XX:XX:XX where X is a hexadecimal digit.

Default Configuration

This command has no default configuration.

Command Mode

DHCP Pool Configuration mode

User Guidelines

For Microsoft DHCP clients, the identifier consists of the media type followed by the MAC address of the client. The media type 01 indicates Ethernet media.

Use the show ip dhcp pool command to display pool configuration parameters.

Example

```
console(config-dhcp-pool)#client-identifier 01:03:13:18:22:33:11
console(config-dhcp-pool)#host 192.168.21.34 32
```

client-name

Use the **client-name** command in DHCP Pool Configuration mode to specify the host name of a DHCP client. Use the **no** form of the command to remove the client name configuration.

Syntax

client-name *name*

no client-name

- *name*—The name of the DHCP client. The client name is specified as up to 31 printable characters.

Default Configuration

There is no default client name.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. The client name should not include the domain name as it is specified separately by the domain-name (IP DHCP Pool Config) command. It is not recommended to use embedded blanks in client names.

Question marks are not allowed in the client name. Enclose the client name in quotes if a blank appears in the name.

Example

```
console(config-dhcp-pool)#client-identifier 01:03:13:18:22:33:11
console(config-dhcp-pool)#host 192.168.21.34 32
console(config-dhcp-pool)#client-name Line_Printer_Hallway
```

default-router

Use the **default-router** command in DHCP Pool Configuration mode to set the IPv4 address of one or more routers for the DHCP client to use. Use the **no** form of the command to remove the default router configuration. Use the show ip dhcp pool command to display pool configuration parameters.

Syntax

default-router {*ip-address1*} [*ip address2*]

no default-router

- *ip-address1*—The IPv4 address of the first default router for the DHCP client.
- *ip-address2*—The IPv4 address of the second default router for the DHCP client.

Default Configuration

No default router is configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config-dhcp-pool)#default-router 192.168.22.1 192.168.23.1
```

dns-server (IP DHCP Pool Config)

Use the **dns-server** command in IP DHCP Pool Configuration mode to set the IP DNS server address which is provided to a DHCP client by the DHCP server. DNS server address is configured for stateless server support.

Syntax

dns-server *ip-address1*

no dns-server

- *ip-address1*—A valid IPv4 address.

Default Configuration

This command has no default configuration.

Command Mode

IP DHCP Pool Configuration mode

User Guidelines

This command has no user guidelines.

domain-name (IP DHCP Pool Config)

Use the **domain-name** command in IP DHCP Pool Configuration mode to set the DNS domain name which is provided to a DHCP client by the DHCP server. The DNS name is an alphanumeric string up to 255 characters in length. Use the **no** form of the command to remove the domain name.

Syntax

domain-name *domain*

no domain-name *domain*

- *domain* — DHCP domain name. (Range: 1–255 characters)

Default Configuration

This command has no default configuration.

Command Mode

IP DHCP Pool Configuration mode

hardware-address

Use the **hardware-address** command in DHCP Pool Configuration mode to specify the MAC address of a client to be manually assigned an address. Use the **no** form of the command to remove the MAC address assignment.

Syntax

hardware-address *hardware-address*

no hardware-address

- *hardware-address*—MAC address of the client. Either the XXXX.XXXX.XXXX or XX:XX:XX:XX:XX:XX form of MAC address may be used where X is a hexadecimal digit.

Default Configuration

There are no default MAC address manual bindings.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. It may be necessary to use the **no host** command prior to executing the **no hardware-address** command.

Example

```
console(config-dhcp-pool)#hardware-address 00:23:12:43:23:54
console(config-dhcp-pool)#host 192.168.21.131 32
```

host

Use the **host** command in DHCP Pool Configuration mode to specify a manual binding for a DHCP client host. Use the **no** form of the command to remove the manual binding.

Syntax

host ip-address [**netmask**|**prefix-length**] no host

- **ip-address**—IPv4 address to be manually assigned to the host identified by the client identifier.
- **netmask**—An IPv4 address indicating the applicable bits of the address, typically 255.255.255.255.
- **prefix-length**—A decimal number ranging from 1-30.

Default Configuration

The default is a 1 day lease.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the client-identifier or hardware-address command prior to using this command for an address pool. Use the show ip dhcp pool command to display pool configuration parameters.

Example

```
console(config-dhcp-pool)#client-identifier 00:23:12:43:23:54
console(config-dhcp-pool)#host 192.168.21.131 32
```

ip dhcp bootp automatic

Use the **ip dhcp bootp automatic** command in Global Configuration mode to enable automatic BOOTP address assignment. By default, BOOTP clients are not automatically assigned addresses, although they may be assigned a static address. Use the no form of the command to disable automatic BOOTP client address assignment. Use the show ip dhcp global configuration command to display the automatic address assignment configuration.

Syntax

ip dhcp bootp automatic

no ip dhcp bootp automatic

Default Configuration

Automatic BOOTP client address assignment is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console#ip dhcp bootp automatic
```

ip dhcp conflict logging

Use the **ip dhcp conflict logging** command in Global Configuration mode to enable DHCP address conflict detection. Use the **no** form of the command to disable DHCP conflict logging.

Syntax

ip dhcp conflict logging

no ip dhcp conflict logging

Default Configuration

Conflict logging is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console#ip dhcp conflict logging
```

ip dhcp excluded-address

Use the **ip dhcp excluded-address** command in Global Configuration mode to exclude one or more DHCP addresses from automatic assignment. Use the no form of the command to allow automatic address assignment for the specified address or address range.

Syntax

ip dhcp excluded-address [vrf *vrf-name*] *low-address* {*high-address*}

no ip dhcp excluded-address [vrf *vrf-name*] *low-address* {*high-address*}

- *vrf-name* — The name of an existing VRF instance.
- *low-address* —An IPv4 address indicating the starting range for exclusion from automatic DHCP address assignment.
- *high-address*—An IPv4 address indicating the ending range for exclusion from automatic DHCP address assignment. The high-address must be numerically greater than the low-address.

Default Configuration

By default, no IP addresses are excluded from the lists configured by the IP DHCP pool configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console#ip dhcp excluded-address 192.168.20.1 192.168.20.3
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

ip dhcp ping packets

Use the **ip dhcp ping packets** command in Global Configuration mode to configure the number of pings sent to detect if an address is in use prior to assigning an address from the DHCP pool. If neither ping is answered, the DHCP server presumes the address is not in use and assigns the selected IP address.

Syntax

ip dhcp ping packets {0, *2-10*}

no ip dhcp ping packets

- *count*—The number of ping packets sent to detect an address in use. The default is 2 packets. Range 0, 2-10. A value of 0 turns off address detection. Use the no form of the command to return the setting to the default value.

Default Configuration

The command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console#ip dhcp ping packets 5
```

lease

Use the **lease** command in DHCP Pool Configuration mode to set the period for which a dynamically assigned DHCP address is valid. Use the infinite parameter to indicate that addresses are to be automatically assigned. Use the **no** form of the command to return the lease configuration to the default. Use the show ip dhcp pool command to display pool configuration parameters. Use the show ip dhcp binding command to display the expiration time of the leased IP address.

Syntax

lease {*days*[*hours*] [*minutes*] | **infinite**}

no lease

- *days*—The number of days for the lease duration. Range 0-59. Default is 1.
- *hours*—The number of hours for the lease duration. Range 0-23. There is no default.
- *minutes*—The number of minutes for the lease duration. Range 0-59. There is no default.
- **infinite**—The lease expires in 60 days.

Default Configuration

The default lease is 1 day.

Command Mode

DHCP Pool Configuration mode

User Guidelines

The Dell EMC Networking DHCP server does not offer infinite duration DHCP leases. The maximum lease offered is 60 days, which corresponds to an “infinite” setting in the UI.

Example

The following examples sets a lease period of 1 day, 12 minutes and 59 seconds.

```
console(config)#ip dhcp pool asd
console(config-dhcp-pool)#network 10.0.0.0 255.0.0.0
console(config-dhcp-pool)#lease 1 12 59
console(config-dhcp-pool)#exit
console(config)#show ip dhcp pool asd

Pool: asd
Pool Type.................................... Network
Network...................................... 10.0.0.0 255.0.0.0
Lease Time................................... 1 days 12 hrs 59 mins
```

netbios-name-server

Use the **netbios-name-server** command in DHCP Pool Configuration mode to configure the IPv4 address of the Windows Internet Naming Service (WINS) for a Microsoft DHCP client. Use the no form of the command to remove the NetBIOS name server configuration.

Syntax

netbios-name-server *ip-address* [*ip-address2...ip-address8*]

no netbios-name-server

- *ip-address*—IPv4 address

Default Configuration

There is no default name server configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. Up to eight name server addresses may be specified. The NetBIOS WINS information is conveyed in the Option 44 TLV of the DHCP OFFER, DCHP ACK, DHCP INFORM ACK and DHCP BOOTREPLY messages.

Example

```
console(config-dhcp-pool)#netbios-name-server 192.168.21.1 192.168.22.1
```

netbios-node-type

Use the **netbios-node-type** command in DHCP Pool Configuration mode to set the NetBIOS node type for a Microsoft DHCP client. Use the **no** form of the command to remove the netbios node configuration.

Syntax

netbios-node-type *type*

no netbios-node-type

- *type*—The NetBIOS node type can be **b-node**, **h-node**, **m-node** or **p-node**.

Default Configuration

There is no default NetBIOS node type configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. The NetBIOS node type information is conveyed in the Option 46 TLV of the DHCP OFFER, DHCP ACK, DHCP INFORM ACK and DHCP BOOTREPLY messages. Supported NetBIOS node types are:

- broadcast (b-node)
- peer-to-peer (p-node)
- mixed (m-node)
- hybrid (h-node)

Example

```
console(config-dhcp-pool)#netbios-node-type h-node
```

network

Use the **network** command in IP DHCP Pool Configuration mode to define a pool of IPv4 addresses for distributing to clients.

Syntax

network *network-number* [*mask* | *prefix-length*]

- *network-number*—A valid IPv4 address
- *mask*—A valid IPv4 network mask with contiguous left-aligned bits.
- *prefix-length*—An integer indicating the number of leftmost bits in the network-number to use as a prefix for allocating cells.

Default Configuration

This command has no default configuration.

Command Mode

IP DHCP Pool Configuration mode

next-server

Use the **next-server** command in DHCP Pool Configuration mode to set the IPv4 address of the TFTP server to be used during auto-install. Use the **no** form of the command to remove the next server configuration.

Syntax

next-server *ip-address*

no next-server

- *ip-address*—The IPv4 address of the TFTP server to use during auto-configuration.

Default Configuration

There is no default IPv4 next server configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. The IPv4 address is conveyed in the SIADDR field of the DHCP OFFER, DHCP ACK, DHCP INFORM ACK and DHCP BOOTREPLY messages.

Example

```
console(config-dhcp-pool)#next-server 192.168.21.2
```

option

Use the **option** command in DHCP Pool Configuration mode to supply arbitrary configuration information to a DHCP client. Use the **no** form of the command to remove the option configuration. Use the show ip dhcp pool command to display pool configuration parameters.

Syntax

option code {**ascii string1** | **hex**[*string1...string8*] | **ip**[*ip-address1...ip-address8]}*

no option code

- *code*—The DHCP TLV option code.
- *ascii string1*—An ASCII character string. Strings with embedded blanks must be wholly contained in quotes.
- *hex string1*—A hexadecimal string containing the characters [0-9A-F]. The string should not begin with 0x. A hex string consists of two characters which are parsed to fill a single byte. Multiple values are separated by blanks.
- *ip-address1*—An IPv4 address in dotted decimal notation.

Default Configuration

There is no default option configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

The option information must match the selected option type and length. Options cannot be longer than 255 characters in length. The option information is conveyed in the TLV specified by the code parameter in the DHCP OFFER, DHCP ACK, DHCP INFORM ACK and DHCP BOOTREPLY messages.

Option 125 strings must conform to the relevant TLV format as specified in RFC 3925 beginning with a 2 byte pad filled in by the switch (option code 125 and option length), the 2 byte enterprise number, the data length and the sub-option values. For example, option 125 might be written on the command line as:

```
option 125 hex 0000.02a2.1205.1061.7574.6f69.6e73.7461.6c6c.5f64.6863.70
```

which translates to:

- 0x0000 - Two byte pad filled in by switch (option-code 125 and option-len)
- 0x02A2 - Dell Vendor code 674
- 0x12 - TLV length - 18 bytes
- 0x05 - Sub-option code 5
- 0x10 - Sub-option length - 16 bytes
- 0x6175746f696e7374616c6c5f646863.70 - Sub-option value "autoinstall_dhcp"

Options that accept only fixed length strings need only have the relevant data bytes specified on the command line. The switch will build the TLV and insert the specified data bytes into the option. Refer to the relevant documentation for the DHCP client to identify what information, if any, is accepted by the client in DHCP Option 125.

Table 7-1 lists the other options that can be configured and their fixed length, minimum length, and length multiple requirements. Refer to the relevant documentation for the DHCP client to identify what information, if any, is accepted by the client for the options listed below.

Table 7-1. Option Codes and Lengths

Option Code	Fixed Length	Minimum Length	Multiple Of
2 (Time Offset)	4	–	–
4 (Time Server)	–	4	4
7 (Log Server)	–	4	4
8 (Cookie Server)	–	4	4
9 (LPR Server)	–	4	4
10 (Impress Server)	–	4	4

Table 7-1. Option Codes and Lengths *(continued)*

Option Code	Fixed Length	Minimum Length	Multiple Of
11 (Resource Location Server)	–	4	4
12 (Host Name)	–	1	–
13 (Boot File Size)	2	–	–
14 (Merit File Dump)	–	1	–
16 (Swap Server)	4	–	–
17 (Root Path)	–	1	–
18 (Extensions Path)	–	1	–
19 (IP Forwarding Enable)	1	–	–
20 (Non-local Source Routing)	1	–	–
21 (Policy Filter)	–	8	8
22 (Max Datagram Reassembly)	2	–	–
23 (IP TTL)	1	–	–
24 (Path MTU Aging)	4	–	–
25 (Path MTU Plateau)	–	2	2
26 (Interface MTU)	2	–	–
27 (Subnets are local)	1	–	–
28 (Broadcast Address)	4	–	–
29 (Perform Mask)	1	–	–
30 (Mask Supplier)	1	–	–
31 (Perform Router Discovery)	1	–	–
32 (Router Solicitation Address)	4	–	–
33 (Static Router Option)	–	8	8

Table 7-1. Option Codes and Lengths *(continued)*

Option Code	Fixed Length	Minimum Length	Multiple Of
34 (Trailer Encapsulation)	1	–	–
35 (ARP Cache Timeout)	4	–	–
36 (Ethernet Encapsulation)	1	–	–
37 (TCP TTL)	1	–	–
38 (TCP Keepalive Interval)	4	–	–
39 (TCP Keepalive Garbage)	1	–	–
40 (Network Information Service)	–	1	–
41 (Network Information Servers)	–	4	4
42 (NTP Servers)	–	4	4
43 (Vendor Specific Information)	1	–	–
45 (NetBIOS Datagram Distribution)	–	4	4
47 (Netbois Scope)	–	1	–
48 (X-Windows Font Server)	–	4	4
49 (X-Windows Display Manager)	–	4	4
58 (Renewal Time T1)	4	–	–
59 (Rebinding Time T2)	4	–	–
60 (Vendor Class)	–	1	–
64 (NIS Domain)	–	1	–
65 (NIS Servers)	–	4	4
66 (TFTP Server)	–	1	–

Table 7-1. Option Codes and Lengths *(continued)*

Option Code	Fixed Length	Minimum Length	Multiple Of
68 (Mobile IP Home Agent)	–	0	4
69 (SMTP Server)	–	4	4
70 (POP3 Server)	–	4	4
71 (NNTP Server)	–	4	4
72 (WWW Server)	–	4	4
73 (Finger Server)	–	4	4
74 (IRC Server)	–	4	4
75 (Streettalk Server)	–	4	4
76 (STDA Server)	–	4	4

Options 19, 20, 27, 29, 30, 31, 34, 36, and 39 only accept hex 00 or hex 01 values.

Example

```
console(config-dhcp-pool)#option 4 ascii "ntpservice.com "
console(config-dhcp-pool)#option 42 ip 192.168.21.1
console(config-dhcp-pool)#option 29 hex 01
console(config-dhcp-pool)#option 59 hex 00 00 10 01
console(config-dhcp-pool)#option 25 hex 01 ff
```

service dhcp

Use the **service dhcp** command in Global Configuration mode to enable the local IPv4 DHCP server on the switch. Use the **no** form of the command to disable the DHCPv4 service.

Syntax

service dhcp

no service dhcp

Default Configuration

The service is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

sntp

Use the **sntp** command in DHCP Pool Configuration mode to set the IPv4 address of the NTP server to be used for time synchronization of the client. Use the **no** form of the command to remove the NTP server configuration.

Syntax

sntp *ip-address*

no sntp

- *ip-address*—The IPv4 address of the NTP server to use for time services.

Default Configuration

There is no default IPv4 NTP server configured.

Command Mode

DHCP Pool Configuration mode

User Guidelines

Use the show ip dhcp pool command to display pool configuration parameters. The IPv4 address of the NTP server is conveyed in the Option 42 TLV of the DHCP OFFER, DHCP ACK, DHCP INFORM ACK and DHCP BOOTREPLY messages.

Example

```
console(config-dhcp-pool)#sntp 192.168.21.2
```

show ip dhcp binding

Use the **show ip dhcp binding** command to display the configured DHCP bindings.

Syntax

show ip dhcp binding [all | {[vrf *vrf-name*] [*address*]}]

- *vrf-name* — The name of an existing VRF instance.
- ***address***—A valid IPv4 address

Default Configuration

The command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console(config)# show ip dhcp binding
IP address      Hardware Address    Expires    Type   client-DUID
-----------     -----------------   ---------  -----  --------------
10.10.10.3      00:0e:c6:88:0e:98   00:23:56    Auto
00:01:01:02:03:04:05:06:00:0e:c6:88:0e:98
```

Command History

Syntax to support VRFs added in version 6.7.0 firmware.

show ip dhcp conflict

Use the **show ip dhcp conflict** command in User Exec mode to display DHCP address conflicts for all relevant interfaces or a specified interface. If an interface is specified, the optional statistics parameter is available to view statistics for the specified interface.

Syntax

show ip dhcp conflict [*address*]

- *address*—A valid IPv4 address for which the conflict information is desired.

Default Configuration

The command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

show ip dhcp global configuration

Use the **show ip dhcp global configuration** command to display the DHCP global configuration.

Syntax

show ip dhcp server statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip dhcp server statistics
```

show ip dhcp pool

Use the **show ip dhcp pool** command in User Exec or Privileged Exec mode to display the configured DHCP pool or pools. If no pool name is specified, information about all pools is displayed.

Syntax

show ip dhcp pool [**all** | *poolname*]

- *poolname*—Name of the pool. (Range: 1-32 characters)

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

show ip dhcp server statistics

Use the **show ip dhcp server statistics** command to display the DHCP server binding and message counters.

Syntax

show ip dhcp server statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show ip dhcp server statistics
Automatic Bindings............................ 100
Expired Bindings.............................. 32
```

```
Malformed Bindings............................ 0

Messages                                    Received
----------                                 ----------
DHCP DISCOVER................................. 132
DHCP REQUEST.................................. 132
DHCP DECLINE.................................. 0
DHCP RELEASE.................................. 32
DHCP INFORM................................... 0

Messages                                      Sent
----------                                    ------
DHCP OFFER.................................... 132
DHCP ACK...................................... 132
DHCP NACK..................................... 0
```

DHCPv6 Server Commands

Dell EMC Networking N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

clear ipv6 dhcp

Use the **clear ipv6 dhcp** command to clear DHCPv6 statistics for all interfaces or for a specific interface.

Syntax

clear ipv6 dhcp {statistics | interface vlan *vlan-id* **statistics}**

- *vlan-id* — Valid VLAN ID.
- **statistics** — Indicates statistics display if VLAN is specified.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Examples

The following examples clears DHCPv6 statistics for VLAN 11.

```
console#clear ipv6 dhcp interface vlan 11 statistics\
```

dns-server (IPv6 DHCP Pool Config)

Use the **dns-server** command in IPv6 DHCP Pool Configuration mode to set the IPv6 DNS server address which is provided to a DHCPv6 client by the DHCPv6 server. DNS server address is configured for stateless server support.

Syntax

dns-server *ipv6-address*

no dns-server *ipv6-address*

- *ipv6-address* —Valid IPv6 address.

Default Configuration

This command has no default configuration.

Command Mode

IPv6 DHCP Pool Configuration mode

User Guidelines

This command has no user guidelines.

domain-name (IPv6 DHCP Pool Config)

Use the **domain-name** command in IPv6 DHCP Pool Configuration mode to set the DNS domain name which is provided to a DHCPv6 client by the DHCPv6 server. DNS domain name is configured for stateless server support.

Syntax

domain-name *domain*

no domain-name *domain*

- *domain* — DHCPv6 domain name. (Range: 1–255 characters)

Default Configuration

This command has no default configuration.

Command Mode

IPv6 DHCP Pool Configuration mode

User Guidelines

DHCPv6 pool can have multiple number of domain names with maximum of 8.

Example

The following example sets the DNS domain name “test”, which is provided to a DHCPv6 client by the DHCPv6 server.

```
console(config)#ipv6 dhcp pool addrpool
console(config-dhcp6s-pool)#domain-name test
console(config-dhcp6s-pool)#no domain-name test
```

ipv6 dhcp pool

This capability requires the IPv6 DHCP service to be enabled. Use the **service dhcpv6** command to enable the DHCPv6 service. Use the **ipv6 dhcp pool** command in Global Configuration mode to enter IPv6 DHCP Pool Configuration mode. DHCPv6 pools are used to specify information for DHCPv6 server to distribute to DHCPv6 clients. These pools are shared between multiple interfaces over which DHCPv6 server capabilities are configured.

Syntax

ipv6 dhcp pool *pool-name*

no ipv6 dhcp pool *pool-name*

- *pool-name* — DHCPv6 pool name. (Range: 1-31 characters)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enters IPv6 DHCP Pool Configuration mode.

```
console(config)#service dhcpv6
console(config)#ipv6 dhcp pool addrpool
console(config-dhcp6s-pool)#
```

ipv6 dhcp relay

Use the **ipv6 dhcp relay** command in Interface Configuration mode to configure an interface for DHCPv6 relay functionality.

Syntax

ipv6 dhcp relay {**destination** *relay-address* [**interface vlan** *vlan-id*] | **interface vlan** *vlan-id*} | **remote-id** {**duid-ifid** | *user-defined-string*}

no ipv6 dhcp relay

- **destination** — Keyword that sets the relay server IPv6 address.
- *relay-address* — An IPv6 address of a DHCPv6 relay server.
- **interface** — Sets the relay server interface.
- *vlan-id* — A valid VLAN ID.
- [**remote-id** {**duid-ifid** | *user-defined-string*}] — The Relay Agent Information Option “remote ID” suboption to be added to relayed messages. This can either be the special keyword duid-ifid, which causes the “remote ID” to be derived from the DHCPv6 server DUID and the relay interface number, or it can be specified as a user-defined string.

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration (VLAN, Tunnel) mode

User Guidelines

The IPv6 DHCP service must be enabled to use this feature. Enable the IPv6 DHCP service using the **service dhcpv6** command.

An IP interface (VLAN) may be configured in DHCP relay mode or server mode. Configuring an interface in DHCP relay mode overwrites DHCP server mode and vice-versa. An IP interface configured in relay mode cannot be configured as a DHCP client (**ip address dhcp**).

Up to 10 relay destinations may be configured per interface. If a destination relay address has global scope, then the interface option (option 18) is not required. If the destination relay address scope is link local (FE80::) or multicast (FF00::/8), then the destination interface option (Option 18) must be configured.

If no relay destination is configured, then a relay interface must be configured and the DHCPV6-ALLAGENTS multicast address (i.e. FF02::1:2) is used to relay DHCPv6 messages to the relay server.

The remote ID (option 37) may be configured with the keyword **duid-ifid**, which causes the *remote ID* to be derived from the DHCPv6 server DUID and the relay interface, or it may be a user-defined string. The remote ID must be unique.

Example

The following example configures VLAN 15 for DHCPv6 relay functionality.

```
console(config)#service dhcpv6
console(config)#interface vlan 15
console(config-if-vlan15)#ipv6 dhcp relay destination 2020:1::1
```

ipv6 dhcp server

Use the **ipv6 dhcp server** command in Interface Configuration mode to configure DHCPv6 server functionality on an interface. For a particular interface DHCPv6 server and DHCPv6 relay functions are mutually exclusive.

Syntax

ipv6 dhcp server *pool-name* [**rapid-commit**] [**preference** *pref-value*]

- *pool-name* — The name of the DHCPv6 pool containing stateless and/or prefix delegation parameters
- **rapid-commit** — An option that allows for an abbreviated exchange between the client and server.
- *pref-value* — Preference value—used by clients to determine preference between multiple DHCPv6 servers. (Range: 0-4294967295)

Default Configuration

The default preference value is 20. Rapid commit is not enabled by default.

Command Mode

Interface Configuration (VLAN, Tunnel) mode

User Guidelines

This feature requires the IPv6 DHCP service. Enable the IPv6 DHCP service using the **service dhcpv6** command. The **ipv6 dhcp server** command enables DHCP for IPv6 service on a specified interface using the pool for prefix delegation and other configuration through that interface.

The rapid-commit keyword enables the use of the two-message exchange for prefix delegation and other configuration. If a client has included a rapid commit option in the solicit message and the rapid-commit keyword is enabled for the server, the server responds to the solicit message with a reply message.

If the preference keyword is configured with a value other than 0, the server adds a preference option to carry the preference value for the advertise messages. This action affects the selection of a server by the client. Any advertise message that does not include a preference option is considered to have a preference value of 0. If the client receives an advertise message that includes a preference option with a preference value of 255, the client immediately sends a request message to the server from which the advertise message was received.

The DHCP for IPv6 client, server, and relay functions are mutually exclusive on an interface. When one of these functions is already enabled and a user tries to configure a different function on the same interface, a message is displayed.

Example

```
console#configure
console(config)#service dhcpv6
console(config)# ipv6 dhcp pool pool1
console(config-dhcp6s-pool)# address prefix-delegation 2001::/64
00:01:32:00:32:00
console(config-dhcp6s-pool)# exit
console(config)#interface vlan 10
console(config-if-vlan10)#ipv6 dhcp server pool1
console(config-if-vlan10)#
```

prefix-delegation

Use the **prefix-delegation** command in IPv6 DHCP Pool Configuration mode to define multiple IPv6 prefixes within a pool for distributing to specific DHCPv6 Prefix delegation clients.

Syntax

prefix-delegation *ipv6-prefix/prefix-length client-DUID* [**name** *hostname*] [**valid-lifetime** {*valid-lifetime* | **infinite**}] [**preferred-lifetime** {*preferred-lifetime* | **infinite**}]

no prefix-delegation ipv6-prefix/prefix-length

- *prefix/prefix-length*—Delegated IPv6 prefix.
- *client-DUID*—Client DUID (e.g. 00:01:00:09:f8:79:4e:00:04:76:73:43:76').
- *hostname*—Client hostname used for logging and tracing. (Range: 0-31 characters.) The command allows spaces in the host name when specified in double quotes. For example, `console(config)#snmp-server host "host name"` is allowed.
- *valid-lifetime*—Valid lifetime for delegated prefix. (Range: 0-4294967295 seconds) or use the keyword **infinite**. Using the value 0 for the valid-lifetime sets the value to the default.
- *preferred-lifetime*—Preferred lifetime for delegated prefix. (Range: 0-4294967295 seconds) or use the keyword **infinite**. Using the value 0 for the preferred-lifetime sets the value to the default.

Default Configuration

604800 seconds (30 days) is the default value for *preferred-lifetime*. 2592000 seconds (7 days) is the default value for *valid-lifetime*.

Command Mode

IPv6 DHCP Pool Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines a Multiple IPv6 prefix and client DUID within a pool for distributing to specific DHCPv6 Prefix delegation clients.

```
console(config)#ipv6 dhcp pool addrpool
console(config-dhcp6s-pool)#prefix-delegation 2020:1::1/64
00:01:00:09:f8:79:4e:00:04:76:73:43:76
```

The following example defines a unique local address prefix with the MAC address 00:1D:BA:06:37:64 converted to EUI-64 format and a preferred lifetime of 5 days.

```
console(config-dhcp6s-pool)#prefix-delegation fc00::/7
00:1D:BA:FF:FE:06:37:64 preferred-lifetime 43200
```

service dhcpv6

Use the **service dhcpv6** command in Global Configuration mode to enable local IPv6 DHCP server on the switch. Use the **no** form of the command to disable the DHCPv6 service.

Syntax

service dhcpv6

no service dhcpv6

Default Configuration

The service dhcpv6 is disabled by default.

Command Mode

Global Configuration mode

User Guidelines

IPv6 DHCP relay and IPv6 DHCPv6 pool assignments require the DHCPv6 service to be enabled.

Example

The following example enables DHCPv6 globally.

```
console#configure
console(config)#service dhcpv6
console(config)#no service dhcpv6
```

show ipv6 dhcp

Use the **show ipv6 dhcp** command to display the DHCPv6 server name and status.

Syntax

show ipv6 dhcp

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

The DUID value of the server will only appear in the output when a DHCPv6 lease is active.

Example

The following example displays the DHCPv6 server name and status.

```
console#show ipv6 dhcp
DHCPv6 is disabled
Server DUID:
```

show ipv6 dhcp binding

Use the **show ipv6 dhcp binding** command to display the configured DHCP pool.

Syntax

show ipv6 dhcp binding [*ipv6-address*]

- *ipv6-address* — Valid IPv6 address.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec and User Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the configured DHCP pool based on the entered IPv6 address.

```
console#show ipv6 dhcp binding 2020:1::
```

show ipv6 dhcp interface

Use the **show ipv6 dhcp interface** command in User Exec or Privileged Exec mode to display configuration and status information about an IPv6 DHCP specified interface or all interfaces. If an interface is specified, the optional statistics parameter is available to view statistics for the specified interface.

Syntax

show ipv6 dhcp interface [*interface-id*] [**statistics**]

- *interface-id*—A tunnel or VLAN interface identifier. See Interface Naming Conventions for interface representation.
- **statistics**—Enables statistics display if interface is specified.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command shows the DHCP status. Statistics are shown depending on the interface mode (relay, server, or client).

The command output provides the following information for an interface configured in client mode. Not all fields will be shown for an inactive client.

Term	Description
Mode	Displays whether the specified interface is in Client, Relay, or Server mode.
State	State of the DHCPv6 Client on this interface. The valid values are: INACTIVE, SOLICIT, REQUEST, ACTIVE, RENEW, REBIND, RELEASE.
Server DUID	DHCPv6 Unique Identifier of the DHCPv6 Server on this interface.
T1 Time	The T1 (in seconds) time as indicated by the DHCPv6 Server. T1 value indicates the time interval after which the address is requested for renewal.
T2 Time	The T2 (in seconds) time as indicated by the DHCPv6 Server. T2 value indicates the time interval after which the Client sends Rebind message to the Server in case there are no replies to the Renew messages.
Interface IAID	An identifier for an identity association chosen by this Client.
Leased Address	The IPv6 address leased by the DHCPv6 Server for this interface.
Preferred Lifetime	The preferred life time (in seconds) of the IPv6 Address leased by the DHCPv6 Server.
Valid Lifetime	The valid life time (in seconds) of the IPv6 Address leased by the DHCPv6 Server.
Renew Time	The time remaining (in seconds) to send a DHCPv6 Renew request to DHCPv6 Server for the leased address.
Expiry Time	The time (in seconds) when the DHCPv6 leased address expires.

Examples

The following examples display DHCPv6 information for VLAN 11 when configured in relay mode.

```
console#show ipv6 dhcp interface tunnel
IPv6 Interface................................ tunnel 5
Mode.......................................... Relay
Relay Addresses............................... :: vlan 110
Relay Remote ID............................... lvl7india
Option Flags..................................

console#show ipv6 dhcp interface vlan 2047
IPv6 Interface................................ Vl2047
Mode.......................................... Relay
Relay Addresses............................... :: vlan 2047
Relay Remote ID............................... automation
Option Flags..................................


console> show ipv6 dhcp interface vlan 11 statistics
DHCPv6 Interface vlan11 Statistics
------------------------------------
DHCPv6 Solicit Packets Received................ 0
DHCPv6 Request Packets Received................ 0
DHCPv6 Confirm Packets Received................ 0
DHCPv6 Renew Packets Received.................. 0
DHCPv6 Rebind Packets Received................. 0
DHCPv6 Release Packets Received................ 0
DHCPv6 Decline Packets Received................ 0
DHCPv6 Inform Packets Received................. 0
DHCPv6 Relay-forward Packets Received.......... 0
DHCPv6 Relay-reply Packets Received............ 0
DHCPv6 Malformed Packets Received.............. 0
Received DHCPv6 Packets Discarded.............. 0
Total DHCPv6 Packets Received.................. 0
DHCPv6 Advertisement Packets Transmitted....... 0
DHCPv6 Reply Packets Transmitted............... 0
DHCPv6 Reconfig Packets Transmitted............ 0
DHCPv6 Relay-reply Packets Transmitted......... 0
DHCPv6 Relay-forward Packets Transmitted....... 0
Total DHCPv6 Packets Transmitted............... 0
```

The following example shows the output from this command when the device has leased an IPv6 address from the DHCPv6 server on interface Gi1/0/1.

NOTE: Note that the interface is in client mode.

```
console#show ipv6 dhcp interface vlan 2
```

```
IPv6 Interface................................. Vl2
Mode........................................... Client
State.......................................... ACTIVE
Server DUID....................................
00:03:00:01:00:13:c4:db:6c:00
T1 Time........................................ 0 days 12 hrs 0 mins 0 secs
T2 Time........................................ 0 days 19 hrs 12 mins 0 secs
Interface IAID................................. 20
Leased Address................................. 2017::309D:161:4EF1:DBB1/128
Preferred Lifetime............................. 1 days 0 hrs 0 mins 0 secs
Valid Lifetime................................. 2 days 0 hrs 0 mins 0 secs
Renew Time..................................... 0 days 11 hrs 55 mins 28 secs
Expiry Time.................................... 1 days 23 hrs 55 mins 28 secs

console#show ipv6 dhcp interface vlan 10

IPv6 Interface................................. Vl10
Mode........................................... Relay
Relay Addresses................................ 3030::3
Relay Interface Number......................... Relay
Relay Remote ID................................
Option Flags...................................

console#show ipv6 dhcp interface vlan 10

IPv6 Interface................................. Vl10
Mode........................................... Server
Pool Name...................................... asd
Server Preference.............................. 20
Option Flags...................................

console#show ipv6 dhcp interface vlan 10 statistics

DHCPv6 Server Interface Vl10 Statistics
DHCPv6 Solicit Packets Received................ 0
DHCPv6 Request Packets Received................ 0
DHCPv6 Confirm Packets Received................ 0
DHCPv6 Renew Packets Received.................. 0
DHCPv6 Rebind Packets Received................. 0
DHCPv6 Release Packets Received................ 0
DHCPv6 Decline Packets Received................ 0
DHCPv6 Inform Packets Received................. 0
DHCPv6 Relay-forward Packets Received.......... 0
DHCPv6 Relay-reply Packets Received............ 0
DHCPv6 Malformed Packets Received.............. 0
Received DHCPv6 Packets Discarded.............. 0
Total DHCPv6 Packets Received.................. 0
DHCPv6 Advertisement Packets Transmitted....... 0
DHCPv6 Reply Packets Transmitted............... 0
DHCPv6 Reconfig Packets Transmitted............ 0
DHCPv6 Relay-reply Packets Transmitted......... 0
DHCPv6 Relay-forward Packets Transmitted....... 0
```

```
Total DHCPv6 Packets Transmitted.............. 0

console#show ipv6 dhcp interface vlan 10 statistics

DHCPv6 Client Interface Vl10 Statistics
---------------------------------------------------------
DHCPv6 Advertisement Packets Received................. 0
DHCPv6 Reply Packets Received......................... 0
Received DHCPv6 Advertisement Packets Discarded....... 0
Received DHCPv6 Reply Packets Discarded............... 0
DHCPv6 Malformed Packets Received..................... 0
Total DHCPv6 Packets Received......................... 0

DHCPv6 Solicit Packets Transmitted.................... 0
DHCPv6 Request Packets Transmitted.................... 0
DHCPv6 Renew Packets Transmitted...................... 0
DHCPv6 Rebind Packets Transmitted..................... 0
DHCPv6 Release Packets Transmitted.................... 0
Total DHCPv6 Packets Transmitted...................... 0
```

show ipv6 dhcp pool

Use the **show ipv6 dhcp pool** command to display the configured DHCP pool.

Syntax

show ipv6 dhcp pool *poolname*

- *poolname* — Name of the pool. (Range: 1-32 characters)

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the configured DHCP pool.

```
console#show ipv6 dhcp pool test
DHCPv6 Pool: test
```

show ipv6 dhcp statistics

Use the **show ipv6 dhcp statistics** command in User Exec mode to display the global DHCPv6 server and relay statistics.

Syntax

show ipv6 dhcp statistics

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the DHCPv6 server name and status.

```
console> show ipv6 dhcp statistics
DHCPv6 Interface Global Statistics
------------------------------------
DHCPv6 Solicit Packets Received................ 0
DHCPv6 Request Packets Received................ 0
DHCPv6 Confirm Packets Received................ 0
DHCPv6 Renew Packets Received.................. 0
DHCPv6 Rebind Packets Received................. 0
DHCPv6 Release Packets Received................ 0
DHCPv6 Decline Packets Received................ 0
DHCPv6 Inform Packets Received................. 0
DHCPv6 Relay-forward Packets Received.......... 0
DHCPv6 Relay-reply Packets Received............ 0
DHCPv6 Malformed Packets Received.............. 0
Received DHCPv6 Packets Discarded.............. 0
Total DHCPv6 Packets Received.................. 0
DHCPv6 Advertisement Packets Transmitted....... 0
DHCPv6 Reply Packets Transmitted............... 0
DHCPv6 Reconfig Packets Transmitted............ 0
```

```
DHCPv6 Relay-reply Packets Transmitted......... 0
DHCPv6 Relay-forward Packets Transmitted....... 0
Total DHCPv6 Packets Transmitted............... 0
```

HiveAgent Commands

The commands in this section enable configuration of the Dell HiveAgent. HiveAgent commands are not supported on the N2200 or N3200 Series switches.

eula-consent

Use the **eula-consent** command to accept or decline the end-user license agreement (EULA) for the hive agent. If accepted, the latest version of the HiveAgent starts. If declined, all Hive Agent applications are stopped.

Syntax

eula-consent {**hiveagent**} {**accept** | **reject**}

- **hiveagent**—Enter the keyword hiveagent to either accept or reject the EULA for the HiveAgent.
- **accept** — Accepts the EULA for the specified service.
- **reject** — Rejects the EULA for the specified service.

Default Configuration

The default is **eula-consent hiveagent accept**.

Command Mode

Global Configuration

User Guidelines

Messages are shown for both the accept and reject use cases with information directing the user to URLs for further information. If the user rejects or has not yet accepted the EULA, the configuration mode for the specified service is not usable. If there is existing configuration for that feature, the configuration is not removed, but the feature is disabled.

This command can be executed multiple times. It overwrites the previous information each time. The collected information is stored in the running-config. The administrator must write the configuration in order to persist it across reboots. If the administrator clears the config, this information must be reconfigured.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# eula-consent hiveagent accept


This switch includes a feature that enables it to work with HiveManager (an
optional management suite), by sending the switch’s service tag number to
HiveManager to authenticate your entitlement to use HiveManager.  If you wish
to disable this feature, you should run command  “eula-consent hiveagent
reject” immediately upon powering up the switch for the first time, or at any
time thereafter.

console(config)# eula-consent hiveagent reject

I do not accept the terms of the license agreement. The HiveAgent feature has
been deactivated and can no longer be used. To enable HiveAgent
configurations, accept the terms of the license agreement by configuring this
command 'eula-consent hiveagent accept'.
```

hiveagent

Use the **hiveagent** command to access the HiveAgent configuration mode. Use the **no** form of the command to remove the configured Dell HiveAgent information.

Syntax

hiveagent

no hiveagent

Default Configuration

By default, no HiveManager NG is configured by default.

Command Mode

Global Configuration

User Guidelines

This command enters HiveAgent Configuration mode. It allows the administrator to configure HiveAgent information. The configured information is stored in the running config. Use the write command to save the information into the startup-config.

Command History

Introduced in version 6.3.0.1 firmware.

Example

In this example, the HiveAgent EULA has been accepted.

```
console(config)#hiveagent
console(conf-hiveagent)#

In this example, the HiveAgent EULA has been rejected.

console(config)#hiveagent

HiveAgent EULA has not been accepted.
The HiveAgent cannot be configured until the HiveAgent EULA is accepted.

console(config)#
```

server

Use the **server** command to configure a HiveAgent server (HiveManager NG) and enter HiveAgent server configuration mode. Use the **no** form of the command to remove a HiveAgent server.

Syntax

server *server-name*

no server *server-name*

server-name — The name of the server. The server name has a maximum length of 20 characters. Any printable character other than a question mark may be used in the server name. Enclose the server name in quotes if an embedded blank is desired in the server name.

Default Configuration

The default server HiveManagerNG is configured.

Command Mode

HiveAgent Configuration

User Guidelines

The server-name is used as a reference only and is not required to be used as part of a URL definition. The server name can consist of any alphanumeric character plus dashes or underscores.

Use the **exit** command to exit HiveAgent Server configuration mode.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# hiveagent
console(conf-hiveagent)#server HiveManagerNG
console(conf-hiveagent-HiveManagerNG)#
```

debug

Use the **debug** command to enable HiveAgent debug capability.

Syntax

debug

no debug

Default Configuration

By default, HiveAgent debug is disabled.

Command Mode

HiveAgent Configuration mode

User Guidelines

This command enables HiveAgent debug.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)#hiveagent
console(conf-hiveagent)#debug
```

enable

Use the **enable** command to enable a HiveAgent server. Use the **no** form of the command to disable a HiveAgent server.

Syntax

enable

no enable

Default Configuration

By default, the default server is enabled. It may be disabled using the **no enable** form of the command.

Command Mode

HiveAgent Server Configuration

User Guidelines

Only one HiveAgent server (HiveManager NG) can be enabled.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# hiveagent
console(conf-hiveagent)#server HiveManagerNG
console(conf-hiveagent-HiveManagerNG)#enable
```

proxy-ip-address

Use the **proxy-ip-address** command to configure a proxy server to be used to contact the HiveManager NG. Use the **no** form of the command to remove the proxy server information.

Syntax

proxy-ip-address {*ipv4-address* | *ipv6-address*} **port** *port-number* **username** *userid* **password** [*encryption-type*] *password*

no proxy-ip-address

- *ipv4-address* — The IPv4 address of the proxy server in dotted decimal notation.
- *ipv6-address* — The IPv6 address of the proxy server in IPv6 notation.
- *port-number* — The TCP port number of the proxy server. The range is 1–65535. The default is 443.
- *userid* — The user name used to log into the proxy server.
- *encryption-type*— 0 indicates an unencrypted password; 7 indicates an encrypted password.
- *password*— An unencrypted or encrypted password. The maximum length is 64 characters for an unencrypted password. Encrypted passwords must be 128 characters in length.

Default Configuration

By default, no proxy is configured.

By default, passwords are entered as unencrypted and are always displayed and stored encrypted.

Command Mode

HiveAgent Server Configuration

User Guidelines

Passwords are always stored and displayed as encrypted, even if entered in unencrypted format.

Example

```
console(config)#support-assist
console(conf-support-assist)#server 10.0.0.1
console(conf-support-assist-10.0.0.1)#proxy-ip-address 10.0.0.2 port 1025
username admin password 0 password
```

Command History

Introduced in version 6.3.0.1 firmware.

source-interface vlan-id

Use the **source-interface vlan-id** command to assign a source interface which HiveAgent obtains the IP address used as the source IP address in packets addressed to the HiveManager NG.

Syntax

source-interface vlan-id <*vlan-id*>

no source-interface vlan-id

- *vlan-id*— A VLAN from which the IP address may be derived. Range 1–4093.

Default Configuration

By default, a source interface VLAN is not assigned.

Command Mode

HiveAgent Configuration mode

User Guidelines

The source VLAN must have an IP address assigned for it to be used by HiveAgent.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)#interface vlan 1
console(conf-vlan1)#ip address 172.16.32.11 /24
console(conf-vlan1)#exit

console(config)#hiveagent
console(conf-hiveagent)#source interface vlan-id 1
```

url

Use the **url** command to configure the URL to reach on HiveManager NG. Use the **no** form of the command to remove the URL information.

Syntax

url *uniform-resource-locator*

no url

- *uniform-resource-locator* — A text string for the URL using one of the following formats: *hostip* or *hostname*

Default Configuration

By default, the HiveManagerNG URL is cloud-rd.aerohive.com.

Command Mode

HiveAgent Server Configuration

User Guidelines

The hostip for HiveManager NG may be specified as an IPv4 address, an IPv6 address or as a DNS hostname. If using the DNS hostname, the DNS resolver feature will need to be configured, enabled and operational.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)#hiveagent
console(conf-hiveagent)" server HiveManagerNG
console(conf-hiveagent-HiveManagerNG)#url cloud-rd.aerohive.com
```

show hiveagent debug

Use the **show hiveagent debug** command to view information on HiveAgent debug configuration. Status may also be obtained from the HiveManager NG web page.

Syntax

show hiveagent debug

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec mode, Global Configuration mode and all submodes

User Guidelines

There are no guidelines for this command.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)# show hiveagent debug
```

show hiveagent source-interface

Use the **show hiveagent status** command to display the configured HiveAgent source interface.

Syntax

show hiveagent source-interface

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The source VLAN must have an IP address assigned for it to be used by HiveAgent.

Command History

Command introduced in version 6.5 firmware.

Example

```
console(config)# hiveagent
console(conf-hiveagent)#source interface vlan-id 1
```

show hiveagent status

Use the **show hiveagent status** command to display information on the HiveAgent configuration. The status can be obtained from the HiveManager NG web page.

Syntax

show hiveagent status

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console# show hiveagent status

HiveAgent: Enabled
EULA: Accepted
HiveManager Server Name: HiveManagerNG
HiveManager NG (enabled):
HiveAgent Version............................. 1.0.1
HiveAgent Status.............................. CONTACTING REDIRECTOR
HiveAgent AssociationUrl...................... -
HiveAgent AssociationMethod................... REDIRECTOR
HiveAgent PollUrl............................. -
HiveAgent RedirectorFQDN...................... cloud-rd.aerohive.com
HiveAgent RedirectorResponse.................. CURL code [28], HTTP code
[0], Curl string = [Timeout was reached]
```

show eula-consent hiveagent

Use the **show eula-consent** command to review the EULA details. Displaying the EULA details does not modify the current state of EULA acceptance for that feature.

Syntax

show eula-consent hiveagent

Default Configuration

The HiveAgent EULA is Accepted by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Acceptance of the HiveAgent EULA is enabled by default.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show eula-consent hiveagent

HiveAgent EULA has been: Accepted
This switch includes a feature that enables it to work with HiveManager (an
optional management suite), by sending the switch’s service tag number to
HiveManager to authenticate your entitlement to use HiveManager.  If you wish
to disable this feature, you should run command  “eula-consent hiveagent
reject” immediately upon powering up the switch for the first time, or at any
time thereafter.
```

IP Addressing Commands

Dell EMC Networking N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON Series Switches

Interfaces on the Dell EMC Networking switches support a variety of capabilities to support management of the switch. In addition to performing switching and routing of network traffic, Dell EMC Networking switches act as a host for management of the switch. Commands in this category allow the network operator to configure the local host address, utilize the embedded DHCP client to obtain an address, resolve names to addresses using DNS servers, and detect address conflicts on the local subnet.

There are two management interface types on Dell EMC Networking switches. In-band interfaces allow management of the switch through the network switching/routing interfaces. Out-of-band management is always through the dedicated out-of-band interface. The serial port on the management unit in the stack provides a direct console interface supporting a CLI. In-band management interfaces can employ a variety of protection mechanisms including VLAN assignment and Management ACLs. The out-of-band port does not support such protection mechanisms and, therefore, it is recommended that the out-of-band interface only be connected to a physically separated management network.

clear host

Use the **clear host** command to delete entries from the host name-to-address cache.

Syntax

clear host {*name* **|** *}

- *name* — Host name to be deleted from the host name-to-address cache. (Range: 1-255 characters)
- * — Deletes all entries in the host name-to-address cache.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example deletes all entries from the host name-to-address cache.

```
console#clear host *
```

clear ip address-conflict-detect

Use the **clear ip address-conflict-detect** command to clear the address conflict detection status in the switch.

Syntax

clear ip address-conflict-detect [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, counters for the default (global) router instance is cleared.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned. Virtual Router Configuration mode is only available on the Dell EMC Networking N3000-ON/N3100-ON/N3200-ON switches.

Example

```
console#clear ip address-conflict-detect
```

interface out-of-band

Use the **interface out-of-band** command to enter into OOB interface configuration mode.

Syntax

interface out-of-band

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

This command is not available on the N1100-ON/N1500/N2000/N2100-ON/N2200-ON Series switches.

Example

```
console(config)#interface out-of-band
console(config-if)#
```

ip address

Use the **ip address** command to configure an IP address on an in-band VLAN or loopback interface. Also use this command to configure one or more secondary IP addresses on the interface.

Syntax

ip address *ip-address* {{*subnet-mask* **|** *prefix-length*} [**secondary**]**|**dhcp**|**none}

no ip address *ip-address* {*subnet-mask* **|** *prefix-length*} [**secondary**]

- *ip-address* — IP address of the interface.
- *dhcp* — Obtain the address from a DHCP server.
- *none* — Clear the address assignment method.

- *subnet-mask* — Subnet mask of the interface
- *prefix-length* — Length of the prefix. Must be preceded by a forward slash (/). (Range: 1-30 bits)
- **secondary** — Indicates the IP address is a secondary address.

Default Configuration

The N1100/N1500/N2000/N2100-ON/N2200-ON default IPv4 address assignment method is DHCP on VLAN 1.

The N3000-ON/N3100-ON/N3200-ON default IPv4 address assignment method on VLAN 1 is none, and the default address assignment on the out-of-band port is DHCP. See the **ip address (Out-of-band)** command for more information.

Use the **no interface vlan** command to remove an IP routing interface, clear any bound IP address and set the address assignment method to the default.

Command Mode

Interface Configuration (VLAN, Loopback) mode

User Guidelines

This command also implicitly enables the VLAN or loopback interface for routing (i.e. as if the user had issued the 'routing' interface command). By default, configuring an IP address on a VLAN enables in-band management for interfaces configured with that VLAN. Setting up an IP address on VLAN 1 enables switch management on all in-band interfaces except for those where VLAN 1 is specifically excluded.

The **ip address none** command clears the currently assigned IPv4 address and sets the IP address configuration method to **none**. The **no ip address** command clears the currently assigned IPv4 address and sets the IP address configuration method to the default (whatever the default is).

Use the **show ip interface {management|vlan <vlanid>}** command to display the configured IP addresses.

A physical or loopback interface must be made a member of the VLAN in order for the address configuration to be bound to an interface.

A VLAN interface configured for DHCP address assignment will send the following text string in DHCP Option 60 of the DHCPDISCOVER message to assist the DHCP server in identification of the switch: "DellEMC;<switch model>;<firmware version>;<serial number>". The left and right angle brackets and quotation marks are not sent. An example option 60 string might be: DellEMC;N2128PX-ON;6.5.2.0;TW06G93K282986CR0040

IP addresses assigned to Ethernet interfaces support up to 31 bit subnet masks. IP addresses assigned to loopback ports support a full 32 bit subnet mask.

Example

The following example defines the IP address and subnet mask for VLAN 15 and enables the VLAN for routing.

```
console(config)#interface vlan 15
console(config-if-vlan15)#ip address 192.168.10.10 255.255.255.0
```

ip address (Out-of-Band)

Use the **ip address** command in Interface Configuration mode to set an IP address for the out-of-band interface. Use the **no** form of this command to return the ip address configuration to its default value.

Syntax

ip address {*ip-address* {*mask* | *prefix-length*} | **dhcp**|**none**}

no ip address

- *ip-address*—Specifies a valid IPv4 address in dotted-quad notation.
- *mask*—Specifies a valid subnet (network) mask IPv4 address in dotted quad notation.
- *prefix-length*—The number of bits that comprise the IP address prefix. The prefix length must be preceded by a forward slash (/). (Range: 1-30 bits)
- **dhcp**—Obtain the out-of-band interface address via DHCPv4.

Default Configuration

The out-of-band interface (service port) obtains an IP address via DHCP by default.

Command Mode

Interface (Out-of-Band) Configuration mode

User Guidelines

When setting the netmask/prefix length on an IPv4 address, a space is required between the address and the mask or prefix length. Setting an IP address on the out-of-band port enables switch management over the out-of-band port.

The **ip address none** command clears the currently assigned IPv4 address and sets the IP address configuration method to **none**. The **no ip address** command clears the currently assigned IPv4 address and sets the IP address configuration method to the default (dhcp).

A out-of-band interface configured for DHCP address assignment will send the following text string in DHCP Option 60 of the DHCPDISCOVER message to assist the DHCP server in identification of the switch: "DellEMC;<switch model>;<firmware version>;<serial number>". The left and right angle brackets and quotation marks are not sent. An example option 60 string might be: DellEMC;N2128PX-ON;6.5.2.0;TW06G93K282986CR0040

In order to ensure the security of the switches from intruders, it is strongly recommended that the out-of-band interface be isolated on a physically separate network from the in-band ports. This command is only valid for switches equipped with an out-of-band interface.

Example

The following examples configure the out-of-band interface with an IP address 131.108.1.27 and subnet mask 255.255.255.0 and the same IP address with prefix length of 24 bits.

```
console(config)#interface out-of-band
console(config-if)#ip address 131.108.1.27 255.255.255.0
console(config-if)#ip address 131.108.1.27 /24
```

ip address-conflict-detect run

Use the **ip address-conflict-detect run** command in Global Configuration mode to trigger the switch to run active address conflict detection by sending gratuitous ARP packets for IPv4 addresses on the switch.

Syntax

ip address–conflict–detect run

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode, Virtual Router Configuration mode.

User Guidelines

When in virtual router configuration mode, this command operates within the context of the virtual router instance. When in global config mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the Dell EMC Networking N3000-ON/N3100-ON/N3200-ON switches.

Example

```
console#configure
console(config)#ip address-conflict-detect run
```

ip address dhcp (Interface Configuration)

Use the **ip address dhcp** command in Interface (VLAN) Configuration mode to enable the DHCPv4 client on an interface.

Syntax

ip address dhcp

no ip address dhcp

Default Configuration

DHCPv4 is disabled by default on routing interfaces.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command only applies to VLAN routing interfaces. When DHCP is enabled on a routing interface, the system automatically deletes all manually configured IPv4 addresses on the interface.

- The command **no ip address** removes the interface's primary address (Manual/DHCP) including the secondary addresses, if configured, and sets the Interface method to **None**.
- The command **no ip address dhcp** removes the interface's primary address only if configured through DHCP and sets the interface method to **None**. It does not remove a manually configured address.

In addition to leasing an IP address and subnet mask, the DHCP client may learn the following parameters from a DHCP server:

- The IPv4 address of a default gateway. If the device learns different default gateways on different interfaces, the system uses the first default gateway learned. The system installs a default route in the routing table, with the default gateway's address as the next hop address. This default route has a preference of 254.
- The IPv4 address of a DNS server. The DNS client stores each DNS server address in its server list.
- A domain name. The DNS client stores each domain name in its domain name list.

A VLAN routing interface configured for DHCP address assignment will send the following text string in DHCP Option 60 of the DHCPDISCOVER message to assist the DHCP server in identification of the switch: "DellEMC;<switch model>;<firmware version>;<serial number>". The left and right angle brackets and quotation marks are not sent. An example option 60 string might be: DellEMC;N2128PX-ON;6.5.2.0;TW06G93K282986CR0040

Examples

To enable DHCPv4 on vlan 2:

```
console#config
console(config)#interface vlan 2
console(config-if-vlan2)#ip address dhcp
```

ip default-gateway

Use the **ip default-gateway** command to configure a default gateway (router).

Syntax

ip default-gateway *ip-address*

no ip default-gateway *ip-address*

- *ip-address*—Valid IPv4 address of an attached router.

Default Configuration

No default gateway is defined.

Command Mode

Global Configuration mode, Virtual Router Configuration mode

User Guidelines

When the system does not have a more specific route to a packet's destination, it sends the packet to the default gateway. The system installs a default IPv4 route with the gateway address as the next hop address. The route preference is 253. A default gateway configured with this command is more preferred than a default gateway learned from a DHCP server, which has a route preference of 254. It is less preferred than a static route configured via the ip route command, which has a route preference of 1. Use the show ip route command to display the active default gateway.

Only one default gateway can be configured. If you invoke this command multiple times, each command replaces the previous value. When in Virtual Router Configuration mode, this command operates within the context of the virtual router instance. When in Global Configuration mode, the command operates on the global router instance.

Virtual Router Configuration mode is only available on the Dell EMC Networking N3000-ON/N3100-ON/N3200-ON switches.

Setting a default gateway on the in-band network may make indirectly connected hosts on the out-of-band network unreachable. Dell EMC N1100-ON switches support configuration of a single default gateway. If a subsequent gateway is configured, the prior configuration is overwritten. Dell EMC N1100-ON switches do not support routing.

Example

The following example sets the default-gateway to 10.1.1.1.

```
console(config)#ip default-gateway 10.1.1.1.
```

ip domain-lookup

Use the **ip domain-lookup** command in Global Configuration mode to enable IP Domain Naming System (DNS)-based host name-to-address translation. To disable the DNS, use the **no** form of this command.

Syntax

ip domain-lookup

no ip domain-lookup

Default Configuration

DNS name resolution is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example enables the IP Domain Naming System (DNS)-based host name-to-address translation.

```
console(config)#ip domain-lookup
```

ip domain-name

Use the **ip domain-name** command in Global Configuration mode to define a default domain name used to complete unqualified host names. To delete the default domain name, use the **no** form of this command.

Syntax

ip domain-name *name*

no ip domain-name

- *name* — Default domain name used to complete an unqualified host name. Do not include the initial period that separates the unqualified host name from the domain name (Range: 1-255 characters).

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines a default domain name of dell.com.

```
console(config)#ip domain-name dell.com
```

ip host

Use the **ip host** command in Global Configuration mode to define static host name-to-address mapping in the host cache. To delete the name-to-address mapping, use the **no** form of this command.

Syntax

ip host *name address*

no ip host *name*

- *name* — Host name.
- *address* — IP address of the host.

Default Configuration

No host is defined.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example defines a static host name-to-address mapping in the host cache.

```
console(config)#ip host accounting.dell.com 176.10.23.1
```

ip name-server

Use the **ip name-server** command in Global Configuration mode to define available IPv4 or IPv6 name servers. To delete a name server, use the **no** form of this command.

Syntax

ip name-server *server-address1* [*server-address2 … server-address8*]

no ip name-server [*server-address1 … server-address8*]

- *server-address*—Valid IPv4 or IPv6 addresses of the name server. (Range: 1–255 characters)

Default Configuration

No name server IP addresses are specified.

Command Mode

Global Configuration mode

User Guidelines

Server preference is determined by entry order.

Up to eight servers can be defined in one command or by using multiple commands. Use the show hosts command to display the configured name servers.

Example

The following example sets the available name server.

```
console(config)#ip name-server 176.16.1.18
```

ip name-server source-interface

Use the **ip name-server source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted DNS packets. To revert to the default IP address, use the **no** form of this command.

Syntax

ip name-server source-interface {**loopback** *loopback-id* | **tunnel** *tunnel-id* | **vlan** *vlan-id* }

no ip name-server source-interface

- *loopback-id*—A loopback interface identifier.
- *tunnel-id*—A tunnel identifier.
- *vlan-id*—A VLAN identifier.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for DNS packets. This address is either the IP address assigned to the VLAN from which the DNS packet originates or the out-of-band interface IP address.

Command Mode

Global Configuration mode

User Guidelines

The source interface must have an assigned IP address (assigned either manually or via another method such as DHCP).

The use of a source interface allows firewalls devices to identify DNS packets as coming from a specific switch. If the source interface is not specified, the primary address of the outbound interface is used as the source interface. If the specified interface is down, the DNS client falls back to it's original (unconfigured) behavior.

This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example configures a source interface for a VLAN interface that obtains its address via DHCP:

```
console#configure
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#ip name-server source-interface vlan 1
```

This example configures a source interface for a loopback interface. Using a loopback address is the recommended method for assigning a source interface.

```
console#configure
console(config)#interface loopback 0
console(config-if-vlan1)#ip address 129.168.0.13 /32
console(config-if-vlan1)#exit
console(config)#ip name-server source-interface vlan 1
```

ipv6 address (Interface Configuration)

Use the **ipv6 address** command to set the IPv6 address of an interface. Use the **no** form of this command to reset the IPv6 address to the default.

Syntax

ipv6 address {*prefix/prefix-length* [**eui64**] | **autoconfig** | **dhcp**}

no ipv6 address

- *prefix*—The IPv6 address to be configured.
- *prefix-length*—Designates how many of the high-order contiguous bits of the address make up the prefix.
- **eui64**—The optional EUI-64 field designates that IPv6 processing on the interfaces is enabled using an EUI-64 interface ID in the low order 64 bits of the address. If this option is used, the value of prefix_length must be 64 bits.
- **autoconfig**—Use this keyword to enable IPv6 address auto configuration mode.
- **dhcp**—Use this keyword to obtain an IPv6 address via DHCP.

Default Configuration

There is no IPv6 address configured by default.

Command Mode

Interface Configuration mode (VLAN, tunnel, loopback)

User Guidelines

When setting the prefix length on an IPv6 address, no space can be present between the address and the mask.

Multiple globally reachable addresses may be assigned to an interface. Creation of a link local address is automatically performed by this command.

IPv6 addresses may be expressed in up to eight blocks. For simplification, the leading zeros of each 16 bit block may be omitted. One sequence of 16 bit blocks—containing only zeros—may be replaced by a double colon"::", but not more than one at a time.

- Dropping zeros: 3ffe:ffff:100:f101:0:0:0:1 becomes 3ffe:ffff:100:f101:1
- Local host: 0000:0000:0000:0000:0000:0000:0000:0001 becomes ::1
- Any host: 0000:0000:0000:0000:0000:0000:0000:0000 becomes ::

The hexadecimal letters in IPv6 addresses are not case sensitive.

The optional eui64 parameter indicates that the IPv6 address is configured to use the EUI-64 interface ID in the low order 64 bits of the address. If this parameter is specified, the *prefix-length* must be 64.

Example

Configure IPv6 routing on vlan 10 and obtain an address via DHCP. Assumes vlan 10 already exists.

```
console(config)#ip routing
console(config)#interface vlan 10
console(config-if-vlan10)#ipv6 enable
console(config-if-vlan10)#ipv6 address dhcp
Configure a default gateway on vlan 10
console(config)#no ipv6 address autoconfig
console(config)#no ipv6 address 2003::6/64
console(config)#no ipv6 address 2001::/64 eui64
console(config)#no ipv6 address
```

ipv6 address (OOB Port)

Use the **ipv6 address** command in Interface (out-of-band) Configuration mode to set the IPv6 prefix on the out-of-band port. If a prefix is specified, the address will be configured using the prefix and length A link local address in EUI-64 format may also be assigned.

The autoconfig parameter specifies that a link local address in the EUI-64 format is assigned to the interface.

The DHCP parameter indicates that the port should obtain its address via DHCP.

Use the **no** form of the command to remove a specific address or to return the address assignment to its default value. Using the **no** form of the command with no parameters removes all IPv6 prefixes from the interface.

Syntax

ipv6 address {*prefix/prefix-length* [**eui64**] **| autoconfig | dhcp**}

no ipv6 address {*prefix/prefix-length* [**eui64**] **| autoconfig | dhcp**}

- *prefix/prefix-length*—An IPv6 prefix in global format address format.
- **eui64**—Formulate the prefix in EUI-64 format.
- **autoconfig**—Perform IPv6 auto-configuration.

- **dhcp**—Obtain the prefix via DHCP.

Default Configuration

No address is assigned to the out-of-band interface by default.

Command Mode

Interface (out-of-band) Configuration mode

User Guidelines

When DHCPv6 is enabled on the Out-of-Band interface, the system automatically deletes all manually configured IPv6 addresses on the interface.

DHCPv6 can be enabled on the Out-of-Band interface only when IPv6 auto configuration or DHCPv6 is not enabled on any of the in-band management interfaces.

IPv6 auto configuration mode can be enabled in the Out-of-Band interface only when IPv6 auto configuration or DHCPv6 is not enabled on any of the in-band management interfaces.

The optional eui64 parameter indicates that the IPv6 address is configured to use the EUI-64 interface ID in the low order 64 bits of the address. In this parameter is specified, the *prefix-length* must be 64. This command is only valid for switches equipped with an out-of-band interface.

ipv6 address dhcp

Use the **ipv6 address dhcp** command in Interface (VLAN) Configuration mode to enable the DHCPv6 client on an IPv6 interface.

Syntax

ipv6 address dhcp

no ipv6 address dhcp

Default Configuration

DHCPv6 is disabled by default on routing interfaces.

Command Mode

Interface (VLAN) Configuration mode

User Guidelines

This command only applies to VLAN routing interfaces. When DHCPv6 is enabled on a VLAN routing interface, the system automatically deletes all manually configured IPv6 addresses on the interface.

Use the **no ipv6 address dhcp** command to release a leased address and to disable DHCPv6 on an interface. The command **no ipv6 address** does not disable the DHCPv6 client on the interface.

This command will fail if DHCPv6 server has been configured on the interface.

Examples

In the following example, DHCPv6 is enabled on interface vlan2.

```
console#config
console(config)#interface vlan 2
console(config-if-vlan2)#ipv6 address dhcp
```

ipv6 enable (Interface Configuration)

Use the **ipv6 enable** command in Interface Configuration mode to enable IPv6 on an interface. Use the **no** form of this command to reset the IPv6 configuration to the defaults.

Syntax

ipv6 enable

no ipv6 enable

Default Configuration

IPv6 is not enabled by default.

Command Mode

Interface Configuration mode (VLAN, tunnel, loopback)

User Guidelines

Command execution automatically configures the interface with a link-local address. This command is not required if an IPv6 global address is configured on the interface.

Example

The following example enables IPv6 routing on a VLAN which has not been configured with an explicit IPv6 address.

```
console(config)#vlan 15
console(config-vlan)#interface vlan 15
console(config-if-vlan15)#ipv6 enable
```

ipv6 enable (OOB Configuration)

Use the **ipv6 enable** command in Interface (out-of-band) Configuration mode to enable IPv6 operation on the out-of-band interface. Prefixes configured by the ipv6 address command are not configured until the interface is enabled.

Syntax

ipv6 enable

no ipv6 enable

Default Configuration

By default, IPv6 is not enabled on the out-of-band port.

Command Mode

Interface (out-of-band) Configuration mode

User Guidelines

This command is not necessary if an IPv6 address has been assigned to the interface. This command is only valid for switches equipped with an out-of-band interface.

ipv6 gateway (OOB Configuration)

Use the **ipv6 gateway** command in Interface (out-of-band) Configuration mode to configure the address of the IPv6 gateway. The gateway is used as a default route for packets addressed to network devices not present on the local subnet. Use the **no** form of the command to remove the gateway configuration.

Syntax

ipv6 gateway ***ipv6-address***

no ipv6 gateway

- *ipv6-address*—An IPv6 address (not a prefix).

Default Configuration

By default, no IPv6 gateway is configured.

Command Mode

Interface (out-of-band) Configuration mode

User Guidelines

This command is only valid for switches equipped with an out-of-band interface.

show hosts

Use the **show hosts** command in User Exec mode to display the default domain name, a list of name server hosts, and the static and cached list of host names and addresses.

Syntax

shows hosts [*hostname*].

- *hostname*—(Range: 1–255 characters). The command allows spaces in the host name when specified in double quotes. For example, console(config)#show hosts “host name”

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays information about IP hosts.

```
console>show hosts
Host name: dellswitch
Default domain: dell.com
Name/address lookup is enabled
DNS source interface: loopback 1
Name servers (Preference order): 176.16.1.18 176.16.1.19
Configured host name-to-address mapping:
Host                          Addresses
--------------------------    ----------------------------
accounting.dell.com             176.16.8.8
Cache:              TTL (Hours)
Host                Total       Elapsed      Type         Addresses
----------------    -----       -------      -------      -------------
www.stanford.edu    72          3            IP           171.64.14.203
```

show ip address-conflict

Use the **show ip address-conflict** command in User Exec or Privileged Exec mode to display the status information corresponding to the last detected address conflict.

Syntax

show ip address-conflict [**vrf** *vrf-name*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.

Default Configuration

This command has no default configuration.

Command Mode

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches.

The command provides the following information.

Term	Description
Address Conflict Detection Status	Whether the switch has detected an address conflict on any IP address. Set to **Conflict Detected** if detected, **No Conflict Detected** otherwise.
Last Conflicting IP Address	The IP address that was last detected as conflicting on any interface.
Last Conflicting MAC Address	The MAC Address of the conflicting host that was last detected on any interface.
Time Since Conflict Detected	The time in days, hours, minutes, and seconds since the last address conflict was detected.

Example

```
console#show ip address-conflict

Address Conflict Detection Status...Conflict Detected
Last Conflicting IP Address.........10.131.12.56
Last Conflicting MAC Address........00:01:02:04:5A:BC
Time Since Conflict Detected........5 days 2 hrs 6 mins 46 secs

console#show ip address-conflict

Address Conflict Detection Status............. No Conflict Detected
```

show ip helper-address

Use the **show ip helper-address** command to display IP helper addresses configuration.

Syntax

show ip helper-address [**vrf** *vrf-name*] [*intf-address*]

- *vrf-name*—The name of the VRF instance on which the command operates. If no VRF parameter is given, information for the default (global) router instance is shown.
- *intf-address* — IP address of a routing interface in dotted quad notation. (Range: Any valid IP address)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

The VRF parameter is only available on the N3000-ON/N3100-ON/N3200-ON series switches. This command is not available on the N1100-ON Series switches.

Example

```
console#show ip helper-address

IP helper is enabled

Interface              UDP Port    Discard  Hit Count     Server Address
-------------------- ----------- ---------- ---------- ----------------
vlan 25                  domain         No          0 192.168.40.2
vlan 25                    dhcp         No          0 192.168.40.2
vlan 30                    dhcp        Yes          0
vlan 30                     162         No          0 192.168.23.1
```

```
Any                            dhcp         No          0 192.168.40.1
```

show ipv6 dhcp interface out-of-band statistics

Use the **show ipv6 dhcp interface out-of-band statistics** command to display IPv6 DHCP statistics for the out-of-band interface.

Syntax

show ipv6 dhcp interface out-of-band statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command is only supported on platforms equipped with an out-of-band port.

Example

```
console#show ipv6 dhcp interface out-of-band statistics

DHCPv6 Client Statistics
-------------------------
DHCPv6 Advertisement Packets Received.......... 0
DHCPv6 Reply Packets Received.................. 0
Received DHCPv6 Advertisement Packets Discard.. 0
Received DHCPv6 Reply Packets Discarded........ 0
DHCPv6 Malformed Packets Received.............. 0
Total DHCPv6 Packets Received.................. 0
DHCPv6 Solicit Packets Transmitted............. 8
DHCPv6 Request Packets Transmitted............. 0
DHCPv6 Renew Packets Transmitted............... 0
DHCPv6 Rebind Packets Transmitted.............. 0
DHCPv6 Release Packets Transmitted............. 0
Total DHCPv6 Packets Transmitted............... 8
```

show ipv6 interface out-of-band

Use the **show ipv6 interface out-of-band** command to show the IPv6 out-of-band port configuration.

Syntax

show ipv6 interface out-of-band

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command is only available on switches equipped with an out-of-band interface.

Example

```
console(config-if)#show ipv6 interface out-of-band

IPv6 Administrative Mode........Enabled
IPv6 Prefix is..................FE80::21E:C9FF:FEAA:AD79/64
                                                 ::/128
IPv6 Default Router.............FE80::A912:FEC2:A145:FEAD
Configured IPv6 Protocol........None
IPv6 AutoConfiguration mode............Enabled
Burned In MAC Address...........001E.C9AA.AD79
```

Line Commands

Authentication commands related to line configuration mode are in DHCP Client Commands.

accounting

Use the **accounting** command in Line Configuration mode to apply an accounting method to a line config.

Use the **no** form of the command to return the accounting for the line mode to the default.

Syntax

accounting {exec|commands} [default|*list-name***]**

no accounting

- **exec**—Provides accounting for a user Exec terminal session.
- **commands**—Provides accounting for all user-executed commands.
- **default**—The default list of methods for accounting services.
- *list-name*—Character string of not more than 15 characters used to name the list of accounting methods. The list name can consist of any printable character other than a question mark. Use quotes around the list name if embedded blanks are contained in the list name.

Default Configuration

Accounting is not enabled by default.

Command Mode

Line Configuration

User Guidelines

When enabling accounting for exec mode for the current line-configuration type, users logged in with that mode will be logged out.

Examples

Use the following command to enable exec type accounting for telnet.

```
console(config)#line telnet
console(config-telnet)# accounting exec default
```

authorization

Use the **authorization** command to apply a command authorization method to a line config. Use the **no** form of the command to return the authorization for the line mode to the default.

Syntax

authorization {commands|exec} [default|*list-name***]**

no authorization {commands|exec}

- **commands**—Perform authorization for each command entered by the user.
- **exec**—Perform Exec authorization for the user (authorization required to enter privileged Exec mode).
- **default**—The default list of methods for command authorization (cmdAuthList).
- *list-name*—Character string used to name the list of authorization methods. The list name can consist of any printable character other than a question mark. Use quotes around the list name if embedded blanks are contained in the list name.

Default Configuration

Authorization is not enabled on any line method by default.

Command Mode

Line console, line telnet, line SSH

User Guidelines

When command authorization is configured for a line-mode, the switch sends information about the entered command to the method specified in the command list. The authorization method validates the received command and responds with either a PASS or FAIL response. If approved, the command is executed. Otherwise, the command is denied and an error message is shown to the user. If contact with the authorization method fails, then the next method in the list is attempted.

Examples

Use the following command to enable TACACS command authorization for telnet.

```
console(config)#line telnet
console(config-telnet)# authorization commands mycmdAuthList
```

enable authentication

Use the **enable authentication** command in Line Configuration mode to specify the authentication method list when accessing a higher privilege level from a remote telnet or console. To return to the default specified by the **enable authentication** command, use the **no** form of this command.

Syntax

enable authentication {**default** | *list-name*}

no enable authentication

- **default** — Uses the default list created with the **aaa authentication enable** command.
- *list-name* — Uses the indicated list created with the **aaa authentication enable** command. (Range: 1-12 characters)

Default Configuration

Uses the default set with the command **aaa authentication enable**.

Command Mode

Line Configuration mode

User Guidelines

Use of the no form of the command does not disable authentication. Instead, it sets the authentication list to the default list (same as enable authentication default).

Example

The following example specifies the default authentication method when accessing a higher privilege level console.

```
console(config)# line console
console(config-line)# enable authentication default
```

exec-banner

Use the **exec-banner** command to enable exec banner on the console, telnet or SSH connection. To disable, use the **no** form of the command.

Syntax

exec-banner

no exec-banner

- *MESSAGE* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Line Configuration

User Guidelines

The exec banner can consist of multiple lines. Enter a quote to complete the message and return to configuration mode.

Example

```
console(config-telnet)# no exec-banner
```

exec-timeout

Use the **exec-timeout** command in Line Configuration mode to set the interval that the system waits for user input before timeout. To restore the default setting, use the **no** form of this command.

Syntax

exec-timeout *minutes* [*seconds*]

no exec-timeout

- *minutes* — Integer that specifies the number of minutes. (Range: 0–65535)
- *seconds* — Additional time intervals in seconds. (Range: 0–59)

Default Configuration

The default configuration is 10 minutes.

Command Mode

Line (telnet, console, ssh) Configuration mode

User Guidelines

To specify no timeout, enter the **exec-timeout 0** command.

Example

The following example configures the interval that the system waits until user input is detected to 20 minutes. After expiry, the session exits Privileged Exec mode.

```
console(config)#line console
console(config-line)#exec-timeout 20
```

history

Use the **history** command in Line Configuration mode to enable the command history function. To disable the command history function, use the **no** form of this command.

Syntax

history

no history

Default Configuration

The default value for this command is *enabled*.

Command Mode

Line Interface mode

User Guidelines

This command has no user guidelines.

Example

The following example disables the command history function for the current terminal session.

```
console(config-line)# no history
```

history size

Use the **history size** command in Line Configuration mode to change the command history buffer size for a particular line. To reset the command history buffer size to the default setting, use the **no** form of this command.

Syntax

history size *number-of-commands*

no history size

- *number-of-commands*—Specifies the number of commands the system may record in its command history buffer. (Range: 0-216)

Default Configuration

The default command history buffer size is 10.

Command Mode

Line Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the command history buffer size to 20 commands for the current terminal session.

```
console(config-line)#history size 20
```

line

Use the **line** command in Global Configuration mode to identify a specific line for configuration and enter the line configuration command mode.

Syntax

line {**console** | **telnet** | **ssh**}

- **console** — Console terminal line.
- **telnet** — Virtual terminal for remote console access (Telnet).
- **ssh** — Virtual terminal for secured remote console access (SSH).

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The default authentication list for telnet and SSH is enableNetList. The enableNetList uses a single method: enable. This implies that users accessing the switch via telnet or SSH must have an enable password defined in order to access privileged mode. Alternatively, the administrator can set the telnet and ssh lists to enableList, which has the enable and none methods defined.

When using line ssh authentication with a RADIUS server as the primary authentication method, be aware that the default 802.1x timeout is 45 seconds. This is the same timeout value as SSH. Thus a secondary authentication method is unlikely to be invoked due to SSH timing out and dropping the connection attempt.

Examples

The following example sets the telnet authentication list to enableList:

```
console(config)#line telnet
console(config-telnet)#enable authentication enableList
```

The following example enters Line Configuration mode to configure Telnet.

```
console(config)#line telnet
console(config-line)#
```

login authentication

Use the **login authentication** command in Line Configuration mode to specify the login authentication method list for a line (console, telnet, or SSH). To return to the default specified by the authentication login command, use the **no** form of this command.

Syntax

login authentication {**default** | *list-name*}

no login authentication

- **default** — Uses the default list created with the **aaa authentication login** command.
- *list-name* — Uses the indicated list created with the **aaa authentication login** command.

Default Configuration

Uses the default set with the command **aaa authentication login**.

Command Mode

Line Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example specifies the default authentication method for a console.

```
console(config)# line console
console(config-line)# login authentication default
```

login-banner

Use the **login-banner** command to enable login banner on the console, telnet or SSH connection. To disable, use the **no** form of the command.

Syntax

login-banner

no login-banner

- *MESSAGE* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Line Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config-telnet)# no login-banner
```

motd-banner

Use the **motd-banner** command to enable motd on the console, telnet or SSH connection. To disable, use the **no** form of the command.

Syntax

motd-banner

no motd-banner

- *MESSAGE* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Line Configuration

User Guidelines

This command has no user guidelines.

Example

```
console(config-telnet)# motd-banner
```

password (Line Configuration)

Use the **password** command in Line Configuration mode to specify a password on a line. To remove the password, use the **no** form of this command.

NOTE: For commands that configure password properties, see Password Management Commands.

Syntax

password *password* [**encrypted**]

no password

- *password* — Password for this level. (Range: 8- 64 characters) The special characters allowed in the password include ! # $ % & ' ( ) * + , - . / : ; < = > @ [\ ] ^ _ ` { | } ~. User names can contain blanks if the name is surrounded by double quotes.
- **encrypted** — Encrypted password to be entered, copied from another switch configuration.

Default Configuration

No password is specified.

Command Mode

Line Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example specifies a password "mcmxxyyy" on a line.

```
console(config-line)# password mcmxxyyy
```

show line

Use the **show line** command to display line parameters.

Syntax

show line [**console** | **telnet** | **ssh**]

- **console** — Console terminal line.
- **telnet** — Virtual terminal for remote console access (Telnet).
- **ssh** — Virtual terminal for secured remote console access (SSH).

Default Configuration

This command has no default configuration.

Command Mode

User Exec and Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console(config-telnet)#show line

Console configuration:
Serial Port Login Timeout (mins) (secs)........ 10 minutes 0 seconds
Baud Rate (bps)................................ 9600
Character Size (bits).......................... 8
Flow Control................................... Disable
Stop Bits...................................... 1
Parity......................................... none
History:....................................... 10

Telnet configuration:
Remote Connection Login Timeout(mins)(secs).... 10 minutes 0 seconds
```

```
History:....................................... 10

SSH configuration:
Remote Connection Login Timeout(mins)(secs).... 10 minutes 0 seconds
History:....................................... 10
```

speed

Use the **speed** command in Line Configuration mode to set the line BAUD rate. Use the **no** form of the command to restore the default settings.

Syntax

speed {*bps*}

no speed

- *bps* — BAUD rate in bits per second (bps). The options are 2400, 9600, 19200, 38400, 57600, and 115200.

Default Configuration

This default speed is 9600 for all platforms other than the N1100-ON/N2100-ON/N2200-ON/N3100-ON/N3200-ON Series switches. The N1100-ON/N2100-ON/N2200-ON/N3100-ON/N3200-ON Series switches default to 115200 BAUD.

Command Mode

Line Interface (console) mode

User Guidelines

This configuration applies only to the current session.

Example

The following example configures the console BAUD rate to 9600.

```
console(config-line)#speed 9600
```

terminal length

Use the **terminal length** command to set the terminal length. Use the **no** form of the command to reset the terminal length to the default.

Syntax

terminal length *value*

no terminal length

- *value* — The length in number of lines. Range: 0–512

Default Configuration

This default value is 24.

Command Mode

Privileged Exec mode

User Guidelines

Setting the terminal length to 0 disables paging altogether. It is recommended that the terminal length either be set to 0 or a value larger than 4 as terminal lengths in the range of 1 to 4 may give odd output due to prompting. The terminal length command is specific to the current session. Logging out, rebooting or otherwise ending the current session will require that the command be reentered. Likewise, because the terminal length setting is specific to a session, it is never saved in the config.

Example

```
console#terminal length 50
```

MACsec Commands

mka policy (Global Config)

Use this command to create or configure a Media Access Control Security (MACsec) Key Agreement (MKA) Protocol policy and to enter MACsec policy configuration mode (config-macsec-policy).

Syntax

mka policy {*policy-name*}

no mka policy {*policy-name*}

- *policy-name* — The name of the desired MACsec policy. The policy name is a maximum of 16 alphanumeric characters.

Default Configuration

There are no policies configured by default.

Command Mode

Global Configuration mode

User Guidelines

An MKA policy may be used to configure the key server, encryption offset and replay protection.

Applying a policy to an interface enables MKA on the interface. Removing a policy from an interface disables MKA on the interface.

Command History

Command introduced in version 6.7.0 firmware.

key-server priority

Use this command to configure the preference for an MKA key server. To set the default preference, use the **no** form of the command.

Syntax

key-server priority *value*

no key-server priority

- *value* — The MKA key server priority. The range is 0 to 255.

Default Configuration

The default priority is 16.

Command Mode

MACsec Policy Configuration mode

User Guidelines

Lower numerical values indicate a higher preference.

Command History

Command introduced in version 6.7.0 firmware.

macsec-cipher-suite

Use this command to configure the MACsec cipher suite for an MKA policy. To set the default cipher suite, use the **no** form of the command.

Syntax

macsec-cipher-suite {**gcm-aes-128** | **gcm-aes-256** | **gcm-aes-xpn-128** | **gcm-aes-xpn-256**}

no macsec-cipher-suite

- **gcm-aes-128** — Galois counter mode of the Advanced Encryption Standard using a 128-bit key.
- **gcm-aes-256** — Galois counter mode of the Advanced Encryption Standard using a 256-bit key.
- **gcm-aes-xpn-128** — Galois counter mode of the Advanced Encryption Standard using a 128-bit key with extended packet numbering.
- **gcm-aes-xpn-256** — Galois counter mode of the Advanced Encryption Standard using a 256-bit key with extended packet numbering.

Default Configuration

The default cipher suite is **gcm-aes-128**.

Command Mode

MACsec Policy Configuration mode

User Guidelines

The first part of the cipher suite label indicates the cipher mode of operation, for example, Galois Counter Mode (GCM). The second part of the label indicates the cipher suite, that is, Advanced Encryption Standard (AES). XPH, if present, indicates extended packet numbering is used. The number suffix indicates the key length.

Command History

Command introduced in version 6.7.0 firmware.

confidentiality-offset

Use this command to configure where to start encrypting the data packet. Use the **no** form of the command to configure the offset to the default.

Syntax

confidentiality-offset {0 | 30 | 50}

no confidentiality-offset

- **0** — Begin encryption at octet 0 of the data packet.
- **30** — Begin encryption at octet 30 of the data packet.
- **50** — Begin encryption at octet 50 of the data packet.

Default Configuration

The default offset is 0 octets.

Command Mode

MACsec Policy Configuration mode

User Guidelines

The confidentiality offset allows multiple point-to-point services to operate over a link by transmitting the VLAN tag and other information, such as CoS, in the clear.

Both link partners must support the confidentiality offset capability and the offset must be configured identically.

Command History

Command introduced in version 6.7.0 firmware.

key chain

Use this command to configure or modify a key chain and enter Key Chain Configuration mode. Use the **no** form of the command to remove the key chain configuration.

Syntax

key chain *key-chain-name*

no key chain *key-key-chain-name*

- *key-chain-name* — The alphanumeric identifier of the key chain. The maximum length is 16 characters.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Key Chain Configuration mode allows the administrator to configure a key chain using the **key** command. Multiple keys may be configured in a key chain.

The parameter key-chain-name can be 1 to 16 characters in length. Executing this command takes the user to Key Chain Configuration mode.

Key chains are used only for switch-to-switch MACsec.

Command History

Command introduced in version 6.7.0 firmware.

key

Use this command to configure a key and enter Keychain Key Configuration mode. Use the **no** form of the command to remove the key configuration.

Syntax

key *key-id*

no key *key-id*

- *key-id* — The hexadecimal identifier of the key. Maximum length of 64 characters. The key-id must be an even number of characters.

Default Configuration

This command has no defaults. There are no keys configured by default.

Command Mode

Global Configuration mode

User Guidelines

Key Configuration mode allows the administrator to configure a key using the **cryptographic-algorithm**, **key-string**, and **lifetime** commands.

Command History

Command introduced in version 6.7.0 firmware.

cryptographic-algorithm

Use this command to configure the cryptographic algorithm for the key. Use the **no** form of the command to return to the default configuration.

Syntax

cryptographic-algorithm {**gcm-aes-128** | **gcm-aes-256**}

no cryptographic-algorithm

- **gcm-aes-128** — Galois counter mode of the Advanced Encryption Standard using a 128-bit key.
- **gcm-aes-256** — Galois counter mode of the Advanced Encryption Standard using a 256-bit key.

Default Configuration

The default cryptographic algorithm is **gcm-aes-128**.

Command Mode

Keychain Key Configuration mode

User Guidelines

Key Configuration mode allows the administrator to configure a key using the **cryptographic-algorithm**, **key-string**, and **lifetime** commands.

Command History

Command introduced in version 6.7.0 firmware.

key-string

Use this command to configure the key. Use the **no** form of the command to return to the default configuration.

Syntax

key-string *key-string-value*

no key-string

- key-string-value — Key specified in clear text. Use a minimum of 2 characters and a maximum of 32 (128-bit encryption)/64 (256-bit encryption) characters (hexadecimal string). The number of characters must be even.

Default Configuration

There is no key configured by default.

Command Mode

Keychain Key Configuration mode

User Guidelines

The key string is stored in encrypted format in the running config and the stored config.

The key string must contain an even number of characters.

Command History

Command introduced in version 6.7.0 firmware.

time-range

Use this command to configure the key lifetime. Use the **no** form of the command to return to the default configuration.

Syntax

time-range {*time-range-name*}

no time-range

- *time-range-name* — The name of a configured time range. See the Global Configuration time-range [name] command for more information.

Default Configuration

There is no time range configured by default.

Command Mode

Keychain Key Configuration mode

User Guidelines

When configuring multiple keys in a key chain with differing start/end times, it is recommended to configure the lifetimes to overlap to ensure that the session is not torn down and traffic dropped.

Command History

Command introduced in version 6.7.0 firmware.

macsec [network-link]

Use this command to enable MACsec on an interface. Use the **no** form of the command to disable MACsec on the interface.

Syntax

macsec [network-link]

no macsec [network-link]

- network-link — Enable switch-to-switch MACsec on the interface.

Default Configuration

MACsec is disabled on all interfaces by default. The default MACsec mode on an interface is host-to-switch.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

If an MKA policy or key chain is to be used, configure and apply the policy or key chain prior to enabling MACsec.

Command History

Command introduced in version 6.7.0 firmware.

mka policy (Interface Config)

Use this command to apply a MACsec Key Agreement (MKA) policy to an interface. Use the **no** form of the command to remove the MKA policy from the interface.

Syntax

mka policy {*policy-name*}

no mka policy

- *policy-name* — The name of a previously configured MKA policy.

Default Configuration

No MKA policy is applied to an interface.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

If an MKA policy or key chain is to be used, configure and apply the policy or key chain prior to enabling MACsec.

Command History

Command introduced in version 6.7.0 firmware.

mka pre-shared-key key-chain

Use this command to apply a MACsec key chain to an interface. Use the **no** form of the command to remove the key chain from the interface.

Syntax

mka pre-shared-key key-chain {*key-chain-name*}

no mka pre-shared-key key-chain

- *key-chain-name* — The name of a previously configured key chain.

Default Configuration

No MKA policy is applied to an interface.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

If an MKA policy or key chain is to be used, configure and apply the policy or key chain prior to enabling MACsec.

Command History

Command introduced in version 6.7.0 firmware.

macsec replay-protection

Use this command to enable and configure MACsec replay protection on an interface. Use the **no** form of the command to disable replay protection on the interface.

Syntax

macsec replay-protection [**window-size**] {*size*}

no macsec replay-protection [**window-size**]

- *size* — The size of the replay buffer. The range is 0 to 4294967295.

Default Configuration

Replay protection is disabled (window size 0).

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

Replay protection allows packets to be received out of order. Ordering is based upon packet number.

When replay protection is disabled, packets must be received in order. Out of order packets are dropped.

Command History

Command introduced in version 6.7.0 firmware.

authentication linksec policy

Use this command to enable and configure MACsec linksec policy on an interface. Use the **no** form of the command to revert to default linksec policy on the interface.

Syntax

authentication linksec policy <should-secure | must-secure | must-not-secure>

no authentication linksec policy

- **should-secure** — The link should be secured by MACsec.
- **must-secure** — The link must be secured by MACsec.
- **must-not-secure** — The link must not be secured by MACsec.

Default Configuration

The default policy is **should-secure.**

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command is used to apply a MACsec LinkSec security policy on an interface. The configured policy can be overridden for an 802.1X client by RADIUS.

Command History

Command introduced in version 6.7.0 firmware.

show macsec

Use this command to display general information about the MACsec configuration or status for an interface.

Syntax

show macsec {**interface** {*interface-id*} | **status** {*interface-id*}}

- *interface-id* — An Ethernet interface identifier.

User Guidelines

The output field descriptions for the **show macsec interface** command are the following:

Field	Description
MACsec Mode	Switch-to-switch or switch-to-host.
MKA Policy	MKA policy configured on the interface.
Key Chain	Key chain applied on the interface.
Replay Protection	Replay protection enabled or disabled on the interface.
Replay Protection Window	Replay protection window.
Ciphers Supported	Supported cipher suites on the interface.
LinkSec Policy	Configured LinkSec policy.

The output field descriptions for the **show macsec status** command are the following:

Field	Description
Transmit SCI	Transmit SC identifier.
Transmit SC transmitting	Whether Tx SC is transmitting.
Transmit SA Next PN	Next packet number of the Tx SA.
Receive SCI	Receive SCI identifier.
Receive SC receiving	Whether RX SC is receiving.

Receive SA Next PN	Next packet number of the Rx SA.
Receive SA AN	Association number of Rx SA.
Operational LinkSec Policy	Operational LinkSec policy.

Command History

Command introduced in version 6.7.0 firmware.

show mka policy

Use this command to display a summary of all defined MKA protocol policies or to display a summary of a specified policy.

Syntax

show mka policy [*policy-name*]

- *policy-name* — The name of an MKA policy.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The output field descriptions for the **show mka policy** command are the following:

Field	Description
Policy Name	The name of the policy.
KS Priority	The Key Server priority of the MKA instance.
Secure Announcements	MKA Announcements Status
Conf Offset	The configured value of the confidentiality. Configurable values are 0 (no offset), 30, or 50 bytes.
Cipher Suite	The cipher suite configured for the MKA policy.
Interfaces Applied	The interfaces on which this policy is applied.

Command History

Command introduced in version 6.7.0 firmware.

show mka sessions

Use this command to display a summary of all MACsec sessions or to display a session on a specified interface.

Syntax

show mka sessions [**interface** *interface-id* [**detail**]]

- *interface-id* — Displays status information for active MKA sessions on an interface.
- **detail** — Displays detailed information about the active MKA sessions on the specified interface.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The output field descriptions for the **show mka session** command are the following:

Field	Description
Interface	The physical interface on which the MKA session is active.
Port ID	The MACsec logical port identifier.
Local-TxSCI	The MAC address of the physical interface concatenated with the 16-bit Port ID.
Peer-RxSCI	The MAC address of the interface of the peer concatenated with the peer 16-bit Port ID.
Policy-name	The name of the MKA policy.
MACsec Peers	The number of MACsec peers.
Key Server Status	The key server. Has value **Y** for Yes if the MKA session is the key server, otherwise **N** for No.

CKN	The connectivity association key (CAK) name.

The output field descriptions for the **show mka session detail** command are the following:

Field	Description
Status	The secured status of the MKA session.
Local-TxSCI	Tx SCI of the local MKA instance.
Interface MAC Address	MAC address of the local interface.
MKA Port Identifier	MACsec logical port identifier.
Interface Name	Physical interface on which MKA is operational.
CAK Name (CKN)	Name of CAK used for the CA.
Member Identifier (MI)	Local MKA participant identifier.
Message Number (MN)	Local MKA participant message number.
Key Server	Whether the local MKA participant is a key server.
Latest SAK Status	Whether the current SAK is used for TX and RX.
Latest SAK AN	Current SAK association number.
Latest SAK KI (KN)	Current SAK key identifier.
Secure Announcements	MKA Announcements status.
MKA Policy Name	Local MKA policy name.
Key Server Priority	Local MKA instance key server priority.
Replay Protection	Whether replay protection is configured.
Replay Window Size	The configured replay protection window size.
Confidentiality Offset	The configured confidentiality offset.
Algorithm Agility	Algorithm agility parameter for the CA.
Cipher Suite	Operational cipher suite for the CA.
MACsec Capability	MACsec capability for the CA.

MACsec Desired	MACsec desired parameter for the CA.
# of MACsec Capable Live Peers	The number of live MKA peers.
# of MACsec Capable Potential Peers	The number of potential MKA peers.
Live Peers List	The live MKA peer list.
Potential Peers List	The potential MKA peer list.

Command History

Command introduced in version 6.7.0 firmware.

show key chain

Use this command to display a summary of all configured MKA key chains or a specific key chain.

Syntax

show key chain [**key-chain-name**]

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The output field descriptions for the **show mka keychain** command are the following:

Field	Description
Key Chain	Key chain name.
Key ID	The ID of a key in the key chain.
Key String	The configured key string.
Cryptographic Algorithm	The cryptographic algorithm to be used with the key.

Time Range	The configured time range.

Command History

Command introduced in version 6.7.0 firmware.

show mka statistics

Use this command to display MACsec session operational data.

Syntax

show mka statistics

- interface *interface-id* — Display information for active sessions on an interface.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

The output field descriptions for the **show mka statistics interface** command are the following:

Field	Description
SAKs Generated	The number of SAKs generated.
SAKs Rekeyed	The number of SAKs refreshed or rekeyed.
SAKs Received	The number of SAKs received from the key server.
MKPDUs Validated and Rx	The number of valid MKPDUs transmitted.
MKPDUs Transmitted	The number of MKPDUs transmitted.
Received SAKs	The number of SAKs received.
Distributed SAKs	The number of SAKs distributed.

The output field descriptions for the **show mka statistics** command are the following:

Field	Description
MKA Sessions Secured	The number of MKA sessions secured.
MKA Sessions Deleted	The number of MKA sessions deleted.
SAKs Generated	The number of SAKs generated.
SAKs Rekeyed	The number of SAKs refreshed or rekeyed.
SAKs Received	The number of SAKs received from the key server.
MKPDUs Validated and Rx	The number of valid MKPDUs received.
MKPDUs Transmitted	The number of MKPDUs transmitted.
Received SAKs	The number of SAKs received.
Distributed SAKs	The number of SAKs distributed.
SAK Generation Failures	The number of SAK generation failures.
SAK Encryption Failures	The number of SAK encryption failures.
SAK Decryption Failures	The number of SAK decryption failures.
ICK Derivation Failures	The number of ICK derivation failures.
KEK Derivation Failures	The number of KEK derivation failures.
Invalid Peer MACsec Capability	The number of invalid peer MACsec capability.
Rx SC Creation Failures	The number of Rx SC creation failures.
Tx SC Creation Failures	The number of Tx SC creation failures.
Rx SC Installation Failures	The number of Rx SC installation failures.

Tx SC Installation Failures	The number of Tx SC installation failures.
MKPDU Tx Failures	The number of MKPDU Tx failures.
MKPDU Rx Validation Failures	The number of MKPDU Rx validation failures.
MKPDU Rx Bad Peer MN	The number of MKPDU Rx bad peer message number.

Command History

Command introduced in version 6.7.0 firmware.

show macsec secy statistics

Use this command to display MACsec SecY statistics.

Syntax

show macsec secy statistics [**interface** {*interface-id*} **| txSc interface** {*interface-id*} **| rxSc interface** {*interface-id*}]

- **interface** *interface-id* — Display MACsec SecY statistics for an interface. This option displays the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyStatsTable`.
- **txSc interface** *interface-id* — Display statistics for each SecY's transmit SC on the given physical interface. This option displays the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyTxSCStatsTable`.
- **rxSc interface** *interface-id* — Display statistics for each SecY's receive SC on the given physical interface. This option displays the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyRxSCStatsTable`.

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.7.0 firmware.

clear mka statistics

Use this command to clear the MKA protocol statistics for an interface.

Syntax

clear mka statistics [**interface** {*interface-id* | **all**}]

- **interface** *interface-id* — Clear statistics for an MKA session on a physical (Ethernet) interface.
- **interface all** — Clear statistics for an MKA session on all MACsec-enabled interfaces.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.7.0 firmware.

clear macsec secy statistics

Use this command to clear the MKA protocol statistics for an interface.

Syntax

clear macsec secy statistics [**interface** {*interface-id* | **all**} | **txSc interface** {*interface-id* | **all**} | **rxSc interface** {*interface-id* | **all**}]

- **interface** *interface-id* — Clear MACSEC SecY statistics on a physical (Ethernet) interface. This option clears the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyStatsTable`.

- **txSc interface** *interface-id* — Clear statistics for each SecY's transmit SC on the given physical interface. This option clears the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyTxSCStatsTable`.
- **rxSc interface** *interface-id* — Clear statistics for each SecY's receive SC on the given physical interface. This option clears the interface statistics as defined in MIB -- IEEE8021-SECY-MIB; Table `secyRxSCStatsTable`.
- **interface all** — Clear the statistics listed above for all MACSEC-enabled interfaces.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Command History

Command introduced in version 6.7.0 firmware.

mka defaults policy send-secure-announcements

Use this command to configure sending Secure Announcements globally, for all the MKA Policies available on the switch. Use the **no** form of the command to disable sending the announcements.

Syntax

mka defaults policy send-secure-announcements

no mka defaults policy send-secure-announcements

Default Configuration

Sending secure announcements is disable.

Command Mode

Global Configuration mode

User Guidelines

When enabled globally, the announcements are sent as part of the MKA policy exchange on MACsec interfaces, even when explicitly not enabled in the policy config using the command send-secure-announcements, available in the MACsec Policy Configuration mode.

Command History

Command introduced in version 6.7.0 firmware.

send-secure-announcements

Use this command to configure specific MKA policy to send Secure Announcements. Use the **no** form of the command to disable sending the announcements.

Syntax

send-secure-announcements

no send-secure-announcements

Default Configuration

Sending secure announcements is disabled by default.

Command Mode

MACsec Policy Configuration mode

User Guidelines

When enabled in the MACsec Policy Configuration mode, the announcements are sent as part of the MKA policy exchange on MACsec-enabled interfaces, even when **send-secure-announcements** is not enabled globally using the command mka defaults policy send-secure-announcements in Global Configuration mode.

Command History

Command introduced in version 6.7.0 firmware.

eapol announcements

Use this command to configure sending unsecure announcements on specific physical interfaces. Use the **no** form of the command to disable sending the announcements.

Syntax

eapol announcements

no eapol announcements

Default Configuration

Sending secure announcements is disabled.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

When enabled on the interface, the eapol announcements are sent out on the physical interfaces.

Command History

Command introduced in version 6.7.0 firmware.

PHY Diagnostics Commands

show copper-ports tdr

Use the **show copper-ports tdr** command to display the stored information regarding cable lengths.

Syntax

show copper-ports tdr [*interface*]

- *interface* — A valid Ethernet interface identifier.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The copper-related commands do not apply to the stacking or 10GBaseT ports.

The maximum length of the cable for the Time Domain Reflectometry (TDR) test is 120 meters. Disable green-mode on the port in order to obtain accurate results.

Example

The following example displays the last TDR tests on all ports.

```
console#show copper-ports tdr
Port      Result                        Length [meters] Date
--------- ------------------------- -------------- --------------------
Gi1/0/1   OK
Gi1/0/2   Short     50                  13:32:00 23 July 2004
Gi1/0/3   Test has not been performed
Gi1/0/4   Open      128                 13:32:08 23 July 2004
Gi1/0/5   Fiber     -                    -
```

show fiber-ports optical-transceiver

Use the **show fiber-ports optical-transceiver** command to display the optical transceiver diagnostics.

Syntax

show fiber-ports optical-transceiver [*interface*]

- *interface* — A valid SFP, XFP or SFP+ port.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The show fiber ports command is applicable to all fiber ports, including SFP, SFP+, and XFP ports. It will display an error if executed against a copper port or passive or active direct attach cables.

Examples

The following examples display the optical transceiver diagnostics.

```
console#show fiber-ports optical-transceiver
                               Output  Input
Port      Temp Voltage Current Power   Power   TX    LOS
          [C]  [Volt]     [mA] [dBm]   [dBm]   Fault
--------- ---- ------- ------- ------- ------- ----- ---
Te2/0/23  22.5 3.296       7.5  -2.184 -36.990 No    Yes
```

test copper-port tdr

Use the **test copper-port tdr** command to diagnose with Time Domain Reflectometry (TDR) technology the quality and characteristics of a copper cable attached to a 1GBaseT or 10GBaseT port.

Syntax

test copper-port tdr *interface*

- *interface* — A valid Ethernet port.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines.

This command prompts the user to shut down the port for the duration of the test. Passive or active direct attach SFP/SFP+ cables are not based on 1000BaseT technology and do not support TDR testing. Use the **show copper-ports tdr** command to view the test results.

The maximum distance the Virtual Cable Tester (VCT) can measure is 120 meters. Multi-gig ports (2.5G and 5G) must have the cable disconnected at the switch for the test to yield correct results. Disable green-mode on the port to ensure accurate results.

Examples

The following example results in a report on the cable attached to port 1/0/3.

```
console#test copper-port tdr te1/0/1

This command takes the port offline to measure the cable length.
Use the show copper-port tdr command to view the results..

Do you wish to continue and take the port offline (Y/N)?y
```

The following example results in a failure to report on the cable attached to port te2/0/3.

```
console#test copper-port tdr te2/0/3

This command takes the port offline to measure the cable length.
Use the show copper-port tdr command to view the results..

Do you wish to continue and take the port offline? (y/n) y
Error! Invalid interface 2/0/3
```

Power Over Ethernet Commands

Dell EMC Networking PoE N1100P-ON, N1108EP-ON, N1524P, N1548P, N2024P, N2048P, N2124PX-ON, N2148PX-ON, N300EP-ON, N3132PX-ON switches implement the PoE, PoE+, or PoE 60W for power sourcing equipment (PSE), depending on the switch model. IEEE 802.3at allows power to be supplied to Class 4 powered devices (PD) that require power up to 30 Watts or PoE 60W (UPoE) to Class 4 devices on certain ports. This allows deployment of powered devices that require more power than the IEEE 802.3af specification allows. PoE+ 802.3at is compatible with 802.3af.

The Dell EMC Networking N2224PX-ON, and N2248PX-ON switches implement an IEEE 802.3bt Type 3 PSE. This capability supports 60W power delivery in a standards-compliant implementation as well as power negotiation using LLDP.

The Dell EMC Networking N3024EP/N3048EP/N3208PX-ON/N3224P-ON/N3224PX-ON/N3248P-ON/N3248PXE-ON switches support delivery of up to 60W of power on the first 12 interfaces of each stack unit. The Dell EMC Networking N2128PX-ON supports PoE 60W on the four 2.5G interfaces. The Dell EMC Networking N3132PX-ON and N3200PX-ON switches support PoE 60W on all copper ports.

NOTE: This section applies to the N1108EP-ON/N1108P-ON/N1124P-ON/N1148P-ON/N1524P/N1548P/N2024P/N2048P/N2128PX-ON/N2224PX-ON/N2248PX-ON/N3024P/N3048P/N3132PX-ON/N3208PX-ON/N3224P-ON/N3248P-ON/N3248PXE-ON/N3224PX-ON/ switches.

Flexible Power Management

The Dell EMC Networking PoE solution provides power management which supports power reservation, power prioritization and power limiting. The operator can assign a priority to each PoE port. When the power budget of the PoE switch has been exhausted, the higher priority ports are given preference over the lower priority ports. Lower priority ports are forcibly stopped to supply power in order to provide power to higher priority ports.

The static power management feature allows operators to reserve a guaranteed amount of power for a PoE port. This is useful for powering up devices which draw variable amounts of power and provide them an assured power range within which to operate. Class based power management allocates power at class limits as opposed to user defined limits.

In the Dynamic Power management feature, power is not reserved for a given port at any point of time. The power available with the PoE switch is calculated by subtracting the instantaneous power drawn by all the ports from the maximum available power. Thus, more ports can be powered at the same time. This feature is useful to efficiently power up more devices when the available power with the PoE switch is limited.

The Dell EMC Networking PoE solution also provides a global usage threshold feature in order to limit the PoE switch from reaching an overload condition. The operator can specify the limit as a percentage of the maximum power.

NOTE: PoE commands are only applicable to copper ports.

power inline

The **power inline** command enables/disables the ability of the port to deliver power.

Syntax

power inline {**auto**|**never**}

- **auto** — Enables device discovery and, if a device is found using the method specified by the power inline detection setting, supplies power to the device.
- **never** — Disables the device discovery protocol and stops supplying power to the device.

Default Value

The default value is auto, that is, device discovery is enabled and the port is capable of delivering power.

Command Mode

Global Configuration mode

User Guidelines

Auto enables the switch to deliver power to the powered device. The power inline management parameter should be set to class-based mode to enable power negotiation via LLDP-MED. Dell EMC Networking PoE-enabled ports should not be connected to other Power Sourcing Equipment (PSE) with PoE enabled. If the switch detects PSE equipment supplying power to a port, PoE power is disabled on the port. If a port supplying power issues an input power detected (0x24) status and no device is attached, the port should not be used as a possible short may exist.

Examples

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)# power inline auto
```

Command History

Command updated in version 6.7.0 firmware.

power inline detection

Use the **power inline detection** command to configure the detection type that tells which types of PD's will be detected and powered by the switch. Use the **no** form of this command to set the detection type to the default.

Syntax

power inline detection [unit *unit-id*]{**dot3at|dot3at+legacy**}

power inline detection [unit *unit-id*]{**dot3bt|dot3bt+legacy**}

no power inline detection [unit *unit-id*]

- **dot3at**—IEEE 802.3af/IEEE 802.3at detection only.
- **dot3at+legacy**—IEEE 802.3at detection followed by legacy capacitive detection.
- **unit** *unit-id*—The specific stack member to be configured.
- **dot3bt**—Enable strictly compliant IEEE 802.3bt detection on the switch. This is only available on the N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON switches.

- **dot3bt+legacy** —Enable 802.3bt, 802.3at, 802.3af and pre-9802.3af device detection. This is only available on the N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON switches.

Default Configuration

The default value is dot3at+legacy. IEEE 802.3bt+legacy detection is enabled by default for the N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON switches.

Command Mode

Global Configuration mode

User Guidelines

If no unit number is specified, the entire stack is configured. If the detection mode is configured at dot3at, class-based allocation will reserve the full amount of power (33W). To use legacy (pre-802.3af/802.3at), configure detection as dot3at+legacy.

The N2200PX-ON/N3200PX-ON switches implement IEEE 802.3bt event classification in addition to power negotiation using LLDP. PD's that implement 802.3bt may receive 60W power using four event detection or using LLDP negotiation. The dot3at/dot3at+legacy parameters are not available on these switches. IEEE 802.3bt is backwards compatible with 802.3at/802.3af/N3208PX-ON/N3224P-ON/N3224PX-ON/N3248P-ON/N3248PXE-ON devices.

Configure power inline detection **dot3bt** to enable IEEE 802.3bt compliant capability and disable pre-IEEE 802.3af event classification/detection. In this mode, class 0 devices are treated as class 3.

The **power inline detection dot3bt** and **power inline detection dot3bt+legacy** commands are only available on the N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON switches.

Command History

Release 6.3.6 deprecates the legacy-only parameter in favor of dot3at+legacy as the legacy-only capability is not present in the hardware.

Command updated in firmware release 6.6.1.

power inline four-pair forced

Use this command to force 4-pair power feed on an interface. Use the **no** form of the command to use the default 2-pair power feed.

Syntax

power inline four-pair forced

no power inline four-pair forced

Default Configuration

The default detection and power feed is four-pair power for ports that are capable of 60W power delivery. The default detection and power feed is Alt-A two-pair power for ports that are not capable of feeding four-pair power.

Command Mode

Interface Config

User Guidelines

Use this command when the interface is connected to a device that requires detection and power on all four pairs of wires (that is, on both the Alt-A signal and Alt-B spare pairs).

This command is only available on the N2100PX-ON, N3000EP-ON, and N3100PX-ON series switches. This command is not available on the N2200PX-ON, N3200P-ON, N3200PX-ON, and N3200PXE-ON Series switches.

Class D or better cabling is required for feeds in excess of 34.2W. Four pair power is supported in all management modes as follows:

- In class mode, the port power limit is twice the class power.
- In dynamic mode, up to 60W may be delivered depending on the switch used.
- In static mode, the port is limited to the configured limit.

Command History

Introduced in version 6.3.0.1 firmware. Command updated in firmware release 6.6.1.

Example

This example configures forced 60W 4-pair power mode on interface Gi1/0/1

```
console#configure
console(config)#interface gi/10/1
console(config-if-Gi1/0/1)#power inline four-pair forced
```

power inline limit

Use the **power inline limit** command to configure a specific power limit for a port. Use the **no** form of this command to set the power limit to the default.

Syntax

power inline limit user-defined *limit*

no power inline limit user-defined

- **user-defined** *limit*—Allows the port to draw up to user-defined value. The range is 3000-30000 milliwatts (mW) in two-pair mode. In four-pair mode, the range is 3000-60000 milliwatts.

Default Configuration

In two-pair mode, the default power limit is 30000 milliwatts. In four-pair mode, the default power limit is 60000 milliwatts.

Command Mode

Interface Configuration

User Guidelines

This command is not available on the N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON Series switches.

User defined limits are only operational if the power management mode is configured as static. By default, the power management mode is dynamic. If the operator attempts to set a user-defined limit and the power management mode is not configured as static, a warning is issued. On systems that support four-pair power, the UI does not check the limit against the port capability or the configuration. To deliver 60W power, ensure that the port is configured in four-pair mode.

The maximum configurable power limit is 30000 milliwatts for two-pair power. The maximum configurable power limit is 60000 milliwatts for four-pair power. The actual power delivered in two-pair or four-pair mode may exceed the user-defined limit. Refer to the *Class Power Limits and Margin* table in the Dell EMC Networking *User's Configuration Guide* for more information.

Example

This example configures interface Gi1/0/1 to deliver 60W four-pair power.

```
console#configure
console(config)#power inline management static
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#power inline four-pair forced
```

This example configures interface Gi1/0/2 to deliver 50W four-pair power (within the 5% tolerance). The port will deliver up to 52500 mW.

```
console#configure
console(config)#power inline management static
console(config)#interface gi1/0/2
console(config-if-Gi1/0/2)#power inline four-pair forced
console(config-if-Gi1/0/2)#power inline limit user-defined 50000
```

This example displays an interface configured in four-pair power mode.

```
console#show power inline gigabitethernet 1/0/1 detailed

Port   Powered Device   State Priority Status   Class  Power[mW]
                                    Detected/Assigned
------ --------------   ------ --------------   -----  ---------   --------
Gi1/0/1                 auto  Low      Searching/Unknown

          Limit    Power    High Power
Port       Type    Limit      Mode
--------- -------- -------- -----------
Gi1/0/1   None     57000    Enabled

Overload Counter.............................. 0
Short Counter ................................ 0
Denied Counter................................ 0
Absent Counter................................ 0
Invalid Signature Counter..................... 0
Output Voltage (Volts)........................ 53
Output Current (mAmps)........................ 0
```

```
Temperature (C)................................ 39
```

Command History

Description revised in 6.3.5 release. Command updated in firmware release 6.6.1.

power inline management

Use the **power inline management** command in Global Configuration mode to set the power management type. Use the **no** form of this command to set the management mode to the default.

Syntax

power inline management [**unit** *unit-id*]{**dynamic** | **static** | **class**}

no power inline management [**unit** *unit-id*]

- **dynamic**—Dynamic power management
- **static**—Static power management
- **class**—Class-based power management
- **unit-id**—A stack unit ID.

Default Configuration

Default management is dynamic.

Command Mode

Global Configuration

User Guidelines

The N2200PX-ON/N3200P-ON/N3200PX-ON/N3200PXE-ON switches only support **power inline management dynamic** or **power inline management class** configuration. When class-based management is enabled on these switches, IEEE 802.3bt autoclass is also enabled. PDs implementing autoclass may draw less than the class limit at maximum power. The excess power is available for use by other PDs.

If no unit is specified, all members of the stack are configured. Static, dynamic and class-based modes differ in how the available power is calculated and how much power may be delivered to the Powered Device. Refer to the PoE section in the *User's Configuration Guide* for information on Powered Device detection, power allocation methods, and the PoE guard band.

Example

In the following example, no port is specified so the command displays global configuration and status of all the ports. Configure the global power management scheme as dynamic with dot3at+legacy detection and enable PoE capability on ports Gi1/0/1-10.

```
console(config)#power inline management dynamic
console(config)#power inline detection dot3at+legacy
console(config)#interface range Gi1/0/1-10
console(config-if)#power inline auto
console(config-if)#exit
console#show power inline
Unit Status
===========
Unit........................................... 1
Power.......................................... On
Total Power.................................... 500 Watts
Threshold Power................................ 450 Watts
Consumed Power................................. 0 Watts
Usage Threshold................................ 90%
Power Management Mode.......................... Dynamic
Power Detection Mode........................... dot3at+legacy
Port Configuration
==================
Port   Powered Device   State Priority Status   Class  Power[mW]
                                  Detected/Assigned
------ --------------   ------ --------------   -----  ---------  --------
Gi1/0/1                 auto  Low      Searching  Unknown/Unknown
Gi1/0/2                 auto  Low      Searching  Unknown/Unknown
Gi1/0/3                 auto  Low      Searching  Unknown/Unknown
Gi1/0/4                 auto  Low      Searching  Unknown/Unknown
```

Command History

Description revised in version 6.3.1.5 release.

Description revised in version 6.3.1.6 release. Example revised in 6.4 release.

power inline poe-ha

Use the power inline poe-ha command to enable Perpetual PoE.

Syntax

power inline poe-ha [**unit** *unit-id*]

no power inline poe-ha [**unit** *unit-id*]

Default Configuration

Perpetual PoE is disabled by default. Fast PoE is enabled by default and cannot be disabled.

Command Mode

Global Configuration mode

User Guidelines

Perpetual PoE

Perpetual PoE allows the switch to supply power to PDs during reboot. The switch stores the power parameters for ports supplying PoE power when the running configuration is saved. If Perpetual PoE was enabled when the configuration was saved, power is not interrupted on PoE enabled ports during reboot. During or after the reboot cycle completes, the switch may power down or power up ports based upon the supplied power.

It is not possible to configure Perpetual PoE on individual ports.

Perpetual PoE is only available on the N1100EP-ON, N2200PX-ON, N3200P-ON, N3200PX-ON, and N3200PXE-ON Series switches.

Fast PoE

Fast PoE allows the switch to supply power to powered devices (PDs) prior to the switch firmware initializing the PoE ports during a power up event. The switch stores the power parameters for ports supplying PoE power when the running configuration is saved. Fast PoE is enabled by default and cannot be disabled. During or after the reboot cycle completes, the switch may power down or power up ports based upon the supplied power.

Fast PoE is only available on the N1100EP-ON, N2200PX-ON, N3200P-ON, N3200PX-ON, and N3200PXE-ON Series switches.

Command History

Command introduced in version 6.4.3 firmware. Command updated in firmware release 6.6.1.

Example

This example enables Perpetual PoE.

```
console(config)#power inline poe-ha
```

power inline powered-device

The **power inline powered-device** command adds a comment or description of the powered device type to enable the user to remember what is attached to the interface. To remove the description, use the no form of this command.

Syntax

power inline powered-device *pd-type*

no power inline powered-device

- *pd-type* — Specifies the type of powered device attached to the interface. (Range: 1–20 characters)

Command Mode

Interface Configuration (Ethernet).

User Guidelines

No specific guidelines.

Examples

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)# power inline powered-device IP-phone
```

power inline priority

The **power inline priority** command configures the port priority level, for the delivery of power to an attached device. The switch may not be able to supply power to all connected devices, so the port priority is used to determine which ports will supply power if adequate power capacity is not available for all enabled ports. For ports that have the same priority level, the lower-numbered port has higher priority.

For a system delivering peak power to a certain number of devices, if a new device is attached to a high-priority port, power to a low-priority port is shut down and the new device is powered up.

Syntax

power inline priority {**critical** | **high** | **low**}

no power inline priority

Command Mode

Interface Configuration (Ethernet).

User Guidelines

Priority is always enabled for all ports. If all ports have equal priority in an overload condition, the switch will shut down the highest numbered ports first.

Default Value

Low

Examples

```
console(config)#interface gigabitethernet 1/0/1
console(config-if-Gi1/0/1)# power inline priority high
```

power inline reset

Use the **power inline reset** command to reset the port.

Syntax

power inline reset

Default Configuration

This command has no default configuration.

Command Mode

Interface Configuration

User Guidelines

This command is useful if the port is stuck in an Error state. Power to the powered devices may be interrupted as the port is reset.

power inline usage-threshold

The **power inline usage-threshold** command configures the system power usage threshold level at which lower priority ports are disconnected. The threshold is configured as a percentage of the total available power. Use the **no** form of the command to set the threshold to the default value.

Syntax

power inline usage-threshold [**unit** *unit-id*] *threshold*

no power inline usage-threshold [**unit** *unit-id*]

- *threshold*— Power threshold at which ports are disconnected. The range is 25-99%.
- *unit-id*— A stack member identifier.

Default Configuration

The default threshold is 90%.

Command Mode

Global Configuration.

User Guidelines

If no unit number is specified, all stack members are configured. The power limit beyond which ports are disconnected has a configurable range as a percentage of total available power for the individual unit. The maximum power available is given in the table shown in the power inline management command. The usage threshold check calculates the actual consumed power and compares it against the (unit power maximum multiplied by the threshold)/100. If unit power consumption exceeds the threshold, and the power bank is active, ports are disconnected with an over-power condition. The disconnection is priority based. When ports are disconnected due to actual consumed power exceeding the threshold, a trap is generated.

Examples

```
console(config)# power inline usage-threshold 90
```

Command History

Syntax updated in 6.4 release.

clear power inline statistics

Use this command to clear the PoE statistics.

Syntax

clear power inline statistics [*interface-id*]

- *interface-id*—An Ethernet interface capable of supplying PoE power.

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec

User Guidelines

If no interface is specified, the statistics are cleared for all PoE-capable interfaces.

show power inline

Use the **show power inline** command to report current PoE configuration and status. If no port is specified, the command displays global configuration and status of all the ports. If a port is specified, then the command displays the details for the single port. Use the detailed parameter to show power limits, detection type and high power mode for the interface. The detailed parameter is not available on N2200 and N3200 devices.

Syntax

show power inline [*interface-id*] [**detailed**]

- *interface-id*—Any PoE-capable Ethernet interface. See Interface Naming Conventions for interface representation.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Ports configured in static mode will always show as Class 0 regardless of the actual PD type.

The power status column shows `Off` for ports that are administratively or error disabled.

The Power column shows the actual power drawn, not the configured value.

If a port supplying power detects PSE equipment, the power to the port is shut off. If a powered port shows input power detected status (0x24), and no device is attached, the port should not be used as a possible short may exist. The PoE controller returns the *Total Power Consumed* value in Watts. For this reason, Total Power Consumption value displayed might not exactly match the sum of power in milliwatts consumed by various Powered Devices.

The displayed information includes the following:

Field	Description
Priority	Displays the configured priority, which is one of **Critical**, **High**, **Medium**, or **Low**.

Admin	Displays the requested power delivery state, which is either **Auto** or **Never**.
Status	Displays the operational state which is one of **Off**, **Searching**, **On**, **Faulty**, **Testing**, **TestFail**, **Requesting**, or **Overload**.
Class (Measured/Assigned)	Displays the class power range for a single interface or the class, which is one of **Class0**, **Class1**, **Class2**, **Class3**, **Class4**, **Class5**, **Class6**, **Class7**, **Class8**, or **Unknown**.
Total Power	The switch input power (watts).
Threshold Power	The power draw that will cross the power threshold (watts).
Consumed Power	The power fed to the powered devices (watts).
Usage Threshold	The percentage of total power available minus the reserved power.
Power Management Mode	The configured power management mode.
Power Detection Mode	The configured power detection scheme.
High Availability Mode	The configured mode for perpetual and fast PoE.
Overload Counter	A count of the number of times an overload condition was detected.
Short Counter	A count of the number of times the port was turned off because a short was detected.
Denied Counter	A count of the number of times the port was turned off due to power management.
Absent Counter	A count of the number of times the port failed capacitor or resistor detection.
Invalid Signature	A count of the number of times an invalid signature was detected.
Input Voltage	The momentary voltage being fed to the PoE chip by the main power supply (in volts).
Input Current	The momentary current being fed to the PoE chip by the main power supply (in milliamps).

Temperature	The temperature as detected on the PoE chip (degrees centigrade). If the reported temperature is greater than 205°C, the real temperature is 256°C—the reported temperature.

Examples

```
console#show power inline

Unit Status
===========

Unit........................................ 1
Power....................................... On
Total Power................................. 25 Watts
Threshold Power............................. 22 Watts
Consumed Power.............................. 15 Watts
Usage Threshold............................. 90%
Power Management Mode....................... Dynamic
Power Detection Mode........................ dot3at+legacy
High Availability Mode...................... enable

Port Configuration
==================

Port    Powered Device   State Priority  Status    Class            Power[mW]
                                                   Detected/Assigned
-----   --------------   ----- -------- ---------- ---------------- ---------
Gi1/0/1                  auto  Low       On        Class3/Class3     15800
Gi1/0/2                  auto  Low       Test-Fail Unknown/Unknown
Gi1/0/3                  auto  Low       Searching Unknown/Unknown
Gi1/0/4                  auto  Low       Searching Unknown/Unknown
Gi1/0/5                  auto  Low       Searching Unknown/Unknown
Gi1/0/6                  auto  Low       Searching Unknown/Unknown
Gi1/0/7                  auto  Low       Searching Unknown/Unknown
Gi1/0/8                  auto  Low       Off       Unknown/Unknown


console#show power inline gi1/0/1

Port    Powered Device   State Priority  Status    Class            Power[mW]
                                                   Measured/Assigned)
----    --------------   ----- -------- ---------- --------------- ---------
Gi1/0/1                  auto  Low       Test-Fail Unknown/Unknown

Overload Counter............................ 0
```

```
Short Counter................................. 0
Denied Counter................................ 0
Absent Counter................................ 0
Invalid Signature Counter..................... 0
Output Voltage (Volts)........................ 53
Output Current (mAmps)........................ 0
Temperature (C)............................... 39
```

Command History

Example updated in 6.4 release. Description and outputs updated in firmware release 6.6.2.

show power inline firmware-version

Use the **show power inline firmware-version** command to display the version of the PoE controller firmware present on the switch file system.

Syntax

show power inline firmware-version

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command displays the PoE firmware version for each stack member individually.

Example

```
console(config)#show power inline firmware-version
Unit      Firmware Version
----      ----------------
1         265_1
```

RMON Commands

The Dell EMC Networking SNMP component includes an RMON (remote monitoring) agent. RMON is a base technology used by network management applications to manage a network. Troubleshooting and network planning can be accomplished through the network management applications. The network monitor monitors traffic on a network and records selected portions of the network traffic and statistics. The collected traffic and statistics are retrieved using SNMP. The data collected is defined in the RMON MIB, RFC 2819. A device that supports gathering and reporting the RMON data is referred to as an RMON probe or RMON Agent. An RMON probe provides RMON data to an RMON Manager for analysis and presentation to the user. An RMON probe may be embedded in an existing network device or stand-alone.

rmon alarm

Use the **rmon alarm** command in Global Configuration mode to configure alarm conditions. To remove an alarm, use the **no** form of this command. See also the related show rmon alarm command.

Syntax

rmon alarm *number variable interval* {**delta | absolute**} *rising-threshold value* [**event-number**] *falling-threshold value* [**event-number**] [**owner** *string*] [**startup** *direction*]

no rmon alarm *number*

- *number*—The alarm index. (Range: 1–65535)
- *variable*—A fully qualified SNMP object identifier that resolves to a particular instance of a MIB object.
- *interval*—The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. (Range: 1– 2147483647)
- *rising-threshold value*—Rising Threshold value. (Range: -2147483648 – 2147483647)
- *falling-threshold value*—Falling Threshold value. (Range: -2147483648 – 2147483647)

- **event-number**—The index of the Event that is used when a rising or falling threshold is crossed. (Range: 1- 65535)
- **delta**—The sampling method for the selected variable and calculating the value to be compared against the thresholds. If the method is delta, the selected variable value at the last sample is subtracted from the current value, and the difference compared with the thresholds.
- **absolute**—The sampling method for the selected variable and calculating the value to be compared against the thresholds. If the method is absolute, the value of the selected variable is compared directly with the thresholds at the end of the sampling interval.
- **startup** *direction*—The alarm that may be sent when this entry is first set to valid. If the first sample (after this entry becomes valid) is greater than or equal to the rising-threshold, and direction is equal to rising or rising-falling, then a single rising alarm is generated. If the first sample (after this entry becomes valid) is less than or equal to the falling-threshold, and direction is equal to falling or rising-falling, then a single falling alarm is generated.
- **owner** *string*—Enter a name that specifies who configured this alarm. If unspecified, the name is an empty string.

Default Configuration

No alarms are configured.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures the following alarm conditions:

- Alarm index — `1`
- Variable identifier — `1.3.6.1.2.1.2.2.1.10.5`
- Sample interval — `10 seconds`
- Rising threshold — `500000`

- Falling threshold — 10
- Rising threshold event index — 1
- Falling threshold event index — 1

```
console(config)#rmon alarm 1 1.3.6.1.2.1.2.2.1.1.10.5 10 50000 10 1 1
```

rmon collection history

Use the **rmon collection history** command in Interface Configuration mode to enable a Remote Monitoring (RMON) MIB history statistics group on an interface. To remove a specified RMON history statistics group, use the **no** form of this command. Also see the show rmon collection history command.

Syntax

rmon collection history *index* [**owner** *ownername*] [**buckets** *bucket-number*] [**interval** *seconds*]

no rmon collection history *index*

- *index* — The requested statistics index group. (Range: 1–65535)
- **owner** *ownername* — Records the RMON statistics group owner name. If unspecified, the name is an empty string.
- **buckets** *bucket-number* — A value associated with the number of buckets specified for the RMON collection history group of statistics. If unspecified, defaults to 50. (Range: 1 - 65535)
- **interval** *seconds* — The number of seconds in each polling cycle. If unspecified, defaults to 1800. (Range: 1–3600)

Default Configuration

The **buckets** configuration is 50. The **interval** configuration is 1800 seconds.

Command Mode

Interface Configuration (gigabitethernet, port-channel, tengigabitethernet, fortygigabitethernet) mode.

User Guidelines

This command cannot be executed on multiple ports using the **interface range** command.

Example

The following example enables a Remote Monitoring (RMON) MIB history statistics group on port 1/0/8 with the index number "1" and a polling interval period of 2400 seconds.

```
console(config)#interface gigabitethernet 1/0/8
console(config-if-Gi1/0/8)#rmon collection history 1 interval 2400
```

rmon event

Use the **rmon event** command in Global Configuration mode to configure an event. To remove an event, use the **no** form of this command. See also the show rmon events command.

Syntax

rmon event number [**log**] [**trap** *community*] [**description** *string*] [**owner** *string*]

no rmon event *number*

- **number**—The event index. (Range: 1–65535)
- **log**—An entry is made in the log table for each event.
- **trap**—An SNMP trap is sent to one or more management stations.
- **community**—If an SNMP trap is to be sent, it is sent to the SNMP community specified by this octet string. (Range: 0-127 characters)
- **description**—A comment describing this event. (Range 0-127 characters)
- **owner**—Enter a name that specifies who configured this event. If unspecified, the name is an empty string.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example configures an event with the trap index of 10.

```
console(config)#rmon event 10 log
```

rmon hcalarm

Use the **rmon hcalarm** to configure high capacity alarms.Use the **no** form of the command to remove the alarm.

Syntax

rmon hcalarm *alarmnumber variable interval* {**absolute** | **delta**} **rising-threshold** *value-64*[*rising-event-index*] **falling-threshold** *value-64*[*falling-event-index*] [**startup** {**rising** | **falling** | **rising-falling**}] [**owner** *string*]

- *alarmnumber*—An alarm number that uniquely identifies the alarm entry. (Range: 1-65536). Each entry defines a diagnostic sampler at a particular interval for an object on the device.
- *variable*—The MIB object to monitor. May be fully qualified or relative. Only variables that resolve to an ASN.1 primitive type of INTEGER are allowed.
- *interval*—The interval in seconds over which the data is sampled and compared with the rising and falling thresholds. (Range: 1– 2147483647. The default is 1 second.)
- **absolute**—Specifies to use a fixed value for the threshold (Default value).
- **delta**—Specifies to use the difference between the current value and the previous value.
- **rising-threshold** *value-64*—Rising threshold value ($-(2^{63})$ to $2^{63} - 1$)
- *rising-event-index*—Event to trigger when the rising threshold is crossed (1–65535).

- **falling-threshold-high** *value-64*—Falling threshold value ($-(2^{63})$ to $2^{63} - 1$)
- *falling-event-index*—Event to trigger when the rising threshold is crossed (1–65535).
- **startup** {**rising|falling|rising-falling**]—The event that is sent when this entry is first set to active. If the first sample after this entry is configured is greater than or equal to the rising threshold and startup rising or startup rising-falling is configured, a single rising event is generated. If the first sample after this entry is configured is less than or equal to the falling threshold and startup falling or startup rising-falling is configured then a single falling event is generated.
- **owner** *string*—Specify an owner for the alarm (string – no default).

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

```
console(config)# rmon hcalarm 2 ifInOctets.1 30 absolute rising-threshold
high 2147483648 falling-threshold high    -2147483648 startup rising owner
"dell-owner"
```

show rmon alarm

Use the **show rmon alarm** command in User Exec mode to display alarm configuration. Also see the rmon alarm command.

Syntax

show rmon alarm *number*

- *number* — Alarm index. (Range: 1–65535)

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays RMON 1 alarms.

```
console> show rmon alarm 1
Alarm 1
-------
OID: 1.3.6.1.2.1.2.2.1.10.1
Last sample Value: 878128
Interval: 30
Sample Type: delta
Startup Alarm: rising
Rising Threshold: 8700000
Falling Threshold: 78
Rising Event: 1
Falling Event: 1
Owner: CLI
```

The following table describes the significant fields shown in the display:

Field	Description
Alarm	Alarm index.
OID	Monitored variable OID.
Last Sample Value	The statistic value during the last sampling period. For example, if the sample type is delta, this value is the difference between the samples at the beginning and end of the period. If the sample type is absolute, this value is the sampled value at the end of the period.
Interval	The interval in seconds over which the data is sampled and compared with the rising and falling thresholds.

Field	Description
Sample Type	The method of sampling the variable and calculating the value compared against the thresholds. If the value is **absolute**, the value of the variable is compared directly with the thresholds at the end of the sampling interval. If the value is **delta**, the value of the variable at the last sample is subtracted from the current value, and the difference compared with the thresholds.
Startup Alarm	The alarm that may be sent when this entry is first set. If the first sample is greater than or equal to the rising threshold, and startup alarm is equal to rising or rising and falling, then a single rising alarm is generated. If the first sample is less than or equal to the falling threshold, and startup alarm is equal falling or rising and falling, then a single falling alarm is generated.
Rising Threshold	A sampled statistic threshold. When the current sampled value is greater than or equal to this threshold, and the value at the last sampling interval is less than this threshold, a single event is generated.
Falling Threshold	A sampled statistic threshold. When the current sampled value is less than or equal to this threshold, and the value at the last sampling interval is greater than this threshold, a single event is generated.
Rising Event	The event index used when a rising threshold is crossed.
Falling Event	The event index used when a falling threshold is crossed.
Owner	The entity that configured this entry.

show rmon alarms

Use the **show rmon alarms** command in User Exec mode to display the alarms summary table.

Syntax

show rmon alarms

Default Configuration

This command has no arguments or keywords.

Command Mode

User Exec, Privileged Exec modes, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the alarms summary table:

```
console> show rmon alarms
Index    OID                      Owner
-----    ----------------------   -------
1        1.3.6.1.2.1.2.2.1.10.1   CLI
2        1.3.6.1.2.1.2.2.1.10.1   Manager
3        1.3.6.1.2.1.2.2.1.10.9   CLI
```

The following table describes the significant fields shown in the display:

Field	Description
Index	An index that uniquely identifies the entry.
OID	Monitored variable OID.
Owner	The entity that configured this entry.

show rmon collection history

Use the **show rmon collection history** command in User Exec mode to display the requested group of statistics. Also see the rmon collection history command.

Syntax

show rmon collection history [{**gigabitethernet** unit/slot/port | **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}]

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display:

Field	Description
Index	An index that uniquely identifies the entry.
Interface	The sampled Ethernet interface.
Interval	The interval in seconds between samples.
Requested Samples	The requested number of samples to be saved.
Granted Samples	The granted number of samples to be saved.
Owner	The entity that configured this entry.

Example

The following example displays all RMON group statistics.

```
console> show rmon collection history
Index  Interface  Interval   Requested   Granted   Owner
                              Samples    Samples
----------------------------------------------------------
1        Gi1/0/1       30          50          50       CLI
2        Gi1/0/1      1800         50          50       Manager
```

show rmon events

Use the **show rmon events** command in User Exec mode to display the RMON event table. Also see the rmon event command.

Syntax

show rmon events

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display:

Field	Description
Index	An index that uniquely identifies the event.
Description	A comment describing this event.
Type	The type of notification that the device generates about this event. Can have the following values: **none**, **log**, **trap**, **log-trap**. In the case of log, an entry is made in the log table for each event. In the case of trap, an SNMP trap is sent to one or more management stations.
Community	If an SNMP trap is to be sent, it is sent to the SNMP community specified by this octet string.
Owner	The entity that configured this event.
Last time sent	The time this entry last generated an event. If this entry has not generated any events, this value is zero.

Example

The following example displays the RMON event table.

```
console> show rmon events
Index Description    Type    Community   Owner   Last time sent
----- -----------    ----    ---------   ------  -------------------
1     Errors         Log     CLI                 Jan 18 2005  23:58:17
2     High Broadcast Log-Trap  switch    Manager Jan 18 2005  23:59:48
```

show rmon hcalarm

Use the show rmon hcalarm command to display high capacity (64-bit) alarms configured with the rmon hcalarm command.

Syntax

show rmon {hcalarms | hcalarm *number***}**

- *number*—The alarm index (Range: 1-65535)

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec (all show modes)

User Guidelines

This command has no user guidelines.

Example

```
console#show rmon hcalarm 2

Alarm 2
----------
OID: ifInOctets.1
Last Sample Value: 0
Interval: 30
Sample Type: absolute
Startup Alarm: rising
Rising Threshold High: 2
Rising Threshold Low: 10
Rising Threshold Status: Positive
Falling Threshold High: 20
Falling Threshold Low: 10
Falling Threshold Status: Positive
Rising Event: 1
Falling Event: 2
Startup Alarm: Rising
Owner: dell-owner

console#show rmon hcalarms

Index    OID                      Owner
----------------------------------------------
2      ifInOctets.1               dell-owner
```

show rmon history

Use the **show rmon history** command in User Exec mode to display RMON Ethernet Statistics history. Also see the rmon collection history command.

Syntax

show rmon history *index* [**throughput** | **errors** | **other**] [**period** *seconds*]

- *index* — The requested set of samples. (Range: 1–65535)
- **throughput** — Displays throughput counters.
- **errors** — Displays error counters.
- **other** — Displays drop and collision counters.
- **period** *seconds* — Specifies the requested period time to display. (Range: 0–2147483647)

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display:

Field	Description
Time	Date and Time the entry is recorded.
Octets	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).
Packets	The number of packets (including bad packets) received during this sampling interval.
Broadcast	The number of good packets received during this sampling interval that were directed to the Broadcast address.
Multicast	The number of good packets received during this sampling interval that were directed to a multicast address. This number does not include packets addressed to the Broadcast address.
%	The best estimate of the mean physical layer network utilization on this interface during this sampling interval, in hundredths of a percent.

Field	Description
CRC Align	The number of packets received during this sampling interval that had a length (excluding framing bits but including FCS octets) between 64 and 1518 octets, inclusive, but had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
Undersize	The number of packets received during this sampling interval that were less than 64 octets long (excluding framing bits but including FCS octets) and were otherwise well formed.
Oversize	The number of packets received during this sampling interval that were longer than 1518 octets (excluding framing bits but including FCS octets) but were otherwise well formed.
Fragments	The total number of packets received during this sampling interval that were less than 64 octets in length (excluding framing bits but including FCS octets) had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error), or a bad FCS with a non-integral number of octets (AlignmentError). It is normal for etherHistoryFragments to increment because it counts both runts (which are normal occurrences due to collisions) and noise hits.
Jabbers	The number of packets received during this sampling interval that were longer than 1518 octets (excluding framing bits but including FCS octets), and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
Dropped	The total number of events in which packets were dropped by the probe due to lack of resources during this sampling interval. This number is not necessarily the number of packets dropped. It is just the number of times this condition has been detected.
Collisions	The best estimate of the total number of collisions on this Ethernet segment during this sampling interval.

Examples

The following example displays RMON Ethernet Statistics history for “throughput” on index number 1.

```
console> show rmon history 1 throughput
Sample Set: 1 Owner: CLI
Interface: Gi1/0/1 interval: 1800
Requested samples: 50       Granted samples: 50
```

```
Maximum table size: 270
Time                 Octets     Packets     Broadcast  Multicast   %
-------------------- ---------  ----------- ------     -------- --
09-Mar-2005  18:29:32 303595962  357568      3289       7287 19
09-Mar-2005  18:29:42 287696304  275686      2789       5878 20
```

The following example displays RMON Ethernet Statistics history for errors on index number 1.

```
console> show rmon history 1 errors
Sample Set: 1Owner: Me
Interface: Gi1/0/1interval: 1800
Requested samples: 50Granted samples: 50
Maximum table size: 500 (800 after reset)

Time  CRC  UndersizeOversizeFragmentsJabbers Align
----------- ---------  ---------- --------- --------- --------- ---------
09-Mar-2005110490 18:29:32
09-Mar-2005110270 18:29:42
```

The following example displays RMON Ethernet Statistics history for “other” on index number 1.

```
console> show rmon history 1 other
Sample Set: 1               Owner: Me
Interface:  Gi1/0/1 Interval: 1800
Requested samples: 50       Granted samples: 50
Maximum table size: 270
Time                   Dropped     Collisions
-------------------    ----------- -----------
10-Mar-2005  22:06:00     3           0
10-Mar-2005  22:06:20     3           0
```

show rmon log

Use the **show rmon log** command in User Exec mode to display the RMON logging table.

Syntax

show rmon log [*event*]

- *event* — Event index. (Range: 1–65535)

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display:

Field	Description
Event	An index that uniquely identifies the event.
Description	A comment describing this event.
Time	The time this entry was created.

Example

The following examples display the RMON logging table.

```
console> show rmon log
Maximum table size: 100
Event Description     Time
----- -----------     --------------------
1     Errors          Jan 18 2005  23:48:19
1     Errors          Jan 18 2005  23:58:17
2     High Broadcast  Jan 18 2005  23:59:48
console> show rmon log
Maximum table size: 100 (100 after reset)
Event Description     Time
----- -----------     --------------------
1     Errors          Jan 18 2005  23:48:19
1     Errors          Jan 18 2005  23:58:17
2     High Broadcast  Jan 18 2005  23:59:48
```

show rmon statistics

Use the **show rmon statistics** command in User Exec mode to display the RMON Ethernet Statistics.

Syntax

show rmon statistics {**gigabitethernet** unit/slot/port| **port-channel** *port-channel-number* | **tengigabitethernet** unit/slot/port | **fortygigabitethernet** unit/slot/port}

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following table describes the significant fields shown in the display:

Field	Description
Dropped	The total number of events in which packets are dropped by the probe due to lack of resources. This number is not always the number of packets dropped; it is the number of times this condition has been detected.
Octets	The total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).
Packets	The total number of packets (including bad packets, broadcast packets, and multicast packets) received.
Broadcast	The total number of good packets received and directed to the Broadcast address. This does not include multicast packets.
Multicast	The total number of good packets received and directed to a multicast address. This number does not include packets directed to the Broadcast address.
CRC Align Errors	The total number of packets received with a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but with either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).

Field	Description
Undersize Pkts	The total number of packets received less than 64 octets long (excluding framing bits, but including FCS octets) and otherwise well formed.
Oversize Pkts	The total number of packets received longer than 1518 octets (excluding framing bits, but including FCS octets) and otherwise well formed.
Fragments	The total number of packets received less than 64 octets in length (excluding framing bits but including FCS octets) and either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
Jabbers	The total number of packets received longer than 1518 octets (excluding framing bits, but including FCS octets), and either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
Collisions	The best estimate of the total number of collisions on this Ethernet segment.
64 Octets	The total number of packets (including bad packets) received that are 64 octets in length (excluding framing bits but including FCS octets).
65 to 127 Octets	The total number of packets (including bad packets) received that are between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
128 to 255 Octets	The total number of packets (including bad packets) received that are between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
256 to 511 Octets	The total number of packets (including bad packets) received that are between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
512 to 1023 Octets	The total number of packets (including bad packets) received that are between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
1024 to 1518 Octets	The total number of packets (including bad packets) received that are between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).

Example

The following example displays RMON Ethernet Statistics for port Te1/0/1.

```
console#show rmon statistics tengigabitethernet 1/0/1

Port: Te1/0/1
Dropped: 0
Octets: 0  Packets: 0
Broadcast: 0  Multicast: 0
CRC Align Errors: 0  Collisions: 0
Undersize Pkts: 0  Oversize Pkts: 0
Fragments: 0  Jabbers: 0
64 Octets: 0  65 - 127 Octets: 0
128 - 255 Octets: 0  256 - 511 Octets: 0
512 - 1023 Octets: 0  1024 - 1518 Octets: 0
HC Overflow Pkts: 0  HC Pkts: 0
HC Overflow Octets: 0  HC Octets: 0
HC Overflow Pkts 64 Octets: 0  HC Pkts 64 Octets: 0
HC Overflow Pkts 65 - 127 Octets: 0  HC Pkts 65 - 127 Octets: 0
HC Overflow Pkts 128 - 255 Octets: 0  HC Pkts 128 - 255 Octets: 0
HC Overflow Pkts 256 - 511 Octets: 0  HC Pkts 256 - 511 Octets: 0
HC Overflow Pkts 512 - 1023 Octets: 0  HC Pkts 512 - 1023 Octets: 0
HC Overflow Pkts 1024 - 1518 Octets: 0  HC Pkts 1024 - 1518 Octets: 0
```

Serviceability Commands

Debug commands cause the output of the enabled trace to display on a serial port or telnet console. Note that the output resulting from enabling a debug trace always displays on the serial port. The output resulting from enabling a debug trace displays on all login sessions for which any debug trace has been enabled. The configuration of a debug command remains in effect the whole login session.

The output of a debug command is always submitted to the SYSLOG service at a DEBUG severity level. As such, it can be forwarded to a SYSLOG server, stored in the buffer log, or otherwise processed in accordance with the configuration of the SYSLOG service. Configuration of console logging in the SYSLOG service is not required in order to view the output of debug traces.

Debug commands are provided in the normal CLI tree. Debug settings are not persistent and are not visible in the running configuration. To view the current debug settings, use the **show debugging** command.

The output of debug commands can be voluminous and may adversely affect system performance. Therefore, debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output. Use of debug level logging when performing operations such as switch fail-over is not recommended.

Enabling debug for all IP packets can cause a serious impact on the system performance; therefore, it is limited by ACLs. This means debug can be enabled for IP packets that conform to the configured ACL. This also limits the feature availability to only when the QoS component is available. Debug for VRRP and ARP are available on routing builds.

NOTE: Debug commands are not persistent across resets.

debug aaa

Use the **debug aaa** command to track AAA events.

Use the **no** form of the command to disable accounting debugging.

Syntax

debug aaa { accounting | coa | pod }

no debug aaa { accounting | coa | pod }

- accounting—Trace events for RADIUS accounting server interactions.
- coa—Trace events for RADIUS CoA server interactions (such as, RADIUS bounce host port, disable host port, ...).
- pod—Trace events for RADIUS POD (RADIUS Disconnect-Request) server instructions.

Default Configuration

No debug tracing is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output. Use of debug level logging when performing operations such as switch failover is not recommended.

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (**logging console debug**).

The debug options enabled for a specific peer are the union of the options enabled globally and the options enabled specifically for the peer.

Enabling one of the packet type options enables packet tracing in both the inbound and outbound directions.

Command History

Command updated in version 6.6 firmware.

Example

```
console#debug aaa accounting
```

debug arp

Use the **debug arp** command to enable tracing of ARP packets. Use the **no** form of this command to disable tracing of ARP packets.

Use of the optional **vrf** parameter executes the command within the context of the VRF specific routing table.

Syntax

debug arp [**vrf** *vrf-name*]

no debug arp

- *vrf-name*—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.

Default Configuration

ARP packet tracing is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the *vrf* parameter.

This vrf parameter is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug arp
```

debug authentication interface

Use this command to enable Authentication Manager debug traces for the interface.Use the **no** form of this command to set the debug trace to factory default value.

Syntax

debug authentication {**event** | **all**} *interface-id*

no debug authentication {**event** | **all**} *interface-id*

- **event**—Traces Authentication Manager debug events.
- **all**—Enables all Authentication Manager debugs.
- *interface-id*—The interface to trace.

Default Configuration

Default value is disabled.

Command Modes

Privileged Exec mode

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console# debug authentication event Gi1/0/1
console# debug authentication all Gi1/0/1
```

debug auto-voip

Use the **debug auto-voip** command to enable Auto VOIP debug messages. See the optional parameters to trace H323, SCCP, or SIP packets respectively. Use the “no” form of this command to disable Auto VOIP debug messages.

Syntax

debug auto-voip [H323 | **SCCP** | **SIP**]

no debug auto-voip [H323 | SCCP | SIP]

Default Configuration

Auto VOIP tracing is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug auto-voip
```

debug bfd

Use this command to enable the display of BFD events or packets.

Syntax

debug bfd {**packet** | **event**}

no debug bfd {**packet** | **event**}

- **packet**—Display BFD control packets.
- **event**—Display BFD state transition events.

Default Configuration

Debug is disabled by default.

Command Mode

Privileged Exec

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

Example

```
console# configure
console(config)# vlan 100
console(config-vlan100)# exit
console(config)# interface vlan 100
console(config-if-vlan100)# bfd interval 100 min_rx 100 multiplier 5
```

debug cfm

Use the **debug cfm** command to enable CFM debugging. Use the **no** form of the command to disable debugging.

Syntax

debug cfm {**event** | {**pdu** {**all** | **ccm** | **ltm** | **lbm** |} {**tx** | **rx**}}}

- **event**—CFM events
- **pdu**—CFM PDUs
- **ccm**—Continuity check messages
- **ltm**—Link trace messages
- **lbm**—Loopback messages
- **tx**—Transmit only
- **rx**—Receive only
- **all**—Everything

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

Example

The following examples enables display of CFM events on the console.

```
console#debug cfm event
```

debug clear

Use the **debug clear** command to disable all debug traces.

Syntax

debug clear

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode.

User Guidelines

There are no user guidelines for this command.

Example

```
console#debug clear
```

debug console

Use the **debug console** to enable the display of “debug” trace output on the login session in which it is executed. Debug console display must be enabled in order to view any trace output. The output of debug trace commands appears on all login sessions for which debug console has been enabled. The configuration of this command remains in effect for the life of the login session. The effect of this command is not persistent across resets.

Syntax

debug console

Default Configuration

Display of debug traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug console
```

debug crashlog

Use this command to display the crash log contents on the console.

Syntax

debug crashlog {c*rashlog-index* | **proc** | **kernel** *crashlog-index* | **data** c*rashlog-index* [*comp-id*] [*item-number*] [*add-param*] [*add-param*] | **deleteall**} [**unit** *unit-index*]

- *crashlog-index*—Indicates which crash log to display. The range is 0-4. 0 indicates the most recent log and 4 specifies the oldest log.
- **proc**—Display the process crash log.
- **kernel**—Display the kernel crash data.
- **data**—Display the crash summary data.
- **deleteall**—Delete all existing crash logs.
- *unit-index*—An optional specifier identifying the stack unit number from which to obtain the crash log.
- *comp-id*—
- *item-number*—

- *add-param—*

Default Configuration

By default, this command displays all crash logs for the specified index.

Command Modes

Privileged Exec mode, User Config mode, all show modes

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example displays the most recent crash log for the management unit in the stack.

```
console#debug crashlog 0

Displaying Crash Dump 0
For kernel Crash Dump - osapiDebugCrashDumpDisplay(x,1)

***************************************************
*           Start Stack Information      *
***************************************************
pid:              32195
TID:              -1215952016
Task Name:        emWeb
si_signo:         11
si_errno:         0
si_code:          1
si_addr:          0x0
Date/Time:        8/13/2011 16:37:31
SW ver:           0.0.0.0

------------ CALL STACK INFO ------------
Stack pointer before signal: 0x00000000
Offending instruction at address 0x00000000
tried to access address 0x00000000
CPU's exception-cause code: 0x00000000
```

```
Registers (hex) at time of fault:
              r01: 00000000 r02: 00000000 r03: 00000000 r04: 00000000
r05: 00000000 r06: 00000000 r07: 00000000 r08: 00000000 r09: 00000000
r10: 00000000 r11: 00000000 r12: 00000000 r13: 00000000 r14: 00000000
r15: 00000000 r16: 00000000 r17: 00000000 r18: 00000000 r19: 00000000
r20: 00000000 r21: 00000000 r22: 00000000 r23: 00000000 r24: 00000000
r25: 00000000 r26: 00000000 r27: 00000000 r28: 00000000 r29: 00000000
r30: 00000000 r31: 00000000

$0x083da883$ $0x083c9955$ $0x0804b8f6$ $0x0012e40c$ $0x083c73c3$
$0x083c7211$
$0x082b05e3$ $0x081ed66c$ $0x0839db78$ $0x083a0c22$ $0x0839b295$
$0x0839a928$
$0x083a7b73$ $0x08387592$ $0x08372fbc$ $0x08395caf$ $0x083996de$
$0x083d6f71$
$0x00134e99$ $0x0021873e$
-----------------------------------------


**************************************************
*          End Stack Information         *
**************************************************

------------ CALL STACK INFO (VERBOSE) ------------
Stack pointer before signal: 0x00000000
Offending instruction at address 0x00000000
tried to access address 0x00000000
CPU's exception-cause code: 0x00000000
Registers (hex) at time of fault:
              r01: 00000000 r02: 00000000 r03: 00000000 r04: 00000000
r05: 00000000 r06: 00000000 r07: 00000000 r08: 00000000 r09: 00000000
r10: 00000000 r11: 00000000 r12: 00000000 r13: 00000000 r14: 00000000
r15: 00000000 r16: 00000000 r17: 00000000 r18: 00000000 r19: 00000000
r20: 00000000 r21: 00000000 r22: 00000000 r23: 00000000 r24: 00000000
r25: 00000000 r26: 00000000 r27: 00000000 r28: 00000000 r29: 00000000
r30: 00000000 r31: 00000000

$083da883$ osapiSigTrace + 0x14f
$083c9ac0$ osapiCrashDump + 0x449
$0804b8f6$ sigsegv_handler + 0xa7
$0012e40c$ ?????
$083c73c3$ osapiFree + 0x187
$083c7211$ osapiDebugCorruptHeap + 0x65
$082b05e3$ cliDevShell + 0x2ab
$081ed66c$ commandDevShell + 0x373
$0839db78$ ewsCliExec + 0xbf
$083a0c22$ ewsCliData + 0x3045
```

```
$0839b295$ ewaNetTelnetDataInternal + 0x959
$0839a928$ ewaNetTelnetData + 0x30
$083a7b73$ ewsTelnetParse + 0x2b9
$08387592$ ewsParse + 0x162a
$08372fbc$ ewsRun + 0x149
$08395caf$ ewmain + 0x17c
$083996de$ emweb_main + 0x1a3
$083d6f71$ osapi_task_wrapper + 0xa6
$00134e99$ ?????
$0021873e$ ?????
-----------------------------------------
```

debug dhcp packet

Use the **debug dhcp packet** command to display debug information about DHCPv4 client activities and to trace DHCPv4 packets to and from the local DHCPv4 client. To disable debugging, use the **no** form of this command.

Syntax

debug dhcp packet [**transmit** | **receive**]

no debug dhcp packet [**transmit** | **receive**]

Default Configuration

By default, DHCP client packet tracing is disabled.

Command Mode

Privileged Exec

User Guidelines

The DHCP client has an internal packet tracing capability. This command turns the packet tracing on.

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

Example

This example enables DHCP client packet tracing for both transmit and receive flows.

```
console#debug dhcp packet
```

The second example is for transmit flow.

```
console#debug dhcp packet transmit
```

The third example is for receive flow.

```
console#debug dhcp packet receive
```

debug dhcp server packet

Use this command to trace DHCPv4 packets to and from the local DHCPv4 server. To disable debugging, use the **no** form of this command.

Syntax

debug dhcp server packet

no debug dhcp server packet

Default Configuration

DHCP server packet tracing is disabled by default.

Command Mode

Privileged Exec

User Guidelines

The DHCP server support an internal packet tracing facility. This command turns the packet tracing on.

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

Example

This example enables DHCP server packet tracing.

```
console#debug dhcp server packet
```

debug dot1x

Use the **debug dot1x** command to enable dot1x packet tracing. Use the “no” form of this command to disable dot1x packet tracing.

Syntax

debug dot1x packet [**receive** | **transmit**]

no debug dot1x packet [**receive** | **transmit**]

Default Configuration

Display of dot1x traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug dot1x packet
```

debug igmpsnooping

Use the **debug igmpsnooping** to enable tracing of IGMP Snooping packets transmitted and/or received by the switch. IGMP Snooping should be enabled on the device and the interface in order to monitor packets for a particular interface.

Syntax

debug igmpsnooping packet [**receive** | **transmit**]

no debug igmpsnooping packet [**receive** | **transmit**]

Default Configuration

Display of IGMP Snooping traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug igmpsnooping packet
```

debug ip acl

Use the **debug ip acl** command to enable debug of IP Protocol packets matching the ACL criteria. Use the “no” form of this command to disable IP ACL debugging.

Syntax

debug ip acl *acl*

no debug ip acl *acl*

- *acl* — The number of the IP ACL to debug.

Default Configuration

Display of IP ACL traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip acl 1
```

debug ip bgp

To enable debug tracing of BGP events, use the **debug ip bgp** command. To disable debug tracing, use the **no** form of this command.

Syntax

debug ip bgp [**vrf** *vrf-name*] [**i***pv4-address* | *ipv6-address* [**interface** *interface-id*]] | **events** | **keepalives** | **notification** | **open** | **refresh** | **updates** | **in** | **out**]

no debug ip bgp [**i***pv4-address* | *ipv6-address* [**interface** *interface-id*] | **events** | **keepalives** | **notification** | **open** | **refresh** | **updates** | **in** | **out**]

- *interface-id*—A routing interface identifier (VLAN interface).
- **vrf** *vrf-name*—Displays aggregate address information associated with the named VRF.
- *ipv4-address*—(Optional) The IPv4 address of a BGP peer. Debug traces are enabled for a specific peer when this option is specified. The command can be issued multiple times to enable simultaneous tracing for multiple peers.
- *ipv6-address* [**interface** *interface-id*]—The IPv6 address of a BGP peer. Debug traces are enabled for a specific peer when this option is specified. The command can be issued multiple times to enable simultaneous tracing for multiple peers.
- **events**—(Optional) Trace adjacency state events.
- **keepalives**—(Optional) Trace transmit and receive of KEEPALIVE packets.
- **notification**—(Optional) Trace transmit and receive of NOTIFICATION packets.
- **open**—(Optional) Trace transmit and receive of OPEN packets.
- **refresh**—(Optional) Traces transmit and receive of ROUTE REFRESH packets.
- **updates**—(Optional) Traces transmit and receive of UPDATE packets.
- **in**—(Optional) Trace received packets.
- **out**—(Optional) Trace sent packets.

Default Configuration

Debug tracing is not enabled by default. By default, debug capability for the the global VRF is configured.

Command Mode

Global Configuration mode

User Guidelines

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (**logging console debug**).

The debug options enabled for a specific peer are the union of the options enabled globally and the options enabled specifically for the peer.

Enabling one of the packet type options enables packet tracing in both the inbound and outbound directions.

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

If the *vrf-name* is specified, information pertaining to that VRF is displayed.

Command History

Introduced in version 6.2.0.1 firmware.

Updated in version 6.3.0.1 firmware.

Example

```
console#debug ip bgp 10.27.21.142 events
```

debug ip device tracking

Use the **debug ip device tracking** command to enable tracing of the IPDT component. Use the **no** form of the command to disable IPDT tracing.

Syntax

debug ip device tracking

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode

User Guidelines

Debug messages are sent to the system log at the DEBUG severity level. To display them on the console, enable console logging at the DEBUG level (logging console debug).

Command History

Command introduced in version 6.6.0 firmware.

debug ip dvmrp

Use the **debug ip dvmrp** to trace DVMRP packet reception and transmission. The **receive** option traces only received DVMRP packets and the **transmit** option traces only transmitted DVMRP packets. When neither keyword is used in the command, all DVMRP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Syntax

debug ip dvmrp packet [**receive | transmit**]

no debug ip dvmrp packet [**receive | transmit**]

Default Configuration

Display of DVMRP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip dvmrp packet
```

debug ip igmp

Use the **debug ip igmp** command to trace IGMP packet reception and transmission. The **receive** option traces only received IGMP packets and the **transmit** option traces only transmitted IGMP packets. When neither keyword is used in the command, then all IGMP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the “no” form of this command to disable IGMP traces.

Syntax

debug ip igmp packet [**receive** | **transmit**]

no debug ip igmp packet [**receive** | **transmit**]

Default Configuration

Display of IGMP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip igmp packet
```

debug ip mcache

Use the **debug ip mcache** command for tracing MDATA packet reception and transmission. The **receive** option traces only received data packets and the **transmit** option traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the “no” form of this command to disable MDATA tracing.

Syntax

debug ip mcache packet [**receive** | **transmit**]

no debug ip mcache packet [**receive** | **transmit**]

Default Configuration

Display of MDATA traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip mcache packet
```

debug ip pimdm packet

Use the **debug ip pimdm packet** command to trace PIMDM packet reception and transmission. The **receive** option traces only received PIMDM packets and the **transmit** option traces only transmitted PIMDM packets. When neither keyword is used in the command, then all PIMDM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Use the **no** form of this command to disable debug tracing of PIMDM packet reception and transmission.

Syntax

debug ip pimdm packet [**receive** | **transmit**]

no debug ip pimdm packet [**receive** | **transmit**]

Default Configuration

Display of PIMDM traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip pimdm packet
```

debug ip pimsm packet

Use the **debug ip pimsm** command to trace PIMSM packet reception and transmission. The **receive** option traces only received PIMSM packets and the **transmit** option traces only transmitted PIMSM packets. When neither keyword is used in the command, then all PIMSM packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the **no** form of this command to disable debug tracing of PIMSM packet reception and transmission.

Syntax

debug ip pimsm packet [**receive** | **transmit**]

no debug ip pimsm packet [**receive** | **transmit**]

Default Configuration

Display of PIMSM traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ip pimsm packet
```

debug ip vrrp

To enable debug tracing of VRRP events, use the **debug ip vrrp** command in Privileged Exec mode. To disable debug tracing, use the **no** form of the command.

Syntax

debug ip vrrp

no debug ip vrrp

Default Configuration

No debug tracing is enabled by default.

Command Mode

Privileged Exec mode

User Guidelines

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (**logging console debug**).

The debug options enabled for a specific peer are the union of the options enabled globally and the options enabled specifically for the peer.

Enabling one of the packet type options enables packet tracing in both the inbound and outbound directions.

Command History

Command introduced in version 6.6 firmware.

debug ipv6 dhcp

Use the **debug ipv6 dhcp** command to display debug information about DHCPv6 client activities and to trace DHCPv6 packets to and from the local DHCPv6 client. To disable debugging, use the **no** form of the command.

Syntax

debug ipv6 dhcp

no debug ipv6 dhcp

Default Configuration

Debugging for the DHCP for IPv6 is disabled by default.

Command Mode

Privileged Exec

User Guidelines

This command enabled DHCPv6 packet tracing.

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Examples

```
console#debug ipv6 dhcp
```

debug ipv6 mcache

Use the **debug ipv6 mcache** command to trace MDATAv6 packet reception and transmission. The **receive** option traces only received data packets and the **transmit** option traces only transmitted data packets. When neither keyword is used in the command, then all data packet traces are dumped. Vital information such as source address, destination address, packet length, and the interface on which the packet is received or transmitted is displayed on the console.

Syntax

debug ipv6 mcache packet [**receive** | **transmit**]

no debug ipv6 mcache packet [**receive** | **transmit**]

Default Configuration

Display of MDATA traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ipv6 mcache packet
```

debug ipv6 mld

Use the **debug ipv6 mld** command to trace MLD packet reception and transmission. The **receive** option traces only received MLD packets and the **transmit** option traces only transmitted MLD packets. When neither keyword is used in the command, then all MLD packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the “no” form of this command to disable MLD tracing.

Syntax

debug ipv6 mld packet [**receive** | **transmit**]

no debug ipv6 mld packet [**receive** | **transmit**]

Default Configuration

Display of MLD traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ipv6 mld packet
```

debug ipv6 ospfv3 packet

Use the **debug ipv6 ospfv3 packet** command to enable debug tracing of IPv6 OSPFv3 packets.

Syntax

debug ipv6 ospfv3 packet [**vrf** *vrf-name*]

no debug ipv6 ospfv3 packet

- *vrf-name* — The name of an existing VRF instance.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, VRF Configuration

User Guidelines

Debug output should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug output. Use of debug-level logging when performing operations such as switch failover is not recommended.

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (logging console debug).

Command History

Command introduced in firmware release 6.6.1. Syntax to support VRFs added in version 6.7.0 firmware.

debug ipv6 pimdm

Use the **debug ipv6 pimdm** command to trace PIMDMv6 packet reception and transmission. The **receive** option traces only received PIMDMv6 packets and the **transmit** option traces only transmitted PIMDMv6 packets. When neither keyword is used in the command, then all PIMDMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the "no" form of this command to disable PIMDMv6 tracing.

Syntax

debug ipv6 pimdm packet [**receive** | **transmit**]

no debug ipv6 pimdm packet [**receive** | **transmit**]

Default Configuration

Display of PIMDMv6 traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ipv6 pimdm packet
```

debug ipv6 pimsm

Use the **debug ipv6 pimsm** command to trace PIMSMv6 packet reception and transmission. The **receive** option traces only received PIMSMv6 packets and the **transmit** option traces only transmitted PIMSMv6 packets. When neither keyword is used in the command, then all PIMSMv6 packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the "no" form of this command to disable PIMSMv6 tracing.

Syntax

debug ipv6 pimsm packet [**receive** | **transmit**]

no debug ipv6 pimsm packet [**receive** | **transmit**]

Default Configuration

Display of PIMSMv6 traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ipv6 pimsm packet
```

debug ipv6 ping

Use this command to enable tracing of ICMPv6 echo requests and responses. This command traces pings on the network port and on the routing interfaces. Use the no form of this command to disable tracing of ICMPv6 echo requests and responses.

Use of the optional **vrf** parameter executes the command within the context of the VRF-specific routing table.

Syntax

debug ipv6 ping packet [**vrf** *vrf-name*]

no debug ipv6 ping packet

- *vrf-name* — The name of the VRF associated with the routing table context used by the command. If no VRF is specified, the global routing table context is used.

Default Configuration

Display of ICMPv6 echo traces is disabled by default.

Command Mode

Privileged Exec mode

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Example

```
Console#debug ipv6 ping packet
```

Command History

Command introduced in version 6.7.0 firmware.

debug isdp

Use the **debug isdp** command to trace ISDP packet reception and transmission. The **receive** option traces only received ISDP packets and the **transmit** option traces only transmitted ISDP packets. When neither keyword is used in the command, then all ISDP packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the “no” form of this command to disable ISDP tracing.

Syntax

debug isdp packet [**receive** | **transmit**]

no debug isdp packet [**receive** | **transmit**]

Default Configuration

Display of ISDP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug isdp packet
```

debug lacp

Use the **debug lacp** command to enable tracing of LACP packets received and transmitted by the switch. Use the “no” form of this command to disable tracing of LACP packets.

Syntax

debug lacp packet

no debug lacp packet

Default Configuration

Display of LACP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug lacp packet
```

debug mldsnooping

Use the **debug mldsnooping** command to trace MLD snooping packet reception and transmission. The **receive** option traces only received MLD snooping packets and the **transmit** option traces only transmitted MLD snooping packets. When neither keyword is used in the command, then all MLD snooping packet traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the “no” form of this command to disable tracing of MLD Snooping packets.

Syntax

debug mldsnooping packet [**receive** | **transmit**]

no debug mldsnooping packet [**receive** | **transmit**]

Default Configuration

Display of MLD Snooping traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug mldsnooping
```

debug ospf

Use the **debug ospf** command to enable tracing of OSPF packets received and transmitted by the switch. Use the **no** form of this command to disable tracing of OSPF packets.

Use of the optional VRF parameter executes the command within the context of the VRF specific routing table.

Syntax

debug ospf packet [**vrf** *vrf-name*]

no debug ospf packet

- *vrf-name*—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.

Default Configuration

Display of OSPF traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the **vrf** parameter.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug ospf packet
```

debug ospfv3 packet

Use the **debug ospfv3 packet** command to enable tracing of OSPFv3 packets received and transmitted by the switch. Use the **no** form of this command to disable tracing of OSPFv3 packets.

Syntax

debug ospfv3 packet

no debug ospfv3 packet

Default Configuration

Display of OSPFv3 traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug output. Use of debug level logging when performing operations such as switch failover is not recommended.

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (logging console debug).

Example

```
console#debug ospfv3 packet
```

Command History

Command introduced in firmware release 6.6.1.

debug ping

Use the **debug ping** command to enable tracing of ICMP echo requests and responses. This command traces pings on the network port and on the routing interfaces. Use the **no** form of this command to disable tracing of ICMP echo requests and responses.

Use of the optional **vrf** parameter executes the command within the context of the VRF specific routing table.

Syntax

debug ping packet [**vrf** ***vrf-name***]

no debug ping packet

- ***vrf-name***—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.

Default Configuration

Display of ICMP echo traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

The VRF identified in the parameter must have been previously created or an error is returned.

Only IPv4 addresses are supported with the *vrf* parameter.

This command is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

The following example displays.

```
console#debug ping packet
```

debug rip

Use the **debug rip** command to enable tracing of RIP requests and responses. Use the **no** form of this command to disable tracing of RIP requests and responses.

Syntax

debug rip packet

no debug rip packet

Default Configuration

Display of RIP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug rip packet
```

debug sflow

Use the **debug sflow** command to enable sFlow debug packet trace. Use the **no** form of this command to disable sFlow packet tracing.

Syntax

debug sflow packet

no debug sflow packet

Default Configuration

Display of sFlow traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug sflow packet
```

debug spanning-tree

Use the d**ebug spanning-tree** command to trace spanning tree BPDU packet reception and transmission. The **receive** option traces only received spanning tree BPDUs and the **transmit** option traces only transmitted BPDUs. When neither keyword is used in the command, all spanning tree BPDU traces are dumped. Vital information such as source address, destination address, control packet type, packet length, and the interface on which the packet is received or transmitted is displayed on the console. Use the **no** form of this command to disable tracing of spanning tree BPDUs.

Syntax

debug spanning-tree bpdu [**receive** | **transmit**]

no debug spanning-tree bpdu [**receive** | **transmit**]

Default Configuration

Display of spanning tree BPDU traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

Example

```
console#debug spanning-tree bpdu
```

debug tacacs

Use the debug tacacs command to enable debug tracing of TACACS+ debugging.

Syntax

debug tacacs { **packet** [**receive** | **transmit**] | **accounting** | **authentication** }

no debug tacacs { **packet** | **accounting** | **authentication** }

- **packet receive**—Enable debugging for received TACACS packets.
- **packet transmit**—Enable debugging for transmitted TACACS packets.
- **accounting**—Enable debugging for TACACS accounting packets.
- **authentication**—Enable debugging for TACACS authentication packets.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output. Use of debug level logging when performing operations such as switch failover is not recommended.

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (logging console debug).

Command History

Command introduced in firmware release 6.6.1.

debug transfer

Use the **debug transfer** command to enable debug tracing of file transfers.

Syntax

debug transfer

no debug transfer

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output. Use of debug level logging when performing operations such as switch failover is not recommended.

Debug messages are sent to the system log at the DEBUG severity level. To print them on the console, enable console logging at the DEBUG level (logging console debug).

Command History

Command introduced in firmware release 6.6.1.

debug udld

Use the **debug udld** command to enable the display of UDLD packets or event processing.

Use the **no** form of the command to disable debugging.

Syntax

debug udld {packet [receive|transmit]|events}

no debug udld {packet [receive|transmit]|events}

- **Packet**—Display transmitted and received UDLD packets.
- **Receive**—Debug packets received by the switch.
- **Transmit**—Debug packets transmitted by the switch.
- **Events**—Display UDLD events.

Default Configuration

By default, debugging is disabled.

Command Mode

Privileged Exec mode

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

debug vpc

Use the **debug vpc** command to enable debug traces for the specified protocols. Use the **no** form of the command to disable all or some of the debug trace display.

Syntax

debug vpc {peer-keepalive [packet]| peer-link {control-message | data-message} | peer detection | core}

no debug vpc [{**peer-keepalive** [packet]**| peer-link** {**control-message | data-message**} **| peer detection | core**]

- **peer-keepalive**—Displays the debug traces for the keepalive state machine transitions. The packet option enables debug traces for the keepalive packets exchanged between the MLAG peer devices on the peer link.
- **peer-link**—In error cases, enables the debug traces for the control messages or data messages exchanged between the MLAG devices on the peer link.
- **peer detection**—Enables the debug traces dual control plane detection protocol. Traces are seen when DCPDP state changes occur (enable/disable, peer detected…).
- **core**—Displays the MLAG core messages.

Default Configuration

This command has no default configuration.

Command Modes

Global Configuration mode

User Guidelines

Debug commands should be used with caution. Switch behavior may be adversely affected by the additional processing load incurred by enabling debug output.

Example

```
console#debug vpc peer-link data-message

VPC peer link data message tracing enabled.
```

debug vrrp

Use the **debug vrrp** command to enable VRRP debug protocol messages. Use the **no** form of this command to disable VRRP debug protocol messages.

Syntax

debug vrrp all

no debug vrrp all

Default Configuration

The display of VRRP traces is disabled by default.

Command Mode

Privileged Exec mode.

User Guidelines

Debug output should be enabled with caution. Switch behavior may be adversely affected by the additional processing load incurred from enabling debug.

exception core-file

Use the **exception core-file** command to configure the core dump file name. Use the no form of the command the reset the core file name to the default.

Syntax

exception core-file *file-name* [**hostname** [**time-stamp**] **|** **time-stamp** [**hostname**]]

no exception core-file

- *file-name* — The file name. The maximum length is 15 characters. Embedded blanks may not be allowed by the host file system (for example, TFTP server) and are not recommended.
- **hostname** — Includes the switch host name in the core file name. If not configured, uses the switch MAC address in the core file name.
- *time-stamp*—Includes the switch TOD in the core file name.

Default Configuration

By default, the core file name has no prefix and no host name and uses the time stamp of the switch in the core file name.

Command Modes

Global Configuration mode

User Guidelines

The configuration parameters are not validated when this command is entered. Use the **write core test** command to validate the configured parameters and that the core dump is likely to succeed.

An average core file is around 450 KB. Example copy times are as follows:

- TFTP: 13mins (different subnet)
- USB: 3 mins

Administrators should ensure that a cleanly formatted USB flash drive of at least 1G is used for collection of a the full core dump. Do not remove the USB device during data transfer. Use the **unmount** command to cleanly detach the USB device prior to physical removal.

Example

This example enables core dumps to a TFTP server 10.27.9.1 reachable over the out-of-band port. The core file is written to the dumps directory and the name includes the host name of the switch and the switch TOD.

```
console(config)#exception dump tftp-server 10.27.9.1 file-path dumps
console(config)#exception core-file hostname time-stamp
console(config)#exception protocol tftp
```

exception dump

Use this command to configure the core dump location. Use the **no** form of the command to reset the location and parameters to the default values.

Syntax

exception dump {**tftp-server** *ip-address* | **ftp-server** *ip-address* [**username** *user-name* {n**opassword** | **password** *password}*] | **file-path** *dir* | **compression** | **stack-ip-address** [**protocol** {**dhcp** | **static**} | **add** *ip-address netmask* [*gateway*]]

no exception dump {**tftp-server** | **file-path**}

- *ip-address*—The IPv4 address of a TFTP server.

- **ftp-server**—Transfer the core information to an FTP server.
- **username**—The login id on the FTP server
- **nopassword**—The user id configured on the FTP server does not require a password.
- **password**—The user id configured on the FTP server requires a password.
- **file-path**—The directory to prepend to the core file name.
- **protocol dhcp**—Obtain the out-of-band port address via DHCP for core dump transfer.
- **protocol static**—Use a statically assigned address for core dump transfer

Default Configuration

Debug core dumps are disabled by default.

The out-of-band port attempts to retrieve an IP address via DHCP by default.

No TFTP or FTP server is defined.

No stack IP addresses are assigned

Compression is enabled by default

Command Modes

Global Configuration mode

User Guidelines

This option should only be used under the direction of Dell support personnel.

The **file-path** parameter is used by both the USB and TFTP core dumps.

The TFTP or FTP server must be reachable over the out-of-band interface. Front panel ports cannot be used during exception processing.

Configuration parameters are not validated when the command is entered. Use the **write core test** command to validate the configured parameters and that the core dump is likely to succeed.

Crash dump retrieval via FTP or TFTP occurs after the system has crashed. During this time, the switch is not available for normal operation.

If no DHCP server is available for assignment of addresses to switches, the **exception dump stack-ip-address protocol static add** command should be used once for each member of the stack. It is recommended that these addresses be unique in the network. The management unit in the stack will distribute the addresses to the stack members for use on the out-of-band port only during crash dump transfer. In addition, for the purposes of transferring the core file to the server, a unique MAC address is assigned to the stack unit. As crash dump retrieval is not reliable on the front panel ports, the TFTP and FTP parameters are not available on the N1100-ON/N1500/N2000/N2100-ON/N2200-ON Series switches. Use the USB crash dump capability instead.

Example

This example enables core dumps to a TFTP server 10.27.9.1 reachable over the out-of-band port. The core file is written to the "dumps" directory and the name includes the host name of the switch and the switch TOD.

```
console(config)#exception dump tftp-server 10.27.9.1 file-path dumps
console(config)#exception core-file Core hostname time-stamp
console(config)#exception protocol tftp
```

exception protocol

Use the **exception protocol** command as directed by Dell EMC Networking support to enable full core dumps. Use the **no** form of the command to disable full core dumps.

Syntax

exception protocol {**local** |**tftp** | **ftp** | **usb** | **none**}

no exception protocol

- **local**—Save the core file on the local file system.
- **tftp** — Store the core dump on a TFTP server reachable on the out-of-band port.
- **ftp**—Enable core transfer to an FTP server reachable on the out-of-band port.
- *user-name*—The login id on the FTP server.
- **nopassword**—The user id configured on the FTP server does not require a password.

- **password** – the user id configured on the FTP server requires a password.
- *password*—The password associated with the user id on the FTP server.
- *ip address*—The IPv4 address of an FTP or TFTP server.
- **usb** — Store the core dump on a USB device. A USB device must be inserted into the switch front panel.
- **none** — Core dumps are disabled.

Stack-ip-address parameters:

- *ipv4-address*—The address used by the of the out-of-band port of the switch during crash dump transfer.
- *netmask* —The netmask for use with the ip address for core dump transfer.
- *gateway* —The default gateway to use on the out-of-band port for core dump transfer.
- **protocol dhcp**—Obtain the out-of-band port address via DHCP for core dump transfer.
- **protocol static**—Use a statically assigned address for core dump transfer.

Default Configuration

Debug core dumps are disabled by default.

The out-of-band port attempts to retrieve an IP address via DHCP by default.

No TFTP or FTP server is defined.

No stack IP addresses are assigned

Compression is enabled by default

Command Modes

Global Configuration mode

User Guidelines

Crash dump retrieval via FTP or TFTP occurs after the system has crashed. During this time, the switch is not available for normal operation.

If no DHCP server is available for assignment of addresses to switches, the **exception dump stack-ip-address protocol static add** command should be used once for each member of the stack. It is recommended that these addresses be unique in the network. The management unit in the stack will distribute the addresses to the stack members for use on the out-of-band port only during crash dump transfer. In addition, for the purposes of transferring the core file to the server, a unique MAC address is assigned to the stack unit.

As crash dump retrieval is not reliable on the front panel ports, the TFTP and FTP parameters are not available on the N1100-ON/N1500/N2000/N2100-ON/N2200-ON series switches. Use the USB crash dump capability instead.

Example

This example enables core dumps to a TFTP server 10.27.9.1 reachable over the out-of-band port. The core file is written to the dumps directory and the name includes the host name of the switch and the switch TOD.

```
console(config)#exception dump tftp-server 10.27.9.1 file-path dumps
console(config)#exception core-file Core hostname time-stamp
console(config)#exception protocol tftp
```

This example enables core dumps to a USB flash drive. The core file is written to the top level directory and the name includes the host name of the switch and the switch TOD.

```
console(config)#exception core-file Core hostname time-stamp
console(config)#exception protocol usb
console(config)#do dir usb
Attr  Size(bytes)          Creation Time        Name
 drwx                16384 Jan 01 1970 00:00:00 .
 drwx                    0 Dec 16 2014 18:25:43 ..
 -rwx                  943 Jan 01 1980 00:00:00 start.scr
 -rwx             21642899 Jan 01 1980 00:00:00 backup.stk
 -rwx                  373 Jan 01 1980 00:00:00 start.text
 -rwx              8685003 Apr 05 2011 16:27:28 3750CR.pdf
 -rwx                37549 Aug 21 2013 07:55:22 maxacl.scr
 -rwx                33903 Aug 22 2013 10:49:38 max-acls-per-list.scr
 -rwx               139874 Oct 09 2013 14:00:18 max-ipv4-acls.scr
 -rwx                 5899 Sep 20 2013 14:23:26 local_repro.txt
 -rwx             21262857 Oct 24 2013 12:12:30 N3000-ONvD.10.23.2.stk
Total Size: 1002160128
Bytes Used: 51904512
Bytes Free: 950255616
```

exception switch-chip-register

Use the **exception switch-chip-register** command to enable dumping the switch chip registers in case of an exception. The register dump is taken only for the primary unit and not for the stack member units. Use the **no** form of the command to disable dumping of the switch-chip registers.

Syntax

exception switch-chip-register

no exception switch-chip-register

Default Configuration

By default, switch register dumps are disabled.

Command Modes

Global Configuration mode

User Guidelines

This option should only be used under the direction of Dell support personnel.

Switch registers are captured to the local file system.

ip http timeout-policy

Use the **ip http timeout-policy** command to configure the timeout policy for closing HTTP and HTTPS sessions to the local HTTP server.

Syntax

ip http timeout-policy idle *seconds* **life** *seconds*

no ip http timeout-policy

- seconds—For the **idle** parameter, the approximate number of seconds after which an idle connection is closed. For the **life** parameter, the approximate number of seconds since login after which a session is closed.

Default Configuration

The default values are as follows:

- *idle*—180 seconds. Range: 1-3600
- *life*—1800 seconds. Range: 1-86400

Command Mode

Global Configuration

User Guidelines

This command configures the timeout for both HTTP and HTTPS sessions. Changes to the parameters affect existing sessions. Reducing the time parameters may close existing sessions.

The idle timeout closes sessions in which no activity is detected (e.g., no commands are entered). The life timeout specifies the maximum number of seconds a session will be kept open from the time the session was established. Times are approximate.

Use this command to establish an access policy which maximizes throughput or minimizes response time for new connections. For minimal response time for new connections, use smaller values. For maximizing throughput (e.g., with dedicated management connections), use larger values.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)#ip http timeout-policy idle 3600 life 86400
```

show debugging

Use the **show debugging** command to display packet tracing configurations.

Syntax

show debugging

no show debugging

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Enabled packet tracing configurations are displayed.

Example

```
console#show debugging

Authentication manager all debug traces enabled on Gi1/0/1
```

show exception

Use the **show exception** command to display the core dump configuration parameters, the current or previous exception log, or the core dump file listing.

Syntax

show exception [**log** [**previous**] | **core-dump-file**]

- **log**—Display the current exception log.
- **log previous**—Display the previous exception log.
- **core-dump-file**—Display the core-dump file listing.

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec mode (all show modes)

User Guidelines

An exception log or core dump file is generated in the rare event that the switch firmware fails. Dell support personnel may ask administrators to provide the exception log information to assist in issue resolution.

Parameter	Description
Coredump file name	Core dump file name
Coredump filename uses hostname	Core file name includes host name (True or False)
Coredump filename uses time-stamp	Core file name users time stamp (True or False)
TFTP server IP	TFTP server IP address
FTP server IP	FTP server IP address
FTP user name	FTP server account user name
FTP password	FTP server account user password
File path	File path for TFTP or FTP server
Protocol	Exception protocol (TFTP, USB, Core - default none).
Switch-chip-register	Include register dump (True or False)
Compression mode	Compress core file (True or False)
Stack IP Address Protocol	Obtain switch IP address (DHCP or Static)

Example

The following example shows the default core transfer values.

```
console(config)#show exception

Coredump file name............................. crash
Coredump filename uses hostname................ False
Coredump filename uses time-stamp.............. False
TFTP server IP.................................
FTP server IP..................................
FTP user name..................................
FTP password...................................
File path...................................... dumps
```

```
Protocol...................................... none
Switch-chip-register.......................... False
Compression mode.............................. TRUE
Stack IP Address Protocol..................... dhcp
Stack IP Address:
IP Address      Net Mask        Gateway         Assigned Unit
--------------- --------------- --------------- ---------------
```

show supported mibs

Use the **show supported mibs** command to display the implemented SNMP MIBs.

Syntax

show supported mibs

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no user guidelines for this command.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show supported mibs

MIBs Supported:

RFC 1907 - SNMPv2-MIB              The MIB module for SNMPv2 entities
RFC 2819 - RMON-MIB                Remote Network Monitoring Management
                                   Information Base
HC-RMON-MIB                        The original version of this MIB,
                                   published as RFC3273.
HC-ALARM-MIB                      Initial version of the High Capacity Alarm
```

	MIB module. This version published as RFC 3434.
HCNUM-TC	A MIB module containing textual conventions for high capacity data types.
DELL-REF-MIB	DELL Reference
SNMP-COMMUNITY-MIB	This MIB module defines objects to help support coexistence between SNMPv1, SNMPv2, and SNMPv3.
SNMP-FRAMEWORK-MIB	The SNMP Management Architecture MIB
SNMP-MPD-MIB	The MIB for Message Processing and Dispatching
SNMP-NOTIFICATION-MIB	The Notification MIB Module
SNMP-TARGET-MIB	The Target MIB Module
SNMP-USER-BASED-SM-MIB	The management information definitions for the SNMP User-based Security Model.
SNMP-VIEW-BASED-ACM-MIB	The management information definitions for the View-based Access Control Model for SNMP.
USM-TARGET-TAG-MIB	SNMP Research, Inc.
DELL-POWER-ETHERNET-MIB	DELL Power Ethernet Extensions MIB
POWER-ETHERNET-MIB	Power Ethernet MIB
SFLOW-MIB	sFlow MIB
DELL-SFLOW-MIB	The DELL Private MIB for DELL SFLOW
DELL-ISDP-MIB	Industry Standard Discovery Protocol MIB
DELL-UDLD-MIB	UDLD MIB
DELL-BOXSERVICES-PRIVATE-MIB	The DELL Private MIB for DELL Box Services Feature.
DIFFSERV-DSCP-TC	The Textual Conventions defined in this module should be used whenever a Differentiated Services Code Point is used in a MIB.
IANA-ADDRESS-FAMILY-NUMBERS-MIB	The MIB module defines the AddressFamilyNumbers textual convention.
DELL-DHCPSERVER-PRIVATE-MIB	The DELL Private MIB for DELL DHCP Server
DELL-DHCPCLIENT-PRIVATE-MIB	The DELL Private MIB for DELL DHCP Client
DELL-DNS-RESOLVER-CONTROL-MIB	Defines a portion of the SNMP MIB under the DELL Corporation enterprise OID pertaining to DNS Client control configuration
DELL-DENIALOFSERVICE-PRIVATE-MIB	The DELL Private MIB for DELL Denial of Service.
DELL-GREENETHERNET-PRIVATE-MIB Ethernet	The MIB definitions for DELL Green Feature.
DELL-DEVICE-FILESYSTEM-MIB	The DELL Private MIB for DELL DeviceFileSystem
DELL-KEYING-PRIVATE-MIB Utility	The DELL Private MIB for DELL Keying

LLDP-MIB	Management Information Base module for LLDP configuration, statistics, local system data and remote systems data components.
LLDP-EXT-DOT3-MIB	The LLDP Management Information Base extension module for IEEE 802.3 organizationally defined discovery information.
LLDP-EXT-MED-MIB	The LLDP Management Information Base extension module for TIA-TR41.4 Media Endpoint Discovery information.
DELL-LLPF-PRIVATE-MIB	The DELL Private MIB for DELL Link Local Protocol Filtering.
DISMAN-PING-MIB	The Ping MIB (DISMAN-PING-MIB) provides the capability of controlling the use of the ping function at a remote host.
DNS-SERVER-MIB	The MIB module for entities implementing the server side of the Domain Name System (DNS)protocol.
DNS-RESOLVER-MIB	The MIB module for entities implementing the client (resolver) side of the Domain Name System (DNS) protocol.
SMON-MIB	The MIB module for managing remote monitoring device implementations for Switched Networks
DELL-TIMERANGE-MIB	The DELL Private MIB for DELL Time Ranges
DELL-TIMEZONE-PRIVATE-MIB	The DELL Private MIB for DELL for system time, timezone and summer-time settings
DISMAN-TRACEROUTE-MIB	The Traceroute MIB (DISMAN-TRACEROUTE-MIB) provides access to the traceroute capability at a remote host.
LAG-MIB	The Link Aggregation module for managing IEEE 802.3ad
RFC 1213 - RFC1213-MIB	Management Information Base for Network Management of TCP/IP-based internets: MIB-II
RFC 1493 - BRIDGE-MIB	Definitions of Managed Objects for Bridges dot1d)
RFC 2674 - P-BRIDGE-MIB	The Bridge MIB Extension module for managing Priority and Multicast Filtering, defined by IEEE 802.1D-1998.
RFC 2674 - Q-BRIDGE-MIB	The VLAN Bridge MIB module for managing Virtual Bridged Local Area Networks
RFC 2737 - ENTITY-MIB	Entity MIB (Version 2)
RFC 2863 - IF-MIB	The Interfaces Group MIB using SMIv2
RFC 3635 - Etherlike-MIB	Definitions of Managed Objects for the Ethernet-like Interface Types
DELL-SWITCHING-MIB	DELL Switching - Layer 2
DELL-INVENTORY-MIB	Unit and Slot configuration.

DELL-PORTSECURITY-PRIVATE-MIB	Port Security MIB.
INET-ADDRESS-MIB	This MIB module defines textual conventions for representing Internet addresses.
IANAifType-MIB	This MIB module defines the IANAifType Textual Convention
DELL-LOGGING-MIB	This MIB provides objects to configure and display events logged on this system.
MAU-MIB	Management information for 802.3 MAUs.
DELL-MVR-PRIVATE-MIB	The DELL Private MIB for MVR Configuration
DELL-SNTP-CLIENT-MIB	Defines DELL Corporation enterprise OID pertaining to SNTP client configuration and statistical collection.
DELL-VPC-MIB	The MIB definitions for VPC.
IEEE8021-PAE-MIB	Port Access Entity module for managing IEEE 802.1X.
DELL-DOT1X-ADVANCED-FEATURES-MIB Advanced	The DELL Private MIB for DELL Dot1x Features
DELL-DOT1X-AUTHENTICATION-SERVER-MIB	The DELL Private MIB for DELL Dot1x Authentication Server
DELL-RADIUS-AUTH-CLIENT-MIB	The DELL Private MIB for DELL RADIUS Authentication Client.
RADIUS-ACC-CLIENT-MIB	RADIUS Accounting Client MIB
RADIUS-AUTH-CLIENT-MIB	RADIUS Authentication Client MIB
TACACS-CLIENT-MIB	Defines a portion of the SNMP MIB under the DELL Corporation enterprise OID pertaining to TACACS+ client configuration.
DELL-CAPTIVE-PORTAL-MIB	DELL Captive Portal MIB
DELL-AUTHENTICATION-MANAGER-MIB	The DELL Private MIB for DELL authentication manager feature.
DELL-MGMT-SECURITY-MIB	The DELL Private MIB for DELL Mgmt Security
RFC 1724 - RIPv2-MIB	RIP Version 2 MIB Extension
RFC 1850 - OSPF-MIB	OSPF Version 2 Management Information Base
RFC 1850 - OSPF-TRAP-MIB	The MIB module to describe traps for the OSPF Version 2 Protocol.
RFC 2787 - VRRP-MIB	Definitions of Managed Objects for the Virtual Router Redundancy Protocol
DELL-ROUTING-MIB	DELL Routing - Layer 3
IP-FORWARD-MIB	The MIB module for the management of CIDR multipath IP Routes.
IP-MIB	The MIB module for managing IP and ICMP implementations, but excluding their management of IP routes.
DELL-LOOPBACK-MIB	The DELL Private MIB for DELL Loopback
RFC 1657 - BGP4-MIB	Definitions of Managed Objects for the Fourth Version of the Border Gateway

	Protocol (BGP-4) using SMIv2
DELL-BGP-MIB	The MIB definitions for Border Gateway Protocol Flex package.
DELL-QOS-MIB	DELL Flex QOS Support
DELL-QOS-ACL-MIB	DELL Flex QOS ACL
DELL-QOS-COS-MIB	DELL Flex QOS COS
DELL-QOS-AUTOVOIP-MIB	DELL Flex QOS VOIP
DELL-QOS-DIFFSERV-PRIVATE-MIB	DELL Flex QOS DiffServ Private MIBs' definitions
DELL-QOS-ISCSI-MIB	DELL Flex QOS iSCSI Flow Acceleration MIBs' definitions
RFC 2932 - IPMROUTE-MIB	IPv4 Multicast Routing MIB
draft-ietf-magma-mgmd-mib-03	MGMD MIB, includes IGMPv3 and MLDv2.
RFC 5060 - PIM-STD-MIB	Protocol Independent Multicast MIB
RFC 5240 - PIM-BSR-MIB	Bootstrap Router mechanism for PIM routers
DVMRP-STD-MIB	Distance-Vector Multicast Routing Protocol MIB
IANA-RTPROTO-MIB	IANA IP Route Protocol and IP MRoute Protocol Textual Conventions
DELL-MULTICAST-MIB	The MIB definitions for Multicast Routing Flex package.
IPMROUTE-STD-MIB	The MIB module for management of IP Multicast routing, but independent of the specific multicast routing protocol in use.
MGMD-STD-MIB	The MIB module for MGMD Management.
DELL-NSF-MIB configure	The MIB module defines objects to Non Stop Forwarding.
RFC 2465 - IPV6-MIB	Management Information Base for IP Version 6: Textual Conventions and General Group
RFC 2466 - IPV6-ICMP-MIB	Management Information Base for IP Version 6: ICMPv6 Group
RFC 3419 - TRANSPORT-ADDRESS-MIB	Textual Conventions for Transport Addresses
DELL-ROUTING6-MIB	The DELL Private MIB for DELL IPv6 Routing.
DELL-DHCP6SERVER-PRIVATE-MIB	The DELL Private MIB for DELL DHCPv6 Server/Relay
DELL-IPV6-LOOPBACK-MIB	The DELL Private MIB for DELL Loopback IPV6 address configuration.
DELL-IPV6-TUNNEL-MIB	The DELL Private MIB for DELL IPV6 Tunnel.
Dell-LAN-SYSMNG-MIB	Management functions applicable to all Dell Networking managed switches
Dell-LAN-TRAP-MIB	Dell alarms specific global parameters
Dell-Vendor-MIB	This MIB allows Dell Networking devices to

```
be integrated into Dell ITA management
system.
```

snapshot bgp

Use the **snapshot bgp** command in support mode to dump the current state of BGP for use by support personnel.

Syntax

snapshot bgp

Default Configuration

There is no default configuration.

Command Mode

Support mode

User Guidelines

This command has no user guidelines.

Command History

Introduced in version 6.2.0.1 firmware.

write core

Use the **write core** command to generate a core file on demand and either reboot the switch or test the core file configuration.

Syntax

write core [**test** [*dest-file-name*]]

- dest-file-name — The file name used if a tftp-server is configured with the **exception dump tftp-server** command. The dest-file-name parameter overrides the file name parameters configured with the **exception core-file** command.

Default Configuration

This command has no default configuration.

Command Modes

Privileged Exec mode

User Guidelines

Using the **write core** command reboots the switch. The **write core** command is useful when the device malfunctions, but has not crashed.

The **write core test** command is useful for validating the core dump setup. For example, if the protocol is configured as tftp, the command write core test communicates with the tftp server and informs the administrator if the tftp server can be contacted. Similarly, if the protocol is configured as usb, it mounts and unmounts the file system and then informs the administrator regarding the status.

Example

```
console#write core
The system has unsaved changes.
Would you like to save them now? (y/n) n
Configuration Not Saved!
This operation will reboot the device.
Are you sure you want to create coredump? (y/n).y
----------------------------------------------------
Thu Jan 1 00:17:35 1970
[pgid:577] [pid:577] [name:(syncdb)] [signal:11]
Call Trace (depth = 3):
0xb6faf7dc
0xb6fafc60
0xb6ef742c
<188> Jan 1 00:17:36 10.27.22.174-1 General[80499188]: procmgr.c(2926) 1171
%% Application Terminated (syncdb, ID = 2, PID = 577
log_error_code osapi_crash.c 2010

Switching software SIGSEGV Handler
This build was configured to copy this crash information to
a file.
```

Sflow Commands

sFlow® is the standard for monitoring high-speed switched and routed networks. sFlow technology is built into network equipment and gives complete visibility into network activity, enabling effective management and control of network resources.

The sFlow monitoring system consists of an sFlow Agent (embedded in a switch or router or in a stand-alone probe) and a central sFlow Collector. The sFlow Agent uses sampling technology to capture traffic statistics from the device it is monitoring. sFlow datagrams are used to forward the sampled traffic statistics immediately to an sFlow Collector for analysis. The traffic samples sent to the Collector contain the source ifIndex and, for switched packets, the destination ifIndex.

The sFlow Agent supports two forms of sampling: statistical packet-based sampling of switched or routed Packet Flows and time-based sampling of counters.

sflow destination

Use the **sflow destination** command to configure the sFlow collector parameters (owner string, receiver timeout, maxdatagram, ip address and port). Use the "no" form of this command to set receiver parameters to the default or remove a receiver.

Syntax

sflow *rcvr_index* **destination** {i*p-address* [p*ort]* | **maxdatagram** *size* | **owner** *"owner_string"* {**notimeout**|**timeout** rcvr_timeout}}

no sflow *rcvr_index* **destination** [*ip-address* | **maxdatagram** | **owner**]

- *rcvr_index*—The index of this sFlow Receiver (Range: 1–8).
- *ip-address*—The sFlow receiver IP address. If set to 0.0.0.0, no sFlow datagrams will be sent.
- *size*—The maximum number of data bytes that can be sent in a single sample datagram. The management entity should set this value to avoid fragmentation of the sFlow datagrams. (Range: 200–9116 bytes).

- *owner_string*—The identity string for the receiver. A receiver is not enabled until the owner string is assigned. The default is an empty string. The identity string must be set before assigning a receiver to a sampler or poller. (Range: 1–127 characters).
- *rcvr_timeout*—The time, in seconds, remaining before the sampler or poller is released and stops sending samples to the receiver. Setting a value of 0 for the timeout value permanently configures the sflow receiver. Use the no form of the command to remove permanently configured receivers. A management entity wanting to maintain control of the sampler is responsible for setting a new value before the old one expires. (Range: 0–2147483647 seconds).
- *port*—The destination Layer4 UDP port for sFlow datagrams. (Range: 1–65535).

Default Configuration

No receivers are configured by default.

The default IP address is 0.0.0.0

The default maximum datagram size is 1400.

The default owner string is the empty string.

The default receiver timeout is 0.

The default destination port is 6343.

Command Mode

Global Configuration mode.

User Guidelines

An sflow destination entry must have an owner assigned in order for polling or sampling to be operational. The last set of command parameters are optional in the **no** form of the command. Sflow commands with a timeout value supplied do not show in the running config. Because the timer is actively running, the command is ephemeral and is therefore not shown in the running config. Entering an sflow command with a notimeout parameter will cause the sflow configuration to be shown in the running config.

Example

```
console(config)#sflow 1 destination owner 1 timeout 2000
console(config)#sflow 1 destination maxdatagram 500
console(config)#sflow 1 destination 30.30.30.1 560
```

sflow polling

Use the **sflow polling** command to enable a new sflow poller instance for this data source if rcvr_idx is valid. An sflow poller sends counter samples to the receiver. Use the "no" form of this command to reset poller parameters to the defaults.

Syntax

sflow *rcvr-index* **polling** {**gigabitethernet** | **tengigabitethernet** | **fortygigabitethernet**} *interface-list poll-interval*

no sflow *rcvr-index* **polling** {**gigabitethernet** | **tengigabitethernet** | **fortygigabitethernet**} *interfaces*

- *rcvr-index* — The sFlow Receiver associated with the poller (Range: 1–8).
- *interface-list* — The list of interfaces to poll in unit/slot/port format.
- *poll-interval* — The sFlow instance polling interval. A poll interval of 0 disables counter sampling. A value of *n* means once in *n* seconds a counter sample is generated. (Range: 0–86400).

Default Configuration

There are no pollers configured by default.

The default poll interval is 0.

Command Mode

Global Configuration mode.

User Guidelines

The sflow instance must be configured using the **sflow destination owner** command before this command can successfully execute.

Example

```
console(config)#sflow 1 polling gigabitethernet 1/0/1-10 200
```

sflow polling (Interface Mode)

Use the **sflow polling** command in Interface Mode to enable a new sflow poller instance for this interface if rcvr_idx is valid. An sflow poller sends counter samples to the receiver. Use the **no** form of this command to reset poller parameters to the defaults.

Syntax

sflow *rcvr-index* **polling** *poll-interval*

no sflow *rcvr-index* **polling**

- *rcvr-index* — The sFlow Receiver associated with the poller (Range: 1 - 8).
- *poll-interval* — The sFlow instance polling interval. A poll interval of 0 disables counter sampling. A value of n means once in n seconds a counter sample is generated. (Range: 0 - 86400).

Default Configuration

There are no pollers configured by default.

The default poll interval is 0.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

This command has no user guidelines.

Example

```
console(config-if-Gi1/0/2)#sflow 1 polling 6055
```

sflow sampling

Use the **sflow sampling** command to enable a new sflow sampler instance for this data source if rcvr_idx is valid. An sflow sampler collects flow samples to send to the receiver. Use the “no” form of this command to reset sampler parameters to the default.

Syntax

sflow *rcvr-index* **sampling** {**gigabitethernet** | **tengigabitethernet** | **fortygigabitethernet**} *interface-list sampling-rate* [*size*]

no sflow *rcvr-index* **sampling** {**gigabitethernet** | **tengigabitethernet** | **fortygigabitethernet**} *interface-list*

- *rcvr-index*—The sFlow Receiver for this sFlow sampler to which flow samples are to be sent. If no receiver is configured, then no packets will be sampled. Only active receivers can be set. If a receiver times out, then all samplers associated with the receiver will also expire. (Range: 1–8).
- *interface-list* — The list of interfaces to poll in unit/slot/port format.
- *sampling-rate*—The statistical sampling rate for packet sampling from this source. A value of n means that out of n incoming packets, 1 packet will be sampled. (Range: 1024–65536).
- *size*—The maximum number of bytes that should be copied from the sampler packet (Range: 20–256 bytes).

Default Configuration

There are no samplers configured by default.

The default is no default sampling rate.

The default size is 128.

Command Mode

Global Configuration mode.

User Guidelines

Lower sampling numbers cause more samples to be collected and increase the load on the CPU. Setting a sampling rate of 1024 on a large number of ports may tax the CPU beyond it's ability to deliver the packets to the receiver.

Lowering the sampling rate (higher numerical value) will help to ensure that all collected samples can be sent to the receiver. The sflow instance must be configured using the **sflow destination owner** command before this command can successfully execute.

Example

```
console(config)#sflow 1 sampling gigabitethernet 1/0/2 1500 50
```

sflow sampling (Interface Mode)

Use the **sflow sampling** command in Interface Mode to enable a new sflow sampler instance for this data source if rcvr_idx is valid. Use the **no** form of this command to reset sampler parameters to the default.

Syntax

sflow *rcvr-index* **sampling** *sampling-rate* [*size*]

no sflow *rcvr-index* **sampling**

- *rcvr-index* — The sFlow Receiver for this sFlow sampler to which flow samples are to be sent. If no receiver is configured, then no packets will be sampled. Only active receivers can be set. If a receiver expires, then all samplers associated with the receiver will also expire. (Range: 1 - 8).
- *sampling-rate* — The statistical sampling rate for packet sampling from this source. A sampling rate of 1 counts all packets. A rate of 0 disables sampling. A value of n means that out of n incoming packets, 1 packet will be sampled. (Range: 1024 - 65536).
- *size* — The maximum number of bytes that should be copied from the sampler packet (Range: 20 - 256 bytes).

Default Configuration

There are no samplers configured by default.

There is no default sampling rate.

The default maximum header size is 128.

Command Mode

Interface Configuration (Ethernet) mode

User Guidelines

Lower sampling numbers cause more samples to be collected and increase the load on the CPU. Setting a sampling rate of 1024 on a large number of ports may tax the CPU beyond it's ability to deliver the packets to the receiver. Lowering the sampling rate (higher numerical value) will help to ensure that all collected samples can be sent to the receiver.

Example

```
console(config-if-Gi1/0/15)#sflow 1 sampling 1500 50
```

sflow source-interface

Use the **sflow source-interface** command to select the interface from which to use the IP address inserted in the source IP address field of transmitted sFlow packets. Use the no form of the command to revert to the default IP address.

Syntax

sflow source-interface {**loopback** *loopback-id* **|** **vlan** *vlan-id* **|** **out-of-band** **|** **tunnel** *tunnel-id*}

no sflow source-interface

- *loopback-id* — A loopback interface identifier.
- *vlan-id* — A VLAN identifier.
- *tunnel-id* — A tunnel identifier (Range 0–7).
- **out-of-band** — The out-of-band interface.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for sFlow packets. This is either the IP address assigned to the VLAN from which the sFlow packet originates or the out-of-band interface IP address.

Command Mode

Global Configuration mode

User Guidelines

The source interface must have an assigned IP address (either manually or via another method such as DHCP). Use the **show sflow source-interface** command to display the assigned source interface. This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function.

The out-of-band parameter is only available on switches so equipped.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#sflow source-interface vlan 1
```

show sflow agent

Use the **show sflow agent** command to display the sflow agent information.

Syntax

show sflow agent

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

sFlow Version	Uniquely identifies the version and implementation of this MIB. The version string must have the following structure: MIB Version; Organization; Software Revision where: MIB Version: 1.3, the version of this MIB. Organization: Dell Corp. Revision: 1.0
IP Address	The IP address associated with this agent.

Example

```
console#show sflow agent

sFlow Version......................... 1.3;Dell Inc.;10.23.18.28
IP Address............................ 10.27.21.34
```

show sflow destination

Use the **show sflow destination** command to display all the configuration information related to the sFlow receivers.

Syntax

show sflow *rcvr-index* **destination**

- *rcvr index*—The index of the sFlow Receiver to display (Range: 1–8).

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Receiver Index	The sFlow Receiver associated with the sampler/poller.

Owner String	The identity string for receiver, the entity making use of this sFlowRcvrTable entry.
Time Out	The time (in seconds) remaining before the receiver is released and stops sending samples to sFlow receiver.
IP Address	The destination IP address (the sFlow receiver host).
Address Type	1 for IPv4 and 2 for IPv6.
Port	The destination Layer4 UDP port for sFlow datagrams.
Datagram Version	The sFlow record format version. For example, 5 indicates sFlow version 5.
Maximum Datagram Size	The maximum number of bytes that can be sent in a single sFlow datagram.

Example

```
console(config)#show sflow 1 destination

Receiver Index................................ 1
Owner String.................................. asd
Time out...................................... No Timeout
IP Address:................................... 1.2.3.4
Address Type.................................. 1
Port.......................................... 6343
Datagram Version.............................. 5
Maximum Datagram Size......................... 1400
```

show sflow polling

Use the **show sflow polling** command to display the sFlow polling instances created on the switch.

Syntax

show sflow *rcvr-index* **polling** [{**gigabitethernet** | **tengigabitethernet** | fortygigabitethernet} *interface-list*]

- *rcvr-index* — The sFlow Receiver associated with the poller (Range: 1–8).
- *interface-list* — The list of interfaces to poll, in unit/slot/port format.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Poller Data Source	The sFlowDataSource (unit/slot/port) for this sFlow sampler. This agent will support Ethernet ports only.
Receiver Index	The sFlowReceiver associated with this sFlow counter poller.
Poller Interval	The number of seconds between successive samples of the counters associated with this data source.

Example

```
console# show sflow 1 polling

 Poller         Receiver   Poller
 Data Source    Index      Interval
 -----------    -------    -------
 Te1/0/1          1          0
```

show sflow sampling

Use the **show sflow sampling** command to display the sFlow sampling instances created on the switch.

Syntax

show sflow *rcvr-index* **sampling** [{**gigabitethernet** | **tengigabitethernet** | **fortygigabitethernet**} *interface-list*]

- *rcvr-index* — The sFlow Receiver associated with the poller (Range: 1–8).
- *interface-list* — The list of interfaces on which data is sampled.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed:

Sampler Data Source	The sFlowDataSource (unit/slot/port) for this sFlow sampler. This agent will support Ethernet ports only.
Receiver Index	The sFlowReceiver configured for this sFlow sampler.
Packet Sampling Rate	The statistical sampling rate for packet sampling from this source.
Max Header Size	The maximum number of bytes that should be copied from a sampled packet to form a flow sample.

Example

```
console# #show sflow 1 sampling

 Sampler      Receiver  Packet          Max Header
 Data Source  Index     Sampling Rate   Size
 -----------  -------   -------------   ----------
 Gi1/0/1         1         0               128
```

show sflow source-interface

Use the **show sflow source-interface** command to display the assigned sFlow source interface.

Syntax

show sflow source-interface

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec, Global Configuration, and all sub-modes

User Guidelines

Use the **sflow source-interface** command to assign an IP address other than the default for transmitted sFlow packets. This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function.

Example

```
console#conf
console(config)#interface out-of-band
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#sflow source-interface out-of-band
console(config)#show sflow source-interface

sFlow Client Source Interface............... out-of-band
sFlow Client Source IPv4 Address............ 10.27.21.143          [Up]
sFlow Client Source IPv6 Address............ fe80::fab1:56ff:fe2b:a4fb   [Up]
```

SNMP Commands

The SNMP component provides a machine-to-machine interface for the Dell EMC Networking product family. This includes the ability to configure the network device, view settings and statistics, and upload or download code or configuration images. The agent includes a get-bulk command to reduce network management traffic when retrieving a sequence of Management Information Base (MIB) variables and an elaborate set of error codes for improved reporting to the network control station.

The extensible and advanced design of the Dell EMC Networking SNMP makes adding remote manageability to networked devices undemanding. The agent allows a network control station to retrieve reports from the networked device. These reports are based upon the defined objects in the MIB. The agent queries, reports, and sets MIB variables based upon directions from the network control station or upon preset conditions.

Dell EMC Networking supports IPv4 and IPv6 SNMP access. Management access may be restricted to individual IPv4 and IPv6 management stations for management access and traps/informs. Management access may also be restricted to an IPv4 or IPv6 subnet.

show snmp

Use the **show snmp** command to display the SNMP communications status.

Syntax

show snmp

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the SNMP communications status.

```
console(config)#show snmp

Community-String     Community-Access View Name        IP Address       IP
Mask
-------------------- ---------------- ---------------- ----------- --------
private              Read/Write       Default          All            All
public              Read Only       Default        1.1.1.1 255.255.255.254


Community-String     Group Name                     IP Address       IP Mask
-------------------- ------------------------------ ---------- -------------
private              DefaultWrite                   All              All
public               DefaultRead                    All              All

Traps are enabled.
Authentication trap is enabled.


Version 1,2 notifications
Target Address   Type    Community            Version UDP    Filter   TO
Retries
                                                      Port   name     Sec
---------------- ------- -------------------- ------- ------ -------- --- --
----


Version 3 notifications
Target Address   Type    Username           Security UDP    Filter   TO
Retries
                                            Level    Port   name     Sec
---------------- ------- ------------------ -------- ------ -------- --- ---
----


System Contact:
System Location:
Source Interface:
SNMP trap Client Source Interface.............. Default
```

show snmp engineid

Use the **show snmp engineid** command to display the ID of the local Simple Network Management Protocol (SNMP) engine.

Syntax

show snmp engineid

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The SNMP engine ID uniquely identifies the SNMP agent to other SNMPv3 stations. The SNMP engine ID is not cleared by the **clear config** command. The SNMP engine ID must be unique for the administrative domain.

Example

The following example displays the SNMP engine ID.

```
console# show snmp engineID
Local SNMP engineID: 08009009020C0B099C075878
```

show snmp filters

Use the **show snmp filters** command to display the configuration of filters.

Syntax

show snmp filters *filtername*

- *filtername* — Specifies the name of the filter. (Range: 1-30)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Per RFC 2573, an implicit exclude all filter is present at the beginning of every filter list. This implicit filter is not shown in the output of this command.

Example

The following examples display the configuration of filters with and without a filter name specification.

```
console # show snmp filters
 Name                         OID Tree            Type
------------------- ---------------------------------
user-filter1          1.3.6.1.2.1.1              Included
user-filter1          1.3.6.1.2.1.1.7            Excluded
user-filter2          1.3.6.1.2.1.2.2.1.*.1      Included

console # show snmp filters user-filter1

Name                         OID Tree            Type
------------------- ---------------------------------
user-filter1          1.3.6.1.2.1.1              Included
user-filter1          1.3.6.1.2.1.1.7            Excluded
```

show snmp group

Use the **show snmp group** command to display the configuration of groups.

Syntax

show snmp group [*groupname*]

- *groupname* — Specifies the name of the group. (Range: 1-30)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The group name accepts any printable characters except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

The following table contains field descriptions.

Field	Description
Name	Name of the group
Security Model	SNMP model in use (v1, v2 or v3)
Security Level	Authentication of a packet with encryption. Applicable only to SNMP Version 3 security model.
Views	• Read–A string that is the name of the view that enables you only to view the contents of the agent. If unspecified, all the objects except the community-table and SNMPv3 user and access tables are available. • Write–A string that is the name of the view that enables you to enter data and manage the contents of the agent. • Notify–A string that is the name of the view that enables you to specify an inform or a trap. • Context Prefix–A string matching the prefix of an SNMP server group context.

Example

The following examples display the configuration of views.

```
console# show snmp group
    Name            Security                    Views
                  Model  Level          Read    Write    Notify
----------------- -----  ------        -------- -------- ------
user-group         V3    Auth-Priv     Default    ""       ""
managers-group     V3    NoAuth-priv   Default   Default   ""
managers-group     V3    NoAuth-priv   Default    ""       ""

console#show snmp group DefaultWrite
       Name           Context        Security                 Views
```

```
                    Prefix     Model     Level       Read    Write    Notify
-------------------- ---------- ----- ------------- -------- -------- -----
---
DefaultWrite         ""         V1    NoAuth-NoPriv Default  Default  Default
DefaultWrite         ""         V2    NoAuth-NoPriv Default  Default  Default
DefaultWrite         ""         V3    NoAuth-NoPriv Default  Default  Default
DefaultWrite         ""         V3    Auth-NoPriv   Default  Default  Default
DefaultWrite         ""         V3    Auth-Priv     Default  Default  Default
```

Command History

The example was updated in release 6.4.

show snmp user

Use the **show snmp user** command to display the configuration of users.

Syntax

show snmp user [*username*]

- *username* — Specifies the name of the user. (Range: 1-30)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The user name accepts any printable characters except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

Example

The following example displays the configuration of users with the user name specified.

```
Console # show snmp user
     Name         Group Name    Auth Priv
                                Meth Meth    Remote Engine ID
--------------- --------------- ---- ---- -------------------
bob               user-group       MD5  DES  800002a20300fce3900106
john              user-group       SHA  DES  800002a20300fce3900106

Console # show snmp users bob
    Name          Group Name    Auth Priv
                                Meth Meth   Remote Engine ID
--------------- --------------- ---- ---- -------------------
bob               user-group       MD5  DES  800002a20300fce3900106
```

show snmp views

Use the **show snmp views** command to display the configuration of views.

Syntax

show snmp views [*viewname*]

- *viewname* — Specifies the name of the view. (Range: 1-30)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following examples display the configuration of views with and without a view name specified.

```
console# show snmp views


Name           OID Tree                     Type
```

```
-----------   -----------------------     ---------
user-view1    1.3.6.1.2.1.1               Included
user-view1    1.3.6.1.2.1.1.7             Excluded
user-view2    1.3.6.1.2.1.2.2.1.*.1       Included
```

show trapflags

Use the **show trapflags** command to display the trap settings.

Syntax

show trapflags [**vrf** {*vrf-name*}] [**ospf** | **ospfv3** | **captive-portal**]

- *vrf-name*—The name of an existing VRF instance.
- **ospf**—Display OSPFv2 specific trap settings.
- **ospfv3**—Display OSPFv3 specific trap settings.
- **captive-portal**—Display captive-portal specific trap settings.

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example #1

```
console#show trapflags

Authentication Traps.......................... Enabled
Auto-copy-sw Traps............................ Enabled
802.1q Traps.................................. Enabled
Link Up/Down Flag............................. Enabled
Port-security Violation Traps................. Enabled
Multiple Users Traps.......................... Enabled
```

```
Mbuf Threshold Traps.......................... Enabled
CPU Threshold Traps........................... Enabled
Spanning Tree Traps........................... Enabled
VRRP Traps.................................... Enabled
ACL Traps..................................... Enabled
BGP Traps..................................... Enabled
DVMRP Traps................................... Enabled
OSPFv2 Traps.................................. Disabled
PIM Traps..................................... Disabled
OSPFv3 traps.................................. Disabled
Captive Portal Traps.......................... Disabled
DHCP Snooping Traps........................... Enabled
MAC Notification ............................. Disabled
```

Example #2

```
console#show trapflags ospf
OSPFv2 traps.................................. Disabled
  errors:
     all...................................... Disabled
  lsa:
     all...................................... Disabled
  overflow:
     all...................................... Disabled
  retransmit:
     all...................................... Disabled
  state-change:
     all...................................... Disabled
```

Command History

Output updated in version 6.7.0 firmware.

snmp-server community

Use the **snmp-server community** command in Global Configuration mode to set the community string to allow access to the switch SNMP MIBs. To remove the specified community string, use the **no** form of this command.

Syntax

snmp-server community *community-string* {**ro** | **rw** | **su**} [**view** *view-name*] | [**ip-address** *ipaddress*] [**ipmask** *ip-mask*]

no snmp-server community *community-string*

- **community-string**—The SNMP community identifier. See SNMP-COMMUNITY-MIB for further information. (Range: 1-20 printable characters other than an at sign, a backslash, or a question mark.)
- **ro**—Indicates read-only access.
- **rw**—Indicates read-write access.
- **su**—Indicates SNMP administrator access.
- *ip-address*—Specifies the IP address or subnet of the management station(s). If no IP address is specified, all management stations are permitted. Both IPv4 and IPv6 addresses are accepted. If a subnet is specified, it may be entered in the form of an IPv4 address and a space, followed by a forward slash, followed by the decimal number of significant bits with intervening space, or the IP address may be followed by an IPv4 mask in dotted quad notation. The range of IPv4 significant bits is 1 to 31 bits.
- *view-name*—Specifies the name of a previously defined view. For information on views, see the User Guidelines below. (Range: 1-30 characters)

Default Configuration

No community is defined. Defaults to read–only access if not specified.

Command Mode

Global Configuration mode

User Guidelines

The @ character is reserved for future use. It is not accepted in a community string. The question mark is the CLI help trigger. It may not be used in a community name. The backslash is a programmatic escape character. It may not be used in a community name.

You cannot specify a *view-name* for su, which has access to the whole MIB. You can use the view name to restrict the access rights of a community string. When it is specified:

- An internal security name is generated.
- The internal security name for SNMPv1 and SNMPv2 security models is mapped to an internal group name.

- The internal group name for SNMPv1 and SNMPv2 security models is mapped to a view name. If **ro** is specified, then read-view and notify-view are mapped. If **rw** is specified, then read-view, notify-view, and write-view are mapped.

The community name may include any printable characters except a question mark, an at sign, or a backslash. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

Command History

Modified in version 6.5 firmware.

Example

The following example configures community access string **public** to permit administrative access to SNMP at an administrative station with IP address 192.168.1.20.

```
console(config)# snmp-server community public su ipaddress 192.168.1.20
```

snmp-server community-group

Use the **snmp-server community-group** command in Global Configuration mode to map the internal security name for SNMP v1 and SNMP v2 security models to the group name. To remove the specified community string, use the **no snmp-server community** command.

Syntax

snmp-server community-group *community-string group-name* [**ipaddress** *ip-address*]

no snmp-server community-group *community-string*

- *community-string* — The SNMP community identifier. See SNMP-COMMUNITYMIB (Range: 1-20 printable characters other than an at sign, a backslash, or a question mark.)
- *group-name* — Name of a previously defined group. The group defines the objects available to the community. (Range: 1-30 characters)

- ip-address — Specifies the IP address or subnet of the management station(s). If no IP address is specified, all management stations are permitted. Both IPv4 and IPv6 addresses are accepted. If a subnet is specified, it may be entered in the form of an IPv4 address, followed by a space and a forward slash, followed by the decimal number of significant bits with no intervening spaces, or the IP address may be followed by an IPv4 mask in dotted quad notation. The range of IPv4 significant bits is 1 to 31 bits.

Default Configuration

No community group is defined.

Command Mode

Global Configuration mode

User Guidelines

The *group-name* parameter can be used to restrict the access rights of a community string. When it is specified, the software:

- Generates an internal security-name.
- Maps the internal security-name for SNMPv1 and SNMPv2 security models to the group-name.

The community name may include any printable characters except a question mark, a backslash, or an at sign. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character, or reject the entry entirely.

Example

The following example maps a community access string dell_community to group dell_group and restricts access to host 192.168.29.1.

```
console(config)# snmp-server community-group dell_community dell_group
ipaddress 192.168.29.1
```

snmp-server contact

Use the **snmp-server contact** command in Global Configuration mode to set up a system contact (sysContact) string. To remove the system contact information, use the **no** form of the command.

Syntax

snmp-server contact *text*

no snmp-server contact

- *text* — Character string, 1 to 255 characters, describing the system contact information.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays setting up the system contact point as "Dell_Technical_Support".

```
console(config)# snmp-server contact Dell_Technical_Support
```

snmp-server enable traps

Use the **snmp-server enable traps** command in Global Configuration mode to enable sending SNMP traps globally or to enable sending individual SNMP traps. Use the no form of this command to disable sending SNMP traps individually or globally.

Syntax

snmp-server enable traps [acl | all | auto-copy-sw | bgp state-changes limited |buffers |captive-portal *cp-type* | cpu |dhcp-snooping |dot1q | dvrmp | link | port-security [trap-rate] | multiple-users | [vrf *vrf-name*] ospf *ospftype* | ospfv3 *ospfv3type* |pim |poe | snmp authentication | spanning-tree | vrrp | mac-notification]

no snmp-server enable traps [acl | all|auto-copy-sw | bgp state-changes limited |buffers | captive-portal *cp-type* | cpu |dhcp-snooping| dot1q | dvrmp | link | port-security [trap-rate]| multiple-users | [vrf *vrf-name*] ospf *ospftype* | ospfv3 *ospfv3type* | pim | poe | snmp authentication | spanning-tree |vrrp | mac-notification]

- cp-type — {all, client-auth-failure, client-connect, client-db-full, client-disconnect}
- **vrf-name**—The name of a VRF instance for OSPF traps.
- ospftype— {all | errors {all | authentication failure | bad packet | config error | virt authentication failure | virt bad packet | virt config error} | lsa {all | lsa-maxage | lsa-originate} | overflow {all | lsdb-overflow | lsdbapproaching- overflow} | retransmit {all | packets | virt-packets} | state-change {all | if state change | neighbor state change | virtifstate change | virtneighbor state change}}
- ospfv3type—{all | errors {all | bad packet | config error | virt bad packet | virt config error} | lsa {all | lsa-maxage | lsa-originate} | overflow {all | lsdb-overflow | lsdb-approaching-overflow} | retransmit {all | packets | virt-packets} | state-change {all | if state change | neighbor state change | virtif state change | virtneighbor state change}}
- **acl**—Enable traps on ACL match events.
- **all**—Enable all traps (not recommended).
- **auto-copy-sw**—Enable traps on automatic download of switch software.
- **bgp state-changes limited**—Enable the two traps defined in the standard BGP MIB, RFC 4273. A trap is sent when an adjacency reaches the ESTABLISHED state and when a backward adjacency state transition occurs.
- **captive-portal**—Enable captive-portal traps.
- **dhcp-snooping**—Enable DHCP Snooping violation traps.
- **dot1q**—Enable traps on VLAN configuration failures.

- **bgp state-changes limited**—Enable standard traps defined in RFC 4273.
- **port-security**—Enable traps on port security violations.
- **port-security trap-rate**—Configure the interval at which port security traps are issued. Range 1-1000000 seconds. Default 30 seconds.
- **buffers**—Enables sending of a trap on the internal message buffer count exceeding the rising threshold.
- **cpu threshold**—Enables sending of a trap on the CPU occupancy exceeding the rising threshold.
- **multiple-users**—Enable sending a trap when multiple logins are active.
- **link**—Enable sending a trap when a link (interface) transitions to the active state or the inactive state.
- **violation**—Enable sending a trap when a port security MAC locking violation occurs.
- *vrf-name*—The name of an existing VRF instance
- **dvmrp**—Enable DVMRP traps.
- **port-security** —Enable traps on port security violations.
- **ospf**—Enable OSPF event traps.
- **ospfv3**—Enable OSPFv3 event traps.
- **pim**—Enable PIM traps (pim-sm and pim-dm).
- **poe** —Enable PoE traps. This parameter is only available on PoE capable switches.
- **snmp authentication** —Enable SNMP authentication traps.
- **spanning-tree**—Enable traps on topology changes.
- **vrrp** —Enable VRRP traps.
- **mac-notification** — Send MAC address addition and removal traps.

Default Configuration

SNMP authentication, link, multiple-user, spanning-tree, dot1q, and ACL traps are enabled by default. Port-security traps are enabled by default.

Command Mode

Global Configuration mode.

User Guidelines

Not all parameters are available on all switch models. The selection of parameters is based upon the capabilities of the switch firmware and hardware.

Use the command with no parameters to globally enable sending of traps. Use the **no** form of the command with no parameters to globally disable sending of traps without changing the configured traps.

Refer to the description of the Global configuration mode **buffer** command for setting the rising and falling thresholds for the sending of the message buffer trap.

Refer to the description of the Global Configuration mode **process cpu** command for setting the rising and falling thresholds for the sending of the CPU occupancy trap.

MAC notification traps are only sent when enabled on an interface using the **snmp-trap mac-notification change** command, in addition to the Global Configuration mode **snmp-server enable traps mac-notification change** and **mac address-table notification change** commands. See snmp-server enable traps.

Example

The following example displays the options for the **snmp-server enable traps** command.

```
console(config)#snmp-server enable traps ?

<cr>                         Press enter to execute the command.
acl                          Enable/Disable traps for access control lists.
all                          Enable/Disable all Traps.
auto-copy-sw                 Enable/Disable auto copy of code if there is a
                             version mismatch.
bgp                          Enable BGP traps.
buffers                      Configure Mbuf threshold traps.
captive-portal               Enable/Disable SNMP traps for CP system events.
cpu                          Configure CPU threshold traps.
dot1q                        Enable/Disable switch level Dot1q trap flag.
dvmrp                        Enable/Disable traps for distance vector multicast
                             routing protocol.
link                         Enable/Disable switch level Link Up/Down trap flag.
mac-notification             Enable SNMP MAC notification traps.
multiple-users               Configure multiple users login traps.
```

```
ospf                    Enable/Disable OSPF Traps.
ospfv3                  Enable/Disable OSPFv3 Traps.
pim                     Enable/Disable traps for protocol-independent
                        multicast.
port-security           Enable/Disable switch level Maclock Violation trap
                        flag.
snmp                    Enable SNMP traps.
spanning-tree           Configure spanning tree traps.
vrf                     Specify VPN Routing/Forwarding instance.
vrrp                    Enable/Disable VRRP trap.
```

The following example enables MAC notification, sets the buffer size to 255, and enables MAC notification traps. This will send the MAC notification trap and inform to all SNMP servers. Finally, the MAC notification trap is enabled for interface GI1/0/3 for both added and removed MAC addresses.

```
console(config)#mac address-table notification change
console(config)#mac address-table notification change history 255
console(config)#smnp-server enable traps mac-notification
console(config)#interface gi1/0/3
console(config-if-Gi1/0/3)#snmp trap mac-notification change added
console(config-if-Gi1/0/3)#snmp trap mac-notification change removed
```

Command History

Introduced in version 6.2.0.1 firmware. Syntax added in version 6.7.0 firmware.

snmp-server engineID local

Use the **snmpserver engineID local** command in Global Configuration mode to specify the Simple Network Management Protocol (SNMP) engine ID on the local device.

To remove the configured engine ID, use the **no** form of this command.

Syntax

snmp-server engineID local {*engineid-string* | **default**}

no snmp-server engineID local

- engineid-string — The character string that identifies the engine ID. The engine ID is a concatenated hexadecimal string. Each byte in hexadecimal character strings is two hexadecimal digits. Each byte can be separated by a period or colon. (Range: 6-32 characters)

- default — The engineID is created automatically, based on the device MAC address.

Default Configuration

The *engineID* is generated using the switch MAC address.

Command Mode

Global Configuration mode

User Guidelines

If you want to use SNMPv3, an engine ID is required for the switch. You can specify your own ID or use the default string that is generated using the MAC address of the device. If the SNMPv3 engine ID is changed, or the configuration file is erased, then SNMPv3 cannot be used until the SNMPv3 users are reconfigured. Since the EngineID must be unique within an administrative domain, the following guidelines are recommended:

1. For standalone devices use the default keyword to configure the Engine ID.
2. For stackable systems, configure your own EngineID, and verify that is unique within your administrative domain.

Changing the value of the snmpEngineID has important side-effects. A user's password (entered on the command line) is converted to an MD5 or SHA security digest. This digest is based on both the password and the local engine ID. The command line password is then deleted and is not stored on the switch, as required by RFC 2274. Because of this deletion, if the local value of engineID changes, the security digests of SNMPv3 users will be invalid and the users will have to be reconfigured.

Example

The following example configures the Engine ID automatically.

```
console(config)# snmp-server engineID local default
```

snmp-server filter

Use the **snmp-server filter** command in Global Configuration mode to create or update a Simple Network Management Protocol (SNMP) server filter entry. To remove the specified SNMP server filter entry, use the **no** form of this command.

Syntax

snmp-server filter *filter-name oid-tree* {**included** | **excluded**}

no snmp-server filter *filter-name* [*oid-tree*]

- *filter-name* — Specifies the label for the filter record that is being updated or created. The name is used to reference the record. (Range: 1-30 characters.)
- *oid-tree* — Specifies the object identifier of the ASN.1 subtree to be included or excluded from the view. To identify the subtree, specify a text string consisting of numbers, such as `1.3.6.2.4`, or a word, such as `system`. Replace a single subidentifier with the asterisk (*) wild card to specify a subtree family; for example, `1.3.*.4`.
- **included** — Indicates that the filter type is included.
- **excluded** — Indicates that the filter type is excluded.

Default Configuration

No filter entry exists.

Command Mode

Global Configuration mode

User Guidelines

An SNMP server filter identifies the objects to be included or excluded from notifications sent to a server per RFC 2573 Section 6 "NotificationFiltering." This command can be entered multiple times for the same filter record. Later lines take precedence when an object identifier is included in two or more lines.

The filter name may include any printable characters except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely. Per RFC 2573, configuring a filter adds an implicit exclude-all as the first entry in a filter record. Unless an include statement is specified, all notifications are excluded by default.

Examples

The following example creates a filter that includes all objects in the MIB-II system group except for sysServices (System 7) and all objects for interface 1 in the MIB-II interfaces group.

```
console(config)# snmp-server filter user-filter system included
console(config)# snmp-server filter user-filter system.7 excluded
console(config)# snmp-server filter user-filter ifEntry.*.1 included
```

snmp-server group

Use the **snmp-server group** command in Global Configuration mode to configure a new Simple Management Protocol (SNMP) group or a table that maps SNMP users to SNMP views. To remove a specified SNMP group, use the **no** form of this command.

Syntax

snmp-server group *groupname* { **v1** | **v2** | **v3** { **noauth** | **auth** | **priv** } [**notify** *notifyview*] } [**context** *contextname*] [**read** *readview*] [**write** *writeview*]

no snmp-server group *groupname* { **v1** | **v2** | **v3** { **noauth** | **auth** | **priv** } } [**context** *contextname*]

- *groupname* — Specifies the name of the group. (Range: 1-30 characters.)
- **v1** — Indicates the SNMP Version 1 security model.
- **v2** — Indicates the SNMP Version 2 security model.
- **v3** — Indicates the SNMP Version 3 security model.
- **noauth** — Indicates no authentication of a packet. Applicable only to the SNMP Version 3 security model.

- **auth** — Indicates authentication of a packet without encrypting it. Applicable only to the SNMP Version 3 security model.
- **priv** — Indicates authentication of a packet with encryption. Applicable only to the SNMP Version 3 security model.
- *contextname* — Provides different views of the system and provides the user a way of specifying that context.
- *notifyview* — Defines a string that is the name of the view that enables specifying an inform or a trap. If unspecified, nothing is defined for the notify view. (Range: 1-30 characters.)
- *readview* — A string that is the name of the view that enables the you to view only the contents of the agent. If unspecified, all the objects except for the community-table and SNMPv3 user and access tables are available. (Range: 1-30 characters.)
- *writeview* — A string that is the name of the view that enables the user to enter data and configure the contents of the agent. If unspecified, nothing is defined for the write view. (Range: 1-30 characters.)

Default Configuration

No group entry exists. There will be some default groups for Read/Write/Super users. These groups cannot be deleted or modified by the user. This command is used only to configure the user-defined groups.

Command Mode

Global Configuration Mode

User Guidelines

View-name should be an existing view created using the **snmp-server view** command. If there are multiple records with the same view-name, then the argument specified in this command points to first view-name in the table.

Example

The following example attaches a group called **user-group** to SNMPv3 and assigns to the group the privacy security level and read access rights to a view called **user-view**.

```
console(config)#snmp-server view user-view iso included
console(config)#snmp-server group user-group v3 priv read user-view
```

snmp-server host

Use the **snmp-server host** command in Global Configuration mode to specify the recipient of Simple Network Management Protocol notifications. To remove the specified host, use the **no** form of this command. This command enters the user into SNMP-host configuration mode.

Syntax

snmp-server host *host-addr* [**informs** [**timeout** *seconds*] [**retries** *retries*] **|** **traps** [**version** {**1** **|** **2** }]] **community-string** [**udp-port** *port*] [**filter** *filtername*]

no snmp-server host *host-addr* { **traps** **|** **informs** }

- *host-addr*—Specifies the IP address of the host (targeted recipient) or the name of the host. Both IPv4 and IPv6 addresses are accepted.(Range:1-256 characters)
- **community-string**—Specifies a password-like community string sent with the notification operation. (Range: 1-20 characters). The community-string may include any printable characters except a question mark, a backslash, or an at sign.
- **traps** —Indicates that SNMP traps are sent to this host.
- **version 1**—Indicates that SNMPv1 traps will be used.
- **version 2**—Indicates that SNMPv2 traps will be used.
- **informs**— Indicates that SNMPv2 informs are sent to this host.
- *seconds*—Number of seconds to wait for an acknowledgment before resending informs. The default is 15 seconds. (Range: 1-300.)
- *retries*—Maximum number of times to resend an inform request. The default is 3 attempts. (Range: 1-255)
- *port*—UDP port of the host to use. The default is 162. (Range: 1-65535.)
- *filtername*— A string that is the name of the RFC 2573 Section 6 filter that defines the traps/informs sent to this host. If unspecified, all traps/informs are sent (Range: 1-30 characters.) Use the snmp-server filter command to define a filter.

Default Configuration

The default configuration is 3 retries, and 15 seconds timeout. No hosts are configured by default. No notifications are sent by default.

If you enter this command with no keywords, the default is to send all trap types to the host in SNMPv1 format. No informs are sent to the host. If no version keyword is present, the default is Version 1.

Command Mode

Global Configuration mode

User Guidelines

If a DNS host name is entered instead of an IP address, the switch attempts to resolve the host name immediately using DNS. Use the **ip domain-lookup** command and the **ip name-server** command to enable resolution of DNS host names. Once resolved, the host name is not resolved again.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Example

The following example enables SNMP traps for host 192.16.12.143.

```
console(config)# snmp-server host 192.16.12.143 Dell EMC Networking traps
version 2
```

The following example enables the MAC notification, sets the buffer size to 255, and enables MAC notification traps. An SNMP host is configured to receive SNMPv2 traps. At least one SNMP host must be configured for traps or informs to be sent.

```
console(config)#mac address-table notification change
console(config)#mac address-table notification change history 255
console(config)#smnp-server enable traps mac-notification
console(config)#smnp-server host 10.1.1.2 traps version 2 community-string
"MyCommunity"
```

Command History

Added documentation updates in the 6.6.1 firmware release. Syntax updated in version 6.7.0 firmware.

snmp-server location

Use the **snmp-server location** command in Global Configuration mode to set the system location string. To remove the location string, use the **no** form of this command.

Syntax

snmp-server location *text*

no snmp-server location

- *text* — Character string describing the system location. (Range: 1 to 255 characters.)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The location string may contain embedded blanks if enclosed in quotes. Any printable character is allowed in the string.

Example

The following example sets the device location as “New_York”.

```
console(config)# snmp-server location New_York
```

snmp-server user

Use the **snmp-server user** command in Global Configuration mode to configure a new SNMP Version 3 user. To delete a user, use the **no** form of this command.

Syntax

snmp-server user *username groupname* [**remote** *engineid-string*] [{ **auth-md5** *password* | **auth-sha** *password* | **auth-md5-key** *md5-key* | **auth-sha-key** *sha-key* } [**priv-des** *password* | **priv-des-key** *des-key* | **priv-aes128** *password* | **priv-aes128-key** *aes-key*]]

no snmp-server user *username*

- *username* — Specifies the name of the user on the host that connects to the agent. (Range: 1-32 characters.)
- *groupname* — Specifies the name of the group to which the user belongs. (Range: 1-40 characters.)
- *engineid-string* — Specifies the engine ID of the remote SNMP entity to which the user belongs. The engine ID is a concatenated hexadecimal string. Each byte in the hexadecimal character string is two hexadecimal digits. The remote engine id designates the remote management station, and should be defined to enable the device to receive acknowledgments to "informs." (Range: 5-32 characters.)
- **auth-md5** — HMAC-MD5-96 authentication mode.
- **auth-sha** — HMAC-SHA-96 authentication mode.
- *password* — A password. (Range: 1 to 32 characters.)
- **auth-md5-key** — HMAC-MD5-96 authentication message digest key. Enter a pre-generated MD5 key.
- auth-**sha-key** — HMAC-SHA-96 authentication message digest key. Enter a pre-generated SHA key.
- *md5-key* — Character string—length 32 hex characters.
- *sha-key* — Character string—length 40 hex characters.
- **priv-des-key** — CBC-DES Symmetric Encryption privacy mode. The administrator should enter a pre-generated DES encryption key.
- *des-key* — The pregenerated DES encryption key. The length is determined by the authentication method selected. Enter 32 hex characters if MD5 Authentication is selected, 40 hex characters if SHA Authentication is selected.
- **priv-aes128-key** — CBC-AES128 Symmetric Encryption privacy mode.
- *aes-key* — A pre-generated AES128 encryption key, 32 hex characters in length.

Default Configuration

No user entry exists.

Command Mode

Global Configuration mode

User Guidelines

If the SNMP local engine ID is changed, configured users will no longer be able to connect and will need to be re-configured (deleted from the configuration and added back).

Use of MD5 authentication in conjunction with AES privacy is discouraged as it results in a weak cypher. Utilize SHA authentication when using AES privacy.

The SNMP group must exist or an error is displayed and the user is not configured. The user name can consist of any printable character and may contain embedded blanks if enclosed in quotes.

Command History

Syntax updated in version 6.6 firmware to remove insecure ciphers. AES-128 cipher added in version 6.6.2 firmware.

Example

The following example configures an SNMPv3 user “John” in group “user-group”.

```
console(config)# snmp-server user John user-group
```

snmp-server view

Use the **snmp-server view** command in Global Configuration mode to create or update a Simple Network Management Protocol (SNMP) server view entry. To delete a specified SNMP server view entry, use the **no** form of this command.

Syntax

snmp-server view *view-name oid-tree* { **included** | **excluded** }

no snmp-server view *view-name* [*oid-tree*]

- *view-name* — Specifies the label for the view record that is being created or updated. The name is used to reference the record. (Range: 1-30 characters.)
- *oid-tree* — Specifies the object identifier of the ASN.1 subtree to be included or excluded from the view. To identify the subtree, specify a text string consisting of numbers, such as `1.3.6.2.4`, or a word, such as `system`. Replace a single subidentifier with the asterisk (*) wild card to specify a subtree family; for example `1.3.*.4`.
- **included** — Indicates that the view type is included.
- **excluded** — Indicates that the view type is excluded.

Default Configuration

A view entry does not exist.

Command Mode

Global Configuration mode

User Guidelines

A view is a set of ASN.1 objects the SNMP server is allowed to access. Multiple view statements may be entered for a particular view. This command can be entered multiple times for the same view record.

The view name accepts any printable characters except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal combinations of characters on entry and may accept entries up to the first illegal character or reject the entry entirely.

Examples

The following example creates a view named user-view that includes all objects in the MIB-II system group except for sysServices (system.7) and includes all objects for interface 1 in the MIB-II interface group. An additional example of embedded blanks in a view name is given on the last line.

```
console(config)# snmp-server view user-view system included
console(config)# snmp-server view user-view system.7 excluded
```

```
console(config)# snmp-server view user-view ifEntry.*.1 included
console(config)#snmp-server view "A beautiful view!" 1.1.2.1 included
```

snmp-server v3-host

Use the **snmp-server v3-host** command in Global Configuration mode to specify the recipient of Simple Network Management Protocol Version 3 (SNMPv3) notifications. To remove the specified host, use the **no** form of this command.

Syntax

snmp-server v3-host {*ip-address* **|** *hostname*} *username* {**traps | informs**} [**noauth | auth | priv**] [**timeout** *seconds*] [**retries** *retries*] [**udpport** *port*] [**filter** *filtername*]

no snmp-server v3-host *ip-address* {**traps | informs**}

- *ip-address* — Specifies the IP address of the host (targeted recipient). Both IPv4 and IPv6 addresses are allowed.
- *hostname* — Specifies the name of the host. (Range: 1-256 characters.) The command allows spaces in the host name when specified in double quotes. For example, #snmp-server v3-host “host name”. Note that the switch will not resolve host names that are not in conformance with RFC 1035.
- *username* — Specifies user name used to generate the notification. (Range: 1-30 characters.)
- **traps** — Indicates that SNMP traps are sent to this host.
- **informs** — Indicates that SNMPv2 informs are sent to this host.
- **noauth** — Specifies sending of a packet without authentication.
- **auth** — Specifies authentication of a packet without encrypting it
- **priv** — Specifies authentication and encryption of a packet.
- *seconds* — Number of seconds to wait for an acknowledgment before resending informs. This is not allowed for hosts configured to send traps. The default is 15 seconds. (Range: 1-300 seconds.)
- *retries* — Maximum number of times to resend an inform request. This is not allowed for hosts configured to send traps. The default is 3 attempts. (Range: 0-255 retries.)

- *port* — UDP port of the host to use. The default is 162. (Range: 1-65535.)
- *filtername* — A string that is the name of the filter that define the filter for this host. If unspecified, does not filter anything. (Range: 1-30 characters.)

Default Configuration

The default configuration is 3 retries and 15 seconds timeout.

Command Mode

Global Configuration mode

User Guidelines

The username can include any printable characters except a question mark. Enclose the string in double quotes to include spaces within the key. The surrounding quotes are not used as part of the key. The CLI does not filter illegal characters but may accept entries up to the first illegal character or reject the entry entirely.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Example

The following example configures an SNMPv3 host, and sets it to send SNMP INFORMS with user name John using authentication without encryption.

```
console(config)# snmp-server v3-host 192.168.0.20 John informs auth
The following example shows the syntax of the no snmp-server host ip-address
command.
console(config)#no snmp-server host 1.2.3.4 ?

informs Sends SNMP informs to this host.
traps Sends SNMP traps to this host.
```

Command History

Example updated in 6.4 release.

snmp-server source-interface

Use the **snmp-server source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted SNMP traps and informs. Use the **no** form of the command to revert to the default IP address.

Syntax

snmp-server source-interface { **loopback** *loopback-id* | **vlan** *vlan-id* }

no snmp-server source-interface

- *loopback-id* — A loopback interface identifier.
- *vlan-id* — A VLAN identifier.

Default Configuration

By default, the switch uses the assigned switch IP address as the source IP address for SNMP packets. This is either the IP address assigned to the VLAN from which the SNMP packet originates or the out-of-band interface IP address.

Command Mode

Global Configuration

User Guidelines

The source interface must have an assigned IP address (either manually or via another method such as DHCP). This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
```

```
console(config-if-vlan1)#exit
console(config)#snmp-server source-interface vlan 1
```

SupportAssist Commands

The commands in this section enable configuration of SupportAssist.

eula-consent

Use the **eula-consent** command to accept or reject the end-user license agreement (EULA) for the SupportAssist service.

Syntax

eula-consent {**support-assist**} {**accept** | **reject**}

- **support-assist**—Enter the keyword support-assist to either accept or reject the EULA for the SupportAssist service.
- **accept** — Accepts the EULA for the specified service.
- **reject** — Rejects the EULA for the specified service.

Default Configuration

The default is **eula-consent support-assist accept**.

Command Mode

Global Configuration

User Guidelines

Messages are shown for both the accept and reject use cases with information directing the user to URLs for further information. If the user rejects or has not yet accepted the EULA, the configuration mode for the specified service will not be usable. If there is existing configuration for that feature, the configuration will not be removed but the feature will be disabled.

This command can be executed multiple times. It overwrites the previous information each time. The collected information is stored in the running-config. The administrator must write the configuration in order to persist it across reboots.

Command History

Introduced in version 6.3.0.1 firmware.

Example

Example 1

```
console(config)# eula-consent support-assist accept

I accept the terms of the license agreement. You can reject the license
agreement by configuring this command 'eula-consent support-assist reject'.

By installing SupportAssist, you allow Dell to save your contact information
(e.g. name, phone number and/or email address) which would be used to provide
technical support for your Dell products and services.  Dell may use the
information for providing recommendations to improve  your IT infrastructure.
SupportAssist also collects and stores machine diagnostic information, which
may include but is not limited to configuration information, user supplied
contact information, names of data volumes, IP addresses, access control
lists, diagnostics & performance information, network configuration
information, host/server configuration & performance information and related
data (Collected Data) and transmits this information to Dell. By downloading
SupportAssist and agreeing to be bound by these terms and the Dell end user
license agreement, available at: http://www.dell.com/aeula, you agree to
allow Dell to provide remote monitoring services of your IT environment and
you give Dell the right to collect the Collected Data in accordance with
Dell's Privacy Policy, available at:
http://www.dell.com/privacypolicycountryspecific, in order to enable the
performance of all of the various functions of SupportAssist during your
entitlement to receive related repair services from Dell.  You further agree
to allow Dell to transmit and store the Collected Data from SupportAssist in
accordance with these terms. You agree that the provision of SupportAssist
may involve international transfers of data from you to Dell and/or to Dell's
affiliates,subcontractors or business partners. When making such transfers,
Dell shall ensure appropriate protection is in place to safeguard the
Collected Data being transferred in connection with SupportAssist. If you are
downloading SupportAssist on behalf of a company or other legal entity, you
are further certifying to Dell that you have appropriate authority to provide
this consent on behalf of that entity. If you do not consent to the
collection, transmission and/or use of the Collected Data, you may not
download, install or otherwise use SupportAssist.
```

Example 2

```
console(config)# eula-consent support-assist reject

I do not accept the terms of the license agreement. The SupportAssist feature
has been deactivated and can no longer be used.
To enable SupportAssist configurations, accept the terms of the license
agreement by configuring this command 'eula-consent support-assist accept'.
```

contact-company

Use the **contact-company** command to configure the contact information to be sent to the SupportAssist server. Use the **no** form of the command to remove the contact information.

Syntax

contact-company name *company* **street-address** *streetaddress* **address city** *city* **country** *country* **postcode** *postcode*

- *company* — The company for the technical contact person. Maximum of 256 printable characters.
- *streetaddress* — The street address for the technical contact person. Maximum of 99 printable characters.
- *city* — The city for the technical contact person. Maximum of 99 printable characters.
- *country* — The country for the technical contact person in Alpha-3 format-3 capital-case characters.
- *postcode* — The postal code for the technical contact person. Maximum of 10 printable characters.

Enclose a parameter in quotes if an embedded blank is desired in the parameter.

Default Configuration

No contact company information is populated by default.

Command Mode

Support Assist Configuration

User Guidelines

This information is transmitted to Dell if the SupportAssist service is enabled.

This command can be executed multiple times. It overwrites the previous information each time. The collected information is stored in the running-config. The administrator must write the configuration in order to persist it across reboots.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# support-assist
console(conf-support-assist)#contact-company name "Dell Inc." street-address
"5 Round Rock Way" city "Round Rock, TX" country USA postcode 78665
```

contact-person

Use the **contact-person** command to configure the contact information to be sent to the SupportAssist server. Use the **no** form of the command to remove the contact information.

Syntax

contact-person first *firstname* **last** *lastname* **email-address primary** *emailaddress* **phone** *phone-number p***referred-method** { **email** | **phone** }

no contact-person

- *firstname* — The first name of the technical contact person. Maximum of 50 printable characters.
- *lastname* — The last name of the technical contact person. Maximum of 50 printable characters.
- **email-address primary**—The primary email address of the technical contact. Maximum of 50 printable characters.
- **phone**—The complete phone number. Maximum of 23 printable characters.
- **preferred-method**—The preferred method of contact. May be either email or phone.

Default Configuration

No contact person information is populated by default.

Command Mode

Support Assist Configuration

User Guidelines

The email address must conform to RFC 5322 sections 3.2.3 and 3.4.1 and RFC 5321. Additionally, the character set is further restricted to ASCII characters.

This information is transmitted to Dell if the SupportAssist service is enabled.

This command can be executed multiple times. It overwrites the previous information each time. The collected information is stored in the running-config. The administrator must write the configuration in order to persist it across reboots.

Command History

Introduced in version 6.3.0.1 firmware.

Example

The following example

```
console(config)# support-assist
console(conf-support-assist)#contact-person first john last doe email-
address primary jdoe@mycompany.com phone +1-555-999-9999 preferred-method
email
```

enable

Use the **enable** command to enable a SupportAssist server. Use the **no** form of the command to disable a SupportAssist server.

Syntax

enable

no enable

Default Configuration

By default, the default server is enabled. It may be disabled using the no enable form of the command.

Command Mode

Support Assist Configuration

User Guidelines

Only one SupportAssist server may be enabled. If contact with the server fails, the switch sleeps for the quiet period (default 1 hour) before attempting contact again.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# support-assist
console(conf-support-assist)#server New-Server
console(conf-support-assist-NewServer)#enable
```

proxy-ip-address

Use the **proxy-ip-address** command to configure a proxy server to be used to contact the SupportAssist servers. Use the **no** form of the command to remove the proxy server information.

Syntax

proxy-ip-address {*ipv4-address* | *ipv6-address*} **port** *port-number* **username** *userid* **password** [*encryption-type*] *password*

no proxy-ip-address

- *ipv4-address* — The IPv4 address of the proxy server in dotted decimal notation.
- *ipv6-address* — The IPv6 address of the proxy server in IPv6 notation.
- *port-number* — The TCP port number of the proxy server. Range 1-65535. Default 443.
- *userid*— The user name used to log into the proxy server.
- *encryption-type*— 0 indicates an unencrypted password. 7 indicates an encrypted password.
- *password*— An unencrypted or encrypted password. Maximum length is 64 characters for an unencrypted password. Encrypted passwords must be 128 characters in length.

Default Configuration

By default, no proxy is configured.

By default, passwords are entered as unencrypted and are always displayed and stored encrypted

Command Mode

Support Assist Configuration

User Guidelines

Passwords are always stored and displayed as encrypted, even if entered in unencrypted format.

Command History

Introduced in version 6.3.0.1 firmware.

server

Use the **server** command to configure a SupportAssist server and enter SupportAssist server configuration mode. Use the **no** form of the command to remove a SupportAssist server.

Syntax

server *server-name*

no server *server-name*

- *server-name* — The server name has a maximum length of 20 characters. Any printable character may be used in the server name other than a question mark. Enclose the server name in quotes if an embedded blank is desired in the server name.

Default Configuration

A default server named “default” exists at URL stor.g3.ph.dell.com. This server is pre-configured and may not be removed or modified other than to disable it.

Command Mode

Support Assist Configuration

User Guidelines

The server-name is used as a reference only and is not required to be used as part of a URL definition.

Up to four additional servers may be configured.

Use the **exit** command to exit from Support Assist Server configuration mode.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# support-assist
console(conf-support-assist)#server default
console(conf-support-assist-default)#
```

show eula-consent support-assist

Use the **show eula-consent** to may be used to review the EULA details whenever desired. Displaying the EULA details does not modify the current state of EULA acceptance for that feature.

Syntax

show eula-consent support-assist

Default Configuration

The SupportAssist EULA is Accepted by default.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Acceptance of the SupportAssist EULA is enabled by default.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#show eula-consent support-assist

SupportAssist EULA has been: Accepted
Additional information about the SupportAssist EULA is as follows:

By installing SupportAssist, you allow Dell to save your contact information
(e.g. name, phone number and/or email address) which would be used to provide
technical support for your Dell products and services.  Dell may use the
information for providing recommendations to improve  your IT infrastructure.
SupportAssist also collects and stores machine diagnostic information, which
may include but is not limited to configuration information, user supplied
contact information, names of data volumes, IP addresses, access control
lists, diagnostics & performance information, network configuration
information, host/server configuration & performance information and related
data (Collected Data) and transmits this information to Dell. By downloading
SupportAssist and agreeing to be bound by these terms and the Dell end user
license agreement, available at: http://www.dell.com/aeula, you agree to
allow Dell to provide remote monitoring services of your IT environment and
you give Dell the right to collect the Collected Data in accordance with
Dell's Privacy Policy, available at:
http://www.dell.com/privacypolicycountryspecific, in order to enable the
performance of all of the various functions of SupportAssist during your
entitlement to receive related repair services from Dell.  You further agree
to allow Dell to transmit and store the Collected Data from SupportAssist in
accordance with these terms. You agree that the provision of SupportAssist
may involve international transfers of data from you to Dell and/or to Dell's
affiliates, subcontractors or business partners. When making such transfers,
Dell shall ensure  appropriate protection is in place to safeguard the
Collected Data being transferred in connection with SupportAssist. If you are
downloading SupportAssist on behalf of a company or other legal entity, you
are further certifying to Dell that you have appropriate authority to provide
this consent on behalf of that entity. If you do not consent to the
collection, transmission and/or use of the Collected Data, you may not
download, install or otherwise use SupportAssist.
```

show support-assist status

Use the **show support-assist status** command to display information on SupportAssist feature status including any activities, status of communication, last time communication sent, etc.

Syntax

show support-assist status

Default Configuration

This command has no defaults.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

There are no guidelines for this command.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console# show support-assist status
SupportAssist: Enabled
SupportAssist Server: https://stor.g3.ph.dell.com (resolved)
EULA: Accepted
Proxy Server: 172.167.33.101


Proxy port: 8080    State      Last Start  Last
Activity                                  Success
Communication       Success    MM/DD/YYYY  MM/DD/YYYY
Status                        HH:mm:ss AM HH:mm:ss AM
Full Transfer       Success    MM/DD/YYYY  MM/DD/YYYY
                              HH:mm:ss AM HH:mm:ss AM
```

support-assist

Use the **support-assist** command to enable support-assist configuration mode if the EULA has been accepted. Use the **no** form of the command to remove the configured SupportAssist information.

Syntax

support-assist

no support-assist

Default Configuration

By default, a server named "default" is configured. It may be disabled by the administrator.

Command Mode

Global Configuration

User Guidelines

This command enters support-assist-conf mode. It allows the administrator to configure SupportAssist information. The configured information is stored in the running config. Use the **write** command to save the information into the startup-config.

Command History

Introduced in version 6.3.0.1 firmware.

Examples

Example 1

In this example, the SupportAssist EULA has been accepted.

```
console(config)#support-assist
console(conf-support-assist)#
```

Example 2

In this example, the SupportAssist EULA has been rejected.

```
console(config)#support-assist

SupportAssist EULA has not been accepted.
SupportAssist cannot be configured until the SupportAssist EULA is accepted.

console(config)#
```

url

Use the **url** command to configure the URL to reach on the SupportAssist remote server. Use the **no** form of the command to remove the URL information.

Syntax

url *uniform-resource-locator*

no url

uniform-resource-locator — A text string for the URL using one of the following formats:
http://[username:password@]<hostip>:<portNum>/<filepath>

https://[username:password@]<hostip>:<portNum>/<filepath>

Default Configuration

By default, no URL is configured.

Command Mode

Support Assist Configuration

User Guidelines

The hostip for the server may be specified as an IPv4 address, an IPv6 address or as a DNS hostname. If using the DNS hostname, the DNS resolver feature will need to be configured, enabled and operational.

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console(config)# support-assist
console(conf-support-assist)#server default
console(config)support-assist
console(conf-support-assist)#server new
console(conf-support-assist-new)#url https://stor.g3.ph.dell.com
```

SYSLOG Commands

The Dell EMC Networking supports a centralized logging service with support for local in-memory logs, crash dump logs, and forwarding messages to SYSLOG servers. All switch components use the logging service. Components log messages to the logging component using one of the following severity levels:

- Emergency (0): system is unusable
- Alert (1): action must be taken immediately
- Critical (2): critical conditions
- Error (3): error conditions
- Warning (4): warning conditions
- Notice(5): normal but significant conditions
- Informational(6): informational messages
- Debug(7): debug-level messages

Command Logging

The Dell EMC Networking Command Logging component logs all command line interface commands issued on the system. The command log messages are stored with the other system logs and provide the system operators with a detailed log of the commands executed.

CLI command logging is configured through any of the Dell EMC Networking management interfaces. When the feature is enabled, all CLI commands are logged using the existing logging service. By default, CLI command logging is disabled.

Dell EMC Networking supports both RFC 3164 and RFC 5424 logging to remote SYSLOG servers.

The CLI command logging severity is set to SEVERITY_NOTICE. The command logging severity is not modifiable by the administrator.

For example, the CLI log message for the user admin is:

```
<189> Oct 24 02:10:32 10.27.23.197-1 CMDLOGGER[emWeb]: cmd_logger_api.c(83)
440 %% NOTE CLI:EIA-232::show run
<189> Oct 24 02:10:28 10.27.23.197-1 CMDLOGGER[emWeb]: cmd_logger_api.c(83)
439 %% NOTE CLI:EIA-232::exit
```

```
<189> Oct 24 02:10:26 10.27.23.197-1 CMDLOGGER[emWeb]: cmd_logger_api.c(83)
438 %% NOTE CLI:EIA-232::logging buffered info
```

If enabled, the CLI command logger subsystem begins to log commands immediately after the user is authenticated. After authentication, the CLI generates an explicit message and invokes the command logger. The format of the message at login is:

```
<189> Jan 10 18:58:56 10.27.21.22-2 CMDLOGGER[209809328]:
cmd_logger_api.c(83) 361 %% NOTE CLI:10.27.21.22:admin:User admin logged in
<190> Jan 10 18:58:56 10.27.21.22-2 CLI_WEB[209809328]:
cmd_logger_api.c(260) 362 %% INFO [CLI:admin:10.27.21.22] User has
successfully logged in
```

The CLI command log subsystem also logs all user log out instances. The format of the log message is:

```
<190> Jan 10 19:01:04 10.27.21.22-2 CLI_WEB[209809328]:
cmd_logger_api.c(260) 382 %% INFO [CLI:admin:10.27.21.22] User has logged out
```

clear logging

Use the **clear logging** command to clear messages from the internal logging buffer.

Syntax

clear logging

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command has no user guidelines.

Example

The following example clears messages from the internal SYSLOG message logging buffer.

```
console#clear logging
Clear logging buffer [y/n]
```

clear logging file

Use the **clear logging file** command to clear messages from the logging file.

Syntax

clear logging file

Default Configuration

There is no default configuration for the command.

Command Mode

Privileged Exec

User Guidelines

This command has no user guidelines.

Example

The following example shows the **clear logging file** command and confirmation response.

```
console#clear logging file
Clear logging file [y/n]
```

description (Logging)

Use the **description** command in Logging mode to describe the SYSLOG server.

Syntax

description *description*

- *description* — Sets the description of the SYSLOG server. (Range: 1-64 characters.)

Default Configuration

This command has no default value.

Command Mode

Logging mode

User Guidelines

After entering the view corresponding to a specific SYSLOG server, the command can be executed to set the description of the server.

Example

The following example sets the SYSLOG server description.

```
console(config-logging)#description "syslog server 1"
```

level

Use the **level** command in Logging mode to specify the severity level of SYSLOG messages. To reset to the default value, use the **no** form of the command.

Syntax

level <*level*>

no level

- *level*—The severity level for SYSLOG messages. (**emergencies, alerts, critical, errors, warnings, notifications, informational, debugging**)

Default Configuration

The default value for *level* is **info**.

Command Mode

Logging mode

User Guidelines

After entering the view corresponding to a specific SYSLOG server, the command can be executed to set the severity level for SYSLOG messages. Debug level messages are intended for use by support personnel. The output is voluminous, cryptic, and because of the large number of messages generated, can adversely affect switch operations. Only set the logging level to debug under the direction of support personnel.

Example

The following example sets the SYSLOG message severity level to alert.

```
console(config-logging)#level alerts
```

logging cli-command

Use the **logging cli-command** in Global Configuration mode to enable CLI command logging.

Syntax

logging cli-command

no logging cli-command

Default Configuration

Disabled

Command Mode

Global Configuration

User Guidelines

See the CLI commands by using the show logging command.

Example

```
console(config)#logging cli-command
console(config)#do show logging

console#show logging

Logging is enabled
Logging protocol version: 0
Source Interface.............................. Default
Console Logging: Level warnings. Messages : 3 logged, 320 ignored
Monitor Logging: disabled
Buffer Logging: Level informational. Messages : 55 logged, 268 ignored
```

```
File Logging: Level emergencies. Messages : 0 logged, 323 ignored
Switch Auditing : enabled
CLI Command Logging: disabled
Web Session Logging : disabled
SNMP Set Command Logging : disabled
Logging facility level : local7
0 Messages dropped due to lack of resources
Buffer Log:
<189> Jan 10 18:59:09 10.27.21.22-2 CMDLOGGER[209809328]:
cmd_logger_api.c(83) 367 %% NOTE CLI:EIA-232:----:configure
<190> Jan 10 18:59:17 10.27.21.22-2 CLI_WEB[209809328]:
cmd_logger_api.c(260) 369 %% INFO [CLI:----:EIA-232] Access level of user
admin has been set to 15
<189> Jan 10 18:59:19 10.27.21.22-2 CMDLOGGER[209809328]:
cmd_logger_api.c(83) 370 %% NOTE CLI:EIA-232:----:exit
<189> Jan 10 18:59:22 10.27.21.22-2 CMDLOGGER[209809328]:
cmd_logger_api.c(83) 371 %% NOTE CLI:EIA-232:----:telnet 10.27.21.22
<189> Jan 10 18:59:27 10.27.21.22-2 TRAPMGR[209809328]: traputil.c(614) 372
%% Multiple Users: Unit: 0 Slot: 5 Port: 1
<189> Jan 10 18:59:27 10.27.21.22-2 CMDLOGGER[209809328]:
cmd_logger_api.c(83) 373 %% NOTE CLI:10.27.21.22:admin:User admin logged in
<190> Jan 10 18:59:27 10.27.21.22-2 CLI_WEB[209809328]:
cmd_logger_api.c(260) 374 %% INFO [CLI:admin:10.27.21.22] User has
successfully logged in
<190> Jan 10 18:59:28 10.27.21.22-2 CLI_WEB[209809328]:
cmd_logger_api.c(260) 375 %% INFO [CLI:admin:10.27.21.22] User admin logged
in to enable mode.
```

logging

Use the **logging** command in Global Configuration mode to log messages to a SYSLOG server. To delete the SYSLOG server with the specified address from the list of SYSLOG servers, use the **no** form of this command.

Syntax

logging {*ip-address* | *ipv6-address* | *hostname*} [tls {anon | x509 | x509 *certificate index*}]

no logging {*ip-address* | *ipv6-address* |*hostname*}

- *ip-address* — IP address of the host to be used as a SYSLOG server.
- *ipv6-address* — IPv6 address of the host to be used as a SYSLOG server.
- *hostname* — Hostname of the host to be used as a SYSLOG server. (Range: 1-63 characters) The command allows spaces in the host name when specified in double quotes. For example, #snmp-server v3-host “host name”.

- anon—Use anonymous authentication (that is, anonymous mode with no authentication).
- x509—Use mutual authentication (both client and server side). An optional certificate index can be used to identify a specific server and client certificate pair.

Default Configuration

When enabling x509 authentication, a default (non-indexed) certificate pair is used if present and no certificate index has been specified.

The default SYSLOG server port number is 514. When DTLS is configured (logging protocol 1), the default port number is 6514.

Command Mode

Global Configuration mode

User Guidelines

A signed X509 certificate must be present on the switch in order for DTLS (logging protocol 1) to operate. See the **crypto** commands for further information on certificates.

Up to eight SYSLOG servers can be configured.

The Dell EMC Networking uses the local7(23) facility in the SYSLOG message by default. SYSLOG messages will not exceed 96 bytes in length. SYSLOG protocol version 0 messages use the following format:

```
<190> Jan 01 00:00:06 0.0.0.0-1 General[fp_main_task]: bootos.c(191) 4 %% INFO Event(0xaaaaaaaa)
  |               |            |     |  |         |                |         |    |        |       |
  |               |            |     |  |         |                |         |    |        |       |
  |               |            |     |  |         |                |         |    |        |       |
  |               |            |     |  |         |                |         |    |        |     Message
  |               |            |     |  |         |                |         |    |     Severity
  |               |            |     |  |         |                |         |    |
  |               |            |     |  |         |                |         | Sequence Number
  |               |            |     |  |         |                |         |
  |               |            |     |  |         |                |   Line Number
  |               |            |     |  |         |                |
  |               |            |     |  |         |            File name
  |               |            |     |  |         |
  |               |            |     |  |    Thread Name
  |               |            |     |  |
  |               |            |     | Component Name
  |               |            |     |
  |               |            | Stack Member
  |               |            |
  |               |      Host IP address or Host Name
  |           Timestamp
 PRI
```

PRI	This consists of the facility code (see RFC 3164) multiplied by 8 and added to the severity. See below for more information on severity.
Timestamp	The system up time. For systems that use SNTP, this is UTC. When time zones are enabled, local time will be used.
Host IP Address or Host Name	The IP address or Host Name of the local system.
Stack ID	The assigned stack ID. 1 is used for systems without stacking capability. The top of stack is used to collect messages for the entire stack.
Component Name	Component name for the logging component. Components must use the new APIs in order to enable identification of the logging component. Component **UNKN** is substituted for components that do not use the new logging APIs.
Thread ID	The thread ID of the logging component.
File Name	The name of the file containing the invoking macro.
Line Number	The line number which contains the invoking macro.

Sequence Number	The message sequence number for this stack component. Sequence numbers may be skipped because of filtering but are always monotonically increasing on a per stack member basis.
Severity	The message severity. One of: EMER - Emergency, ALRT - Alert, CRIT - Critical, ERR - Error, WARN - Warning, NOTE - Notice, INFO - Informational, DBG - Debug
Message	An informative message regarding the event.

Example

The following example configures the named server as an available SYSLOG server.

```
console# logging Syslog-server-1.dell.com
```

logging audit

Use the **logging audit** command to enable switch auditing. Use the **no** form of the command to disable switch auditing.

Syntax

logging audit

no logging audit

Default Configuration

The command default is enabled.

Command Mode

Global Configuration

Example

```
console(config)#logging audit
```

logging buffered

Use the **logging buffered** command in Global Configuration mode to limit SYSLOG messages displayed from an internal buffer based on severity. To cancel the buffer use, use the **no** form of this command.

Syntax

logging buffered [***severity–**level*]

no logging buffered

- *severity–level*—(Optional) The number or name of the desired severity level. Range:
  - [0 | emergencies]
  - [1 | alerts]
  - [2 | critical]
  - [3 | errors]
  - [4 | warnings]
  - [5 | notifications]
  - [6 | informational]
  - [7 | debugging]

Default Configuration

The default value for *level* is **informational**.

Command Mode

Global Configuration mode

User Guidelines

All the SYSLOG messages are logged to the internal buffer. This command limits the commands displayed to the user. Debug level messages are intended for use by support personnel. The output is voluminous, cryptic, and because of the large number of messages generated, can adversely affect switch operations. Only set the logging level to debug under the direction of support personnel.

Example

The following example limits SYSLOG messages collected in the internal buffer to those of severity level “error” and above (numerically lower).

```
console(config)#logging buffered error
```

logging console

Use the **logging console** command in Global Configuration mode to limit messages logged to the console based on severity. To disable logging to the console terminal, use the **no** form of this command.

Syntax

logging console [*severity–level*]

no logging console

- *severity–level*—(Optional) The number or name of the desired severity level. Range:
  - [0 | emergencies]
  - [1 | alerts]
  - [2 | critical]
  - [3 | errors]
  - [4 | warnings]
  - [5 | notifications]
  - [6 | informational]
  - [7 | debugging]

Default Configuration

The default console logging severity is **warnings**.

Command Mode

Global Configuration mode

User Guidelines

Messages at the selected level and above (numerically lower) are displayed on the console. Debug level messages (logging console 7) are intended for use by support personnel. The output is voluminous, cryptic, and because of the large number of messages generated, can adversely affect switch operations. Only set the logging level to debug under the direction of support personnel.

Example

The following example limits messages logged to the console based on severity level “alerts”.

```
console(config)#logging console alerts
```

logging facility

Use the **logging facility** command in Global Configuration mode to configure the facility to be used in log messages.

Syntax

logging facility *facility*

no logging facility

- *facility*—The facility that will be indicated in the message. (Range: local0, local1, local2, local3, local4, local5, local6, local7).

Default Configuration

The default logging facility is local7.

Command Mode

Global Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example sets the logging facility as **local3**.

```
console(config)#logging facility local3
```

logging file

Use the **logging file** command in Global Configuration mode to limit SYSLOG messages sent to the logging file based on severity. To set the default logging level, use the **no** form of this command.

Syntax

logging file [*severity–level-number* **|** *type*]

no logging file

- *severity–level*—(Optional) The number or name of the desired severity level. Range:
  - [0 | emergencies]
  - [1 | alerts]
  - [2 | critical]
  - [3 | errors]
  - [4 | warnings]
  - [5 | notifications]
  - [6 | informational]
  - [7 | debugging]

Default Configuration

The default severity level is **emergencies**.

Command Mode

Global Configuration mode

User Guidelines

The logging file command controls the minimum severity for which system messages are logged to the flash file system. Messages are flushed to the file system on every write. It is not recommended to use any setting other than the default unless debugging a specific issue. Using a severity other than the default may shorten the lifespan of the switch as the flash supports a limited number of write cycles and a limited number of spare blocks.

Debug level messages are intended for use by support personnel. The output is voluminous, cryptic, and because of the large number of messages generated, can adversely affect switch operations. Only set the logging level to debug under the direction of support personnel.

Example

The following example limits SYSLOG messages stored in the logging file to severity level “warnings” and above (numerically lower).

```
console(config)#logging file warnings
```

logging monitor

Use the **logging monitor** command in Global Configuration mode to enable logging messages to telnet and SSH sessions at the specified severity level.

Use the **no logging monitor** command to disable logging messages.

Syntax

logging monitor *<severity>*

no logging monitor

- *severity*—(Optional) The number or name of the desired severity level. Range:
  - [0 | emergencies]
  - [1 | alerts]
  - [2 | critical]
  - [3 | errors]
  - [4 | warnings]
  - [5 | notifications]
  - [6 | informational]
  - [7 | debugging]

Default Configuration

The default logging monitor severity level is not configured. By default, logging messages are not displayed on SSH or telnet sessions (no logging monitor). Logging messages are displayed by default on console sessions (serial and out-of-band ports).

Command Mode

Global Configuration mode

User Guidelines

Use the terminal monitor command to enable the asynchronous display of system messages within an individual telnet or SSH session. Use the logging monitor command to globally configure the severity of logged messages within all telnet/SSH sessions. Messages logged telnet and SSH sessions are filtered based on severity. Selecting a severity level will log that severity and higher (numerically lower) level messages.

logging on

Use the **logging on** command in Global Configuration mode to control error messages logging. This command globally enables the sending of logging messages to the currently configured locations. To disable the sending of log messages, use the **no** form of this command.

Syntax

logging on

no logging on

Default Configuration

Logging is enabled.

Command Mode

Global Configuration mode

User Guidelines

The logging process controls the distribution of logging messages to the console, logging buffer, logging file, and SYSLOG servers. Logging on and off for these destinations can be individually configured using the **logging buffered**, **logging file**, and **logging** *server* commands. However, if the **logging on** command is disabled, no messages are sent to these destinations. Command logging is not affected by this command.

Example

The following example shows how logging is enabled.

```
console(config)#logging on
```

logging protocol

Use this command to log messages in RFC5424 format, including time zone and subsecond resolution time stamps. Use the **no** form of this command to set the logging to the default format.

Syntax

logging protocol {*protocol-selector*}

no logging protocol

- *protocol-selector*—One of the following:
  - 0 – Generate RFC3164 format messages
  - 1 – Generate RFC5424 format messages

Default Configuration

Messages are logged in RFC3164 format by default (logging protocol 0).

Command Modes

Global Configuration mode.

User Guidelines

During system startup, messages are logged in RFC3164 format (e.g., in the startup persistent log). Messages are logged in the selected format upon the system processing the startup configuration.

The time zone must be configured for the system to generate RFC5424 log messages with the time zone included.

Example

This example set the logging message format to RFC5424. DTLS is used for X509 configured SYSLOG servers if a certificate is available.

```
console(config)#logging protocol 1
```

This example sets the logging message format to RFC3164

```
console(config)#no logging protocol
```

The following example shows the logging format when logging protocol is set to 0.

```
console(config)#logging protocol 0

console(config)#
<190> Oct 18 07:09:15 0.0.0.0-1 RADIUS[radius_task]: radius_api.c(10450) 58
%% INFO RADIUS: Sending RADIUS server state change event to interested users:
1
<189> Oct 18 07:09:15 0.0.0.0-1 TRAPMGR[trapTask]: traputil.c(721) 26 %% NOTE
Unit 1 is the new management unit in the stack, Old management unit in the
stack unit is 0
```

The following example shows the logging format when logging protocol is set to 1.

```
console(config)#logging protocol 1

console(config)#
<190>1 2017-10-18T07:09:23.446Z dhcp-10-130-182-178 UNITMGR cmgrInsertTask
unitmgr.c(8063) 232 [stk@674 unit:1][sev@674 INFO] %% No Potential unit to
configure as Standby when unit 1 joined
<189>1 2017-10-18T07:09:23.445Z dhcp-10-130-182-178 USB_FD emWeb
usbFlashDrive_core.c(903) 231 [stk@674 unit:1][sev@674 NOTE] %% There is
startup-config on flash.
<190>1 2017-10-18T07:09:23.432Z dhcp-10-130-182-178 AUTO_INST emWeb
auto_install_control.c(1358) 230 [stk@674 unit:1][sev@674 INFO] %%
AutoInstall is stopped.
```

The following example shows the logging format when logging protocol is set to 1 with timezone configured on the switch.

```
console(config)#clock timezone +5 minutes 30 zone IST

console(config)#show clock

02:17:44 IST(UTC+5:30) Dec 21 2014
Time source is Local

console(config)#
<189>1 2013-06-13T23:24:15.652+5:30Z 10.130.185.84 TRAPMGR trapTask
traputil.c(721) 11698 [stk@674 unit:1][sev@674 NOTE] %% Link Down: Gi1/0/11
```

logging snmp

Use the **logging snmp command** in Global Configuration mode to enable SNMP Set command logging. To disable, use the no form of this command.

Syntax

logging snmp

no logging snmp

Default Configuration

By default, **logging snmp** is disabled.

Command Mode

Global Configuration mode

User Guidelines

To see SNMP Set command logs use the show logging command.

Example

```
console(config)#logging snmp
```

logging source-interface

Use the **logging source-interface** command to select the interface from which to use the IP address in the source IP address field of transmitted SYSLOG packets. Use the **no** form of the command to revert to the default IP address.

Syntax

logging source-interface {**loopback** *loopback-id*} | {**tunnel** *tunnel-id*} | {**vlan** *vlan-id*} | {**out-of-band** }

no logging source-interface

- *loopback-id* — The name of a loopback interface.
- *tunnel-id* — The name of a tunnel-id.
- *vlan-id* —A VLAN identifier.
- out-of-band —The out-of-band interface identifier.

Default Configuration

By default, the switch uses the assigned switch IP address. This is either the IP address assigned to VLAN or the out-of-band interface IP address.

Command Mode

Global Configuration

User Guidelines

This command is not supported on Dell EMC N1100-ON switches. Dell EMC N1100-ON switches support configuration of a single IP address in interface vlan configuration mode. That IP address is used as the source interface address for this function..

Command History

Introduced in version 6.3.0.1 firmware.

Example

```
console#conf
console(config)#interface vlan 1
console(config-if-vlan1)#ip address dhcp
console(config-if-vlan1)#exit
console(config)#logging source-interface vlan 1
```

logging traps

Use the **logging traps** command in Global Configuration mode to set the lowest severity level at which SNMP traps are logged. To revert the urgent severity level to its default value, use the **no** form of this command.

Syntax

logging traps *severity*

no logging traps

- *severity*—If you specify a severity level, log messages at or above the severity level are e-mailed. The severity level may either be specified by keyword or as an integer from 0 to 7. The accepted keywords, and the numeric severity level each represents, are as follows.
  - emergency (0)
  - alert (1)
  - critical (2)
  - error (3)
  - warning (4)
  - notice (5)

– info (6)
– debug (7)

Default Configuration

The default severity level is info(6).

Command Mode

Global Configuration mode

User Guidelines

You can filter log messages that appear in the buffered log by severity level. You can specify the severity level of log messages that are e-mailed. You can use this command to specify the severity level at which SNMP traps are logged, and thus control whether traps appear in the buffered log or are e-mailed and, if they are e-mailed, whether traps are considered urgent or non-urgent.

logging web-session

Use the **logging web-session** command in Global Configuration mode to enable web session logging. To disable, use the no form of this command.

Syntax

logging web-session

no logging web-session

Default Configuration

Disabled.

Command Mode

Global Configuration mode

User Guidelines

To see web session logs use the show logging command.

Example

```
console(config)#logging web-session
<133> Jan 12 13:51:55 10.130.185.29-6 CLI_WEB[emWeb]: cmd_logger_api.c(140)
9788 %% NOTE WEB:10.130.65.150:admin:session[0] created

<133> Jan 12 13:51:55 10.130.185.29-6 CLI_WEB[emWeb]: cmd_logger_api.c(140)
9789 %% NOTE WEB:10.130.65.150:admin:User admin logged in
```

port

Use the **port** command in Logging Configuration mode to specify the port number of a SYSLOG server to which SYSLOG messages are sent. To reset to the default value, use the **no** form of the command.

Syntax

port *port*

no port

- *port*—The port number to which SYSLOG messages are sent. (Range: 1-65535)

Default Configuration

The default port number for UDP messages is 514. When DTLS is configured (logging protocol 1), the default port number is 6514.

Command Mode

SYSLOG server configuration mode

User Guidelines

After entering the view corresponding to a specific SYSLOG server, the command can be executed to set the port number for the server.

If the port value is changed for a server, the configuration does not take effect until the server is disconnected and reconnected.

Example

The following example sets the SYSLOG server port to 300.

```
console(config-logging)#port 300
```

show logging

Use the **show logging** command to display all logging information, including auditing status and logging protocol version.

Syntax

show logging

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Command History

Updated output in version 6.5.

Example

The following example displays the state of logging and the SYSLOG messages stored in the internal buffer.

```
console#show logging

Logging is enabled
Logging protocol version: 1
Source Interface.............................. out-of-band
Console Logging: Level debugging. Messages : 1221 logged, 8500 ignored
Monitor Logging: disabled
Buffer Logging: Level informational. Messages : 744 logged, 8494 ignored
File Logging: Level emergencies. Messages : 0 logged, 9800 ignored
Switch Auditing : enabled
CLI Command Logging: disabled
Web Session Logging : disabled
SNMP Set Command Logging : disabled
Logging facility level : local7
```

```
SYSLOG Server Details:

0.0.0.0 : Level informational. Messages : 0 dropped
0 Messages dropped due to lack of resources
Buffer Log:
<186> Oct 18 07:09:12 0.0.0.0-1 General[fp_main_task]: bootos.c(191) 10 %%
CRIT Event(0xaaaaaaaa)
<189> Oct 18 07:09:12 0.0.0.0-1 BSP[fp_main_task]: bootos.c(175) 9 %% NOTE
BSP initialization complete, starting switch firmware.
<190> Oct 18 07:09:12 0.0.0.0-1 OSAPI[fp_main_task]: osapi_crash.c(1297) 8 %%
INFO Oldest crashlog (5) will be deleted if another crash happens.
<190> Oct 18 07:09:12 0.0.0.0-1 OSAPI[fp_main_task]: osapi_crash.c(1292) 7 %%
INFO 5 Crashlogs found.
<190> Oct 18 07:09:11 0.0.0.0-1 DRIVER[fp_main_task]:
broad_hpc_stacking.c(1236) 6 %% INFO Configuring CPUTRANS RX
<190> Oct 18 07:09:11 0.0.0.0-1 DRIVER[fp_main_task]:
broad_hpc_stacking.c(1224) 5 %% INFO Configuring CPUTRANS TX
<190> Oct 18 07:09:11 0.0.0.0-1 DRIVER[fp_main_task]:
broad_hpc_stacking.c(1193) 4 %% INFO Adding BCM transport pointers
<189> Oct 18 07:09:06 0.0.0.0-1 General[fp_main_task]:
sdm_template_mgr.c(488) 3 %% NOTE Booting with default SDM template Data
Center - IPv4 and IPv6.
<190> Oct 18 07:09:05 0.0.0.0-1 General[procLOG]: procmgr.c(3685) 2 %% INFO
Application Terminated (user.start, ID = 7, PID = 1349
<185> Oct 18 07:09:05 0.0.0.0-0 General[fp_main_task]: unitmgr.c(6612) 1 %%
ALRT Reboot 1 (0x1)

A protocol version 1 message will appear as follows:

<189>1 2017-10-18T07:09:22.796Z dhcp-10-130-182-178 TRAPMGR trapTask
[SDID@674 unit="1" sev="NOTE" ref="traputil.c(721)"]  222 %% Link on Vl1 is
failed
```

NOTE:

- The stack unit number is not part of the time stamp. It needs to be for protocol version 0, but not for protocol 1.
- The stack unit number, human readable severity and the source reference should be part of the structured data where 674 is the Dell private enterprise number.
- 222 is the MSGID.

show logging file

Use the **show logging file** command to display the state of logging and the messages stored in the logging file.

Syntax

show logging file

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the state of logging messages sorted in the logging file.

```
console(config)#show logging file
Persistent Logging                 : enabled
Persistent Log Count               : 0
---------------------------------------------------------------------------
Persistent Log File Empty
```

show syslog-servers

Use the **show syslog-servers** command to display the SYSLOG servers settings.

Syntax

show syslog-servers

Default Configuration

When enabling x509 authentication, a default (non-indexed) certificate pair is used if present and no index was selected for the server.

Anonymous authentication does not use a certificate.

The default SYSLOG server port number is 514. When DTLS is configured (logging protocol 1), the default port number is 6514.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays the SYSLOG server settings.

```
console#show syslog-servers

IP address      Port  Severity     Description
----------------------------------------------
192.180.2.275   14    Info          7
192.180.2.285   14    Warning       7
Transport Type Authentication    Certificate Index
-------------- ----------------- -------------------
UDP
TLS            X509               5
TLS            Anonymous
```

terminal monitor

Use the **terminal monitor** command to enable the display of system messages on the terminal for telnet and SSH sessions.

Syntax

terminal monitor

no terminal monitor

Default Configuration

The default setting is that system messages are not displayed on telnet or SSH sessions. System messages are always displayed on console sessions (serial or out-of-band port connections).

Command Mode

Privileged Exec mode

User Guidelines

Use the **terminal monitor** command enables system messages to be displayed in a Telnet or SSH session.

Use the **no terminal monitor** command to disable the display of system messages on the terminal for Telnet and SSH sessions. Use the logging monitor command to display logging messages in a Telnet or SSH session.

Terminal monitor and logging monitor are enabled on console sessions by default.

Example

This example enables the display of system messages and logging messages on the current telnet session.

```
console#terminal monitor
console#configure
console(cinsfig)#logging monitor
```

System and Stack Management Commands

asset-tag

Use the **asset-tag** command in Global Configuration mode to specify the switch asset tag. To remove the existing asset tag, use the **no** form of the command.

Syntax

asset-tag [*unit*] *tag*

no asset-tag [*unit*]

- *unit* — Switch number. (Range: 1–<*maximum supported on platform*>)
- *tag* — The switch asset tag.

Default Configuration

No asset tag is defined by default.

Command Mode

Global Configuration mode

User Guidelines

The asset-tag command accepts any printable characters for a tag name except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may accept entries up to the first illegal character or reject the entry entirely.

Example

The following example specifies the switch asset tag as 1qwepot. Because the unit parameter is not specified, the command defaults to the primary switch number.

```
console(config)# asset-tag 1qwepot
```

banner exec

Use the **banner exec** command to set the message that is displayed after a successful login. Use the **no** form of the command to remove the set message.

Syntax

banner exec *MESSAGE*

no banner exec

- *MESSAGE* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The exec message may consist of multiple lines. Enter a quote to complete the message and return to configuration mode. Up to 2000 characters may be entered into a banner. Each line entered will consume an extra two characters to account for the carriage return and line feed.

Example

```
console(config)# banner exec "banner text"
```

banner login

Use the **banner login** command to set the message that is displayed just before the login prompt after a user has successfully connected to the switch and prior to the login banner. Use **no banner login** command to remove the message.

Syntax

banner login *Message*

no banner login

- *Message* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The login banner can consist of multiple lines. Enter a quote to end the banner text and return to the configuration prompt. Up to 2000 characters may be entered into a banner. Each line entered will consume an extra two characters to account for the carriage return and line feed. Different terminal emulators will exhibit different behaviors when logging in over SSH. See the user guidelines for banner motd acknowledge for some examples.

Example

```
console(config)# banner login "banner text"
```

banner motd

Use the **banner motd** command to set the message that is displayed prior to logging into the switch. Use **no banner motd** command to remove the message.

Syntax

banner motd *MESSAGE*

no banner motd

- *MESSAGE* — Quoted text

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The motd banner can consist of multiple lines. Enter a quote to end the banner text and return to the configuration prompt. Up to 2000 characters may be entered into a banner. Each line entered will consume an extra two characters to account for the carriage return and line feed.

The motd banner is usually displayed prior to logging into the switch, although some protocols, for example SSH, may enforce different behavior. See the user guidelines for banner motd acknowledge for some examples.

Example

```
console(config)# banner motd "IMPORTANT: There is a power shutdown at 23:00hrs today, duration 1 hr 30 minutes."
When the MOTD banner is executed, the following displays:
IMPORTANT: There is a power shutdown at 23:00hrs today, duration 1 hr 30 minutes.
```

banner motd acknowledge

The banner displayed on the console must be acknowledged if **banner motd acknowledge** is executed. Enter "y" or "n" to continue to the login prompt. If "n" is entered, the session is terminated and no further communication is allowed on that session. However, serial connection will not get terminated if 'y' is not entered. Use the **no banner motd acknowledge** command to disable banner acknowledge.

Syntax

banner motd acknowledge

no banner motd acknowledge

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Various terminal emulators exhibit different behaviors with regards to the MOTD and the acknowledge prompt, for example, TeraTerm and putty. There are also different behaviors based upon the protocol used (SSH versus telnet). See below for some examples where the MOTD prompt occurs either before or after the acknowledge prompt. The banner motd in this example is "If `you need to utilize this device or otherwise make changes to the configuration, you may contact Kevin at x911. Please be advised this unit is under test by Kevin."` and the banner login is "Welcome `to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is located in A2 and is currently under test."`

SSH (putty):

login as: `dellradius`

```
If you need to utilize this device or otherwise make changes to the
configuration, you may contact Kevin at x911.
Please, be advised this unit is under test by Kevin.
dellradius@192.168.12.84's password:

Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
N3024-C1>

SSH (Linux Terminal):

[root@kevin ~]# ssh 192.168.12.84 -l dellradius
If you need to utilize this device or otherwise make changes to the
configuration, you may contact Kevin at x911.
Please, be advised this unit is under test by Kevin.
dellradius@192.168.12.84's password:

Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
N3024-C1>

SSH (xterm):
```

```
[root@kevin ~]# ssh 192.168.12.84 -l dellradius
If you need to utilize this device or otherwise make changes to the
configuration, you may contact Kevin at x911.
Please, be advised this unit is under test by Kevin.
dellradius@192.168.12.84's password:

Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
N3024-C1>

Telnet:
If you need to utilize this device or otherwise make changes to the
configuration, you may contact Kevin at x911.
Press 'y' to continue (within 30 seconds) (y/n) y

Please, be advised this unit is under test by Kevin.
User:root
Password:******
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
N3024-C1>
```

Example

```
console(config)# banner motd “There is a power shutdown at 23:00hrs today,
duration 1 hr 30 minutes.”
console(config)# banner motd acknowledge
```

When the MOTD banner is executed, the following displays:

```
IMPORTANT: There is a power shutdown at 23:00hrs today, duration 1 hr 30
minutes.
Press ‘y’ to continue
```

If ‘y’ is entered, the following displays:

```
console >
```

If ‘n’ is entered, the session will get disconnected, unless it is a serial connection.

buffers

Use the **buffers** command to configure the rising and falling thresholds for the issuance of the message buffer SNMP trap and notification via a SYSLOG message.

Syntax

buffers {**rising-threshold** *rising-threshold-val* | **falling-threshold** *falling-threshold-val* | **severity** *severity-level*}

no buffers {**rising-threshold** | **falling-threshold** | **severity** }

- rising-threshold-val—The rising message buffer threshold over which a trap will be issued. This is a percentage of messages buffers utilized and ranges from 0 to 100.
- falling-threshold-val—The falling threshold value. Once the rising threshold has been crossed, another trap will not be issued until the message buffer has dropped below the falling threshold. This is a percentage of messages buffers utilized and ranges from 0 to 100.
- severity-level—The severity level of the trap issued by SNMP. Range is 0 (EMERGENCY) to 7 (DEBUG).

Default Configuration

The default rising-threshold-val is 80%.

The default falling-threshold-val is 50%

The default severity level is NOTICE.

Command Mode

Global Configuration

User Guidelines

Message buffers are used internally by the switch firmware to pass network PDUs. This includes PDUs such as spanning tree BPDUs or multicast or unicast packets forwarded in software. On rare occasions, a packet storm may cause the switch to become congested due to an excessive number of messages forwarded to the switch CPU. The switch has numerous rate limiters and other mechanisms to appropriately handle such packet floods, however, due to the changing nature of Internet traffic, new types of traffic may cause temporary internal congestion conditions. This command allows the operator to enable the issuance of a trap in such a condition as an aid to early diagnosis and mitigation of the conditions causing traffic to flood the switch CPU.

Setting the rising threshold to 0 disables message buffer monitoring.

The *falling-threshold-val* should be configured to be less than or equal to the *rising-threshold-val*.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)#buffers rising-threshold 90
```

clear checkpoint statistics

Use the **clear checkpoint statistics** command to clear the statistics for the checkpointing process.

Syntax

clear checkpoint statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

When nonstop forwarding is enabled on a stack, the stack's management unit checkpoints operational data to the backup unit. If the backup unit takes over as the management unit, the control plane on the new management unit uses the checkpoint data when initializing its state. Checkpoint statistics track the amount of data checkpointed from the management unit to the backup unit.

Example

```
console#clear checkpoint statistics
```

clear counters stack-ports

Use the **clear counters stack-ports** command to clear the statistics for all stack-ports.

Syntax

clear counters stack-ports

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

This command resets all statistics shown by the **show switch stack-ports counters** and the **show switch stack-ports diag** commands.

Example

```
console#clear counters stack-ports
```

connect

Use this command to connect the serial console of a different stack member to the local unit. The **connect** command allows administrations that deploy terminal servers to connect a single serial line to any stack member for administration of the stack via the console. The network administrator can use the connect command to access the primary unit console session when presented with a “CLI unavailable message” due to a primary switchover.

Syntax

connect *unit*

- *unit*—A unit number in the stack.

Default Configuration

There is no default configuration for this command.

Command Modes

Privileged Exec mode on management unit in the stack.

Unit Prompt on stack member.

User Guidelines

This command is available from the Unit prompt on a member unit serial port. The user need not be currently connected over the serial port to connect to another unit.

The stack member being connected to must be up and running and connected as part of the stack. This command connects the the serial console from the target stack member to the local unit. There is only one console session allowed per stack. The remote console session is not restarted and the privilege level is not changed as a result of being connected to the local unit. All security mechanisms applicable to the serial port remain in place.

Example

Example 1:

To connect to a remote stack member from primary.

```
Stack-Primary#connect 2

Remote session started. Type "exit" to exit the session.

(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

Example 2:

To connect to the management unit in the stack (unit 1, below) over a stack member serial port.

```
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#
```

disconnect

Use the **disconnect** command to detach a UI session.

Syntax

disconnect { *session-id* **|** **all** }

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode.

User Guidelines

This command forcibly logs out and disconnects a Telnet, SSH, HTTP or HTTPs session. Use the **show sessions** command to display the session identifier.

The session identifier ranges from 0-42. The **all** parameter disconnects all telnet, SSH, HTTP or HTTPs sessions.

It is not possible to disconnect the EIA-232 (serial console) session.

exit

Use this command to disconnect the serial connection to a remote unit.

Syntax

exit

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec mode on management unit in the stack.

Unit prompt on the stack member.

User Guidelines

This command is available in User Exec mode on the primary unit serial port and from the Unit prompt on member unit serial ports. The user need not be currently connected over the serial port to connect to another unit.

The stack member being connected to must be up and running and connected as part of the stack.

Example

Example 1:

To disconnect a remote session to a stack member established from the stack manager.

```
Stack-Primary#connect 2

Remote session started. Type "exit" to exit the session.

(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>exit

Stack-Primary#
```

Example 2:

To disconnect a remote session to the management unit in the stack established from a stack member.

```
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 2

(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#
Stack-Primary#exit

Stack-Primary>exit

(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

hardware profile portmode

Use the **hardware profile portmode** command to configure a 100G QSFP port to operate in either 1x100G, 2x50G, or 4x25G mode.

Use the **no** form of the command to return the port to the default mode.

This command can only be executed on interfaces that support the expandable ports feature. Entering the command on any other type of interface will give an error.

NOTE: This command does not operate in interface range mode.

NOTE: This command is only valid on the N2200-ON and N3200-ON switches. It issues an error response is used on any other switch model.

Syntax

hardware profile portmode {1x40g | 4x10g }

hardware profile portmode {1x100g | 2x50g | 4x25g }

no hardware profile portmode

The available modes depend on the platform.

N2200 only:

- 1x40g: Configure the port as a single 40G port using four lanes.
- 4x10g: Configure the port as four 10G ports, each on a separate lane.

N3200 only:

- 1x100g: Configure the port as a single 1x100G port using one lane.
- 2x50g: Configure the port as two 50G ports, each on a separate lane. AN is not supported.
- 4x25g: Configure the port as a four 25G ports, each on a separate lane.
- The 25G ports may also operate at 10G speeds.

Default Configuration

- By default, 40G ports are configured in 1x40G stacking mode.
- By default, 100G ports are configured in 2x50G stacking mode.

Command Mode

Interface (Ethernet) Configuration mode

User Guidelines

This command can only be executed on a 40G or 100G Ethernet interface that supports the expandable ports feature. Entering this command on any of the 4x10G, 2x50G, or 4x25G Ethernet interfaces (or any non-Ethernet port) will give an error. Entering the command on a non-expandable type of interface will give an error.

When an expandable port is configured to operate in Ethernet mode, a breakout cable may be used to connect to other switches or hosts.

When the stack port is configured in Ethernet mode, the stack ports and the non-configured Ethernet ports show as detached in the output of the show interfaces status command. For example, if the port is configured as 100G Ethernet, the two stack ports, the 2x50G Ethernet ports, and the 4x25G Ethernet ports show as detached. Likewise, when the port is configured in stack mode, all of the associated Ethernet ports will show as detached.

On the N3200, AN is supported in 25G and 100G modes only. The port will not link up if configured for 2x50G breakout with AN enabled.

NOTE: This command does not operate in interface range mode.

NOTE: This command is only valid on the N2200-ON and N3200-ON switches. It issues an error response if used on any other switch model. On the N2200, the switch must be rebooted for the command to take effect.

Example

Change N3200 2x50G stacking ports to 100G Ethernet.

```
console#config
console(config)#stack
console(config-stack)#stack-port fiftygigabitethernet 1/0/1 ethernet
console(config-stack)#stack-port fiftygigabitethernet 1/0/2 ethernet
console(config-stack)#stack-port fiftygigabitethernet 1/0/3 ethernet
console(config-stack)#stack-port fiftygigabitethernet 1/0/4 ethernet
console(config-stack)#exit
console(config)#interface hundredgigabitethernet 1/0/1
console(config-if-Hu1/0/1)#hardware profile portmode 1x100g
console(config-if-Hu1/0/1)#interface hundredgigabitethernet 2/0/2
console(config-if-Hu1/0/2)#hardware profile portmode 1x100g
console(config-if-Hu1/0/2)#end
console#write
console#reload
```

Change N3200 100G Ethernet ports to 2x50G stacking.

```
console#config
console(config)#interface hundredgigabitethernet 1/0/1
console(config-if-Hu1/0/1)#hardware profile portmode 2x50g
console(config-if-Hu1/0/1)#interface hundredgigabitethernet 1/0/2
console(config-if-Hu1/0/2)#hardware profile portmode 2x50g
console(config-if-Hu1/0/2)#exit
console(config)#stack
console(config-stack)#stack-port fiftygigabitethernet 1/0/1 stack
console(config-stack)#stack-port fiftygigabitethernet 1/0/2 stack
console(config-stack)#stack-port fiftygigabitethernet 1/0/3 stack
console(config-stack)#stack-port fiftygigabitethernet 1/0/4 stack
console(config-stack)#end
console#write
console#reload
```

Command History

Command updated in firmware release 6.6.2. 40G ports removed in release 6.7.0 firmware.

hostname

Use the **hostname** command in Global Configuration mode to specify or modify the switch host name. To restore the default host name, use the **no** form of the command.

Syntax

hostname *name*

no hostname

- *name* — The name of the host. (Range: 1–255 characters) The command allows spaces in the host name when specified in double quotes. For example, #snmp-server v3-host “host name”.

Default Configuration

No host name is configured.

Command Mode

Global Configuration mode

User Guidelines

The hostname, if configured, is advertised in the LLDP system-name TLV. The hostname may include any printable characters except a question mark. Enclose the string in double quotes to include spaces within the name. The surrounding quotes are not used as part of the name. The CLI does not filter illegal characters and may truncate entries at the first illegal character or reject the entire entirely.

Example

The following example specifies the switch host name.

```
console(config)# hostname Dell
```

initiate failover

To manually force a failover from the management unit to the backup unit in a stack, use the **initiate failover** command in Stack Configuration mode.

The **initiate failover** command checks for stack port errors and NSF synchronization prior to initiating failover. If stack port errors are found, or if the NSF status is not synchronized, a message is displayed and the user is prompted to continue or abort the operation (see example, below).

Syntax

initiate failover

Default Configuration

There is no default configuration.

Command Mode

Stack Configuration mode

User Guidelines

This command forces a warm restart of the stack. The backup unit takes over as the new management unit without clearing the hardware state on any of the stack members. The original management unit reboots. If the system is not ready for a warm restart, for example because no backup unit has been elected or one or more members of the stack do not support nonstop forwarding, the command fails with a warning message. Use the **standby** command to select a specific unit to act as the backup unit. Use the **show nsf** command to check the NSF state. If the switch shows Warm Restart Ready as Yes, then the primary switch state is synchronized with the standby switch.

Examples

Example-No Stack Port Errors

```
console(config-stack)#initiate failover ?
<cr> Press enter to execute the command.
console(config-stack)#initiate failover
Management unit will be reloaded.
Are you sure you want to failover to the backup unit? (y/n) y
```

Example-Stack Port Errors

```
console(config-stack)#initiate failover
Warning! Stack errors detected on the following interfaces:

Interface          Error Count
----------------   ----------------
Gi1/0/1                          12
Gi1/0/3                          22

NSF Status: Not synchronized

Stack port errors or lack of NSF synchronization may indicate a non-redundant
stack topology exists. Fail-over on a non-redundant topology may cause the
stack to split!

Management unit will be reloaded.
Are you sure you want to failover to the backup unit? (y/n)
```

load-interval

Use this command to load the interface utilization measurement interval. Use the **no** form of this command to reset the duration to the factory default value.

Syntax

load-interval *time*

no load-interval

- *time*—The number of seconds after which interface utilization is measured periodically. The time has to be a multiple of 30. (Range 30-600 seconds)

Default Configuration

The default interval is 300 seconds.

Command Modes

Interface Configuration mode, Interface Range Configuration mode, Port Channel Configuration mode, Port Channel Range Configuration mode.

User Guidelines

This command has no user guidelines.

Example

```
console(config-if-Gi1/0/1)#load-interval 150
```

locate

Use the **locate** command to locate a switch by LED blinking.

Syntax

locate [**switch** *unit*] [**time** *time*]

- switch *unit*—If multiple devices are stacked, you can choose which switch to identify.
- **time** *time* —LED blinking duration in seconds. Range 1-3600 seconds.

Default Configuration

Default value is 20 seconds.

Command Mode

Privileged Exec

User Guidelines

When this command is executed on N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON switches, the front panel power supply 1 LED blinks.

The LED blinks until it times out. The user may select a new time value while the LED is blinking. The last value selected takes effect immediately. The locate command does not persist across reboots.

Example

```
console# locate switch 1 time 555
```

logout

Use this command to disconnect the serial connection to the remote unit on the stack member.

Syntax

logout

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec mode on the management unit in the stack. Unit prompt on the stack member.

User Guidelines

This command is available in User Exec mode on the primary unit serial port and from the Unit prompt on member unit serial ports. The user need not be currently connected over the serial port to connect to another unit.

The stack member being connected to must be up and running and connected as part of the stack.

This command is an alias for the exit command.

Example

(Example 1:

To disconnect a remote session to management unit in the stack established from a stack member.

```
Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#
Stack-Primary#logout
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

Example 2:

To disconnect a remote session to management unit in the stack established from a stack member.

```
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#exit
```

```
Stack-Primary>logout
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

member

Use the **member** command in Stack Configuration mode to preconfigure a switch stack member. Execute this command on the Management Switch. To remove a stack-member configuration from the stack, use the **no** form of the command.

The **no** form of the command may not be used if the member is present in the stack.

Syntax

member *unit switchindex*

no member *unit*

- *unit* — The switch identifier of the switch to be added or removed from the stack. (Range: 1–<*maximum supported on platform*>)
- *switchindex* — The index into the database of the supported switch types, indicating the type of the switch being preconfigured. The switch index is obtained from the show supported switchtype command.

Default configuration

This command has no defaults.

Command Mode

Stack Configuration

User Guidelines

The switch index (SID) can be obtained by executing the show supported switchtype command in User Exec mode. When removing a unit from a stack, use the **no member** command to remove the stack member configuration after physically removing the unit.

Example

The following example displays how to add to stack switch number 2 with index 1.

```
console(config)# stack
```

```
console(config-stack)# member 2 1
```

memory free low-watermark

Use the **memory free low-watermark** command to configure the notification of a low memory condition on the switch. for the issuance of the CPU overload SNMP trap and notification via a SYSLOG message. Use the **no** form of the command to return the threshold to its default value.

Syntax

memory free low-watermark processor [**kb**]

no memory free low-watermark processor

- **kb**—The amount of free memory (in Kilobytes) below which a trap is issued and a message is logged.

Default Configuration

The default low memory notification is 0 MB.

The SYSLOG notification message is issued with severity NOTICE.

Command Mode

Global Configuration

User Guidelines

Use the **show memory cpu** command to display the allocated and free memory.

Setting the threshold to 0 disables low memory notifications.

The traps and SYSLOG messages are suppressed if they occur more frequently than once a minute.

Command History

Introduced in version 6.2.0.1 firmware.

Example

This example sets the notification for low memory at 1 megabyte. A notice message and trap will be issued if free memory falls below 1M and another notice message and trap will be issued when free memory rises above 1M.

```
console(config)#memory free low-watermark processor 1000
```

nsf

Use this command to enable non-stop forwarding. The **no** form of the command will disable NSF.

Syntax

nsf

no nsf

Default Configuration

Non-stop forwarding is enabled by default.

Command Mode

Stack Configuration mode

User Guidelines

Nonstop forwarding allows the forwarding plane of stack units to continue to forward packets while the control and management planes restart as a result of a power failure, hardware failure, or software fault on the stack management unit.

Example

```
console(config)#nsf
```

ping

Use the **ping** command to check the accessibility of the specified station on the network.

Use of the optional VRF parameter executes the command within the context of the VRF specific routing table.

Syntax

ping [**vrf** *vrf-name*] {[**ip**]*ip-address* | *hostname* | { **ipv6** { **interface** *interface-id* | **vlan** *vlan-id* | **loopback** *loopback-id* | **out-of-band** | **tunnel** *tunnel-id*} *link-local-address* | *ipv6-address* | *hostname*} [**count** *count*] [**interval** *interval*] [**size** *size*] [**source** { *ip-address* | *ipv6-address* | *interface-id* | **vlan** *vlan-id* | **out-of-band**}]

- *ip-address*—The IPv4 address to ping.
- *ipv6-address*—The IPv6 address to ping.
- *link-local-address* — The link local IPv6 address to ping.
- *hostname*—The domain name of the host to ping. (Range: 1–256 characters). When used with the IPv6 keyword, the hostname will be resolved to an IPv6 address, otherwise, it will be resolved to an IPv4 address.
- *vrf-name*—(Optional) The name of the VRF instance from which to ping. Only hosts reachable from within the VRF instance can be pinged. If a source parameter is specified in conjunction with a VRF parameter, it must be a member of the VRF. The **ipv6** parameter cannot be used with the **vrf** parameter.
- *interface-id*—The interface over which a link local IPv6 address may be reached. Only available when used with the IPv6 keyword.
- **repeat**—The number of ping packets to send. (Range: 1–100 packets).
- *interval*—The time between Echo Requests, in seconds (Range: 1–60 seconds).
- *size*—Number of data bytes in a packet (Range: 0–13000 bytes).
- **source** *ip-address*—The ping packets are transmitted using the specified source IP address.
- **source loopback** *loopback-id*—The ping packets are transmitted with the source address of the loopback interface.
- **source vlan** *vlan-id*—The ping packets are transmitted over the VLAN with the source address of the VLAN.
- **source tunnel** *tunnel-id*—The ping packets are transmitted with the source address of the tunnel.
- **out-of-band**—The ping packets are transmitted over the out-of-band interface.

Default Configuration

The default mode is IPv4. The command defaults to an IPv4 address.

The default ping count is 4.

The default interval is 1 second.

The default packet size is 0 data bytes.

The packet size is specified in bytes and refers to the packet payload, not the frame size.

Packets are padded to extend the frame to the minimum legal frame length by default.

Command Mode

User Exec mode, Privileged Exec mode

User Guidelines

If the **ipv6** or **ip** parameter is specified, all the other arguments must match (i.e., it is not possible to ping an IPv6 address from an IPv4 source and vice-versa).

The **ipv6** parameter must be specified if an IPv6 address is entered. Otherwise, the command will interpret the IPv6 address as a hostname parameter.

The switch can be pinged from a remote IPv4/IPv6 host with which the switch is connected through the default VLAN (VLAN 1) or another VLAN, if configured, as long as there is a physical path between the switch and the host.

Use the optional **interface** keyword to ping an IPv6 link-local interface by using the IPv6 link-local address or the global IPv6 address of the interface as the destination address in the ICMP echo packet.

Use the **source** keyword to specify the source IPv6 address to use in the ping packet and to specify the source interface on which to transmit the ICMP packet. The source can be a loopback, tunnel, logical interface, or the out-of-band interface.

If a host name is specified, a DNS server must be configured locally on the switch and the host name must resolve to an IPv4/IPv6 address as appropriate for the syntax entered. The command allows spaces in the host name when specified in double quotes, even though host names may only consist of letters, numbers and the hyphen character.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

The VRF identified in the parameter must have been previously created or an error is returned.

The vrf parameter is only available on the N3000-ON/N3100-ON/N3200-ON switches. Loopback interfaces are not supported on the N1100-ON Series switches.

Examples

The following example sends an IPv4 ICMP Echo request from VLAN 3 to 10.1.1.3

```
console#ping 10.1.1.3 source vlan 3
```

The following example determines whether the loopback interface is reachable on the network at the IPv6 address specified.

```
console(config)#ping ipv6 interface loopback 1 FE80::202:BCFF:FE00:3068

Pinging fe80::21e:c9ff:fede:b137 with 0 bytes of data:

Reply From fe80::21e:c9ff:fede:b137: icmp_seq = 0. time <10 msec.
Reply From fe80::21e:c9ff:fede:b137: icmp_seq = 1. time <10 msec.
Reply From fe80::21e:c9ff:fede:b137: icmp_seq = 2. time <10 msec.
Reply From fe80::21e:c9ff:fede:b137: icmp_seq = 3. time <10 msec.
```

The following example determines whether another computer is reachable over the network at the IPv6 address specified.

```
console#ping ipv6 2030:1::1

Pinging 2030:1::1 with 0 bytes of data:

Reply From 2030:1::1: icmp_seq = 0. time <10 msec.
Reply From 2030:1::1: icmp_seq = 1. time <10 msec.
```

```
Reply From 2030:1::1: icmp_seq = 2. time <10 msec.
Reply From 2030:1::1: icmp_seq = 3. time <10 msec.
```

process cpu threshold

Use the **process cpu threshold** command to configure the rising and falling thresholds for the issuance of the CPU overload SNMP trap and notification via a SYSLOG message. Use the **no** form of the command to return the thresholds to their default values.

Syntax

process cpu threshold type total rising *percentage* **interval** *seconds* [**falling** *percentage* **interval** *seconds*]

no process cpu threshold total type {**rising** | **falling** }

- **rising** *percentage*—The rising CPU percentage threshold over which a trap will be issued and a message logged. This is a percentage of CPU utilized over the period and ranges from 1 to 100.
- **falling** *percentage*—The falling threshold value under which a trap will be issued and message logged. This is a percentage of CPU utilized and ranges from 1 to 100.
- **interval** *seconds*—The number of seconds in the exponential weighted moving average period (multiple of 5 seconds).

Default Configuration

- The default rising-threshold-val is 0%.
- The default falling-threshold-val is 0%
- The default interval is 0 seconds.
- The default severity level is NOTICE.

Command Modes

Global Configuration

User Guidelines

CPU utilization is calculated using Exponential Moving Weighted Average (EMWA) over the total time period. The EMWA is calculated using the following formula:

EMWA(current_period) = EMA(prev_period) + (currentUtilization – EMA(prev_period)) * weight

where weight = 2 / ((TotalTimePeriod/samplePeriod) + 1). The sample period is 5 seconds. The utilization monitoring time period can be configured from 5 secs to 86400 seconds in multiples of 5 seconds.

Setting a threshold or interval to 0 disables that individual function.

The falling-threshold percentage should be configured to be less than or equal to the rising-threshold percentage. The switch reports the task level CPU utilization for the last 5 second, 1 minute and 5 minute periods. To aid the operator in troubleshooting when the CPU utilization has crossed the rising threshold, the show proc cpu command has been extended to show the task/total CPU utilization for the rising threshold period also. If the utilization thresholds are not configured, then the utilization for last 5 secs, 1 minute and 5 minutes is displayed as before. The CPU utilization for any given period is displayed in only after the first average has been calculated over the time period.

For instance, the 5 minute average is shown only after the switch has been up for more than 5 minutes. Additionally, whenever a time-period is configured for CPU utilization monitoring, the existing utilization data for the time-period is cleared and average is built again over the time period. This is done to prevent generation of notifications based on the old utilization data.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console(config)#process cpu threshold type total rising 90 interval 100
```

quit

Use this command to disconnect the serial connection to the remote unit on the stack member.

Syntax

quit

Default Configuration

There is no default configuration for this command.

Command Modes

User Exec mode on the management unit in the stack. Unit prompt on the stack member.

User Guidelines

This command is available in User Exec mode on the primary unit serial port and from the Unit prompt on member unit serial ports. The user need not be currently connected over the serial port to connect to another unit.

The stack member being connected to must be up and running and connected as part of the stack.

This command is an alias for the exit command.

Example

Example 1:

To disconnect a remote session to the management unit in the stack established from a stack member.

```
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#
Stack-Primary#quit
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

Example 2:

To disconnect a remote session to the management unit in the stack established from stack member.

```
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>connect 1
Stack-Primary#exit
Stack-Primary>quit
(Unit 2 - CLI unavailable - please connect to primary on Unit 1)>
```

reload

Use the **reload** command to reload stack members.

The reload command checks for stack port errors prior to reloading stack members and after the check for unsaved configuration changes. If stack port errors are found, a message is displayed.

Syntax

reload [*stack–member–number*]

- *stack–member–number*—The stack member to be reloaded.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

If no unit is specified, all units in a stack are reloaded. When copying firmware onto the switch in a stacked configuration, use the **show sfs** and **show version** commands to check the status of stack firmware synchronization prior to a reboot.

Examples

Example-Reloading the Stack

The following example displays how to reload the stack.

```
console#reload 1
Management switch has unsaved changes.
Would you like to save them now? (y/n)n
Configuration Not Saved!
Are you sure you want to reload the switch? (y/n) y
Reloading management switch 1.
```

Example-Stack Port Errors

The following example shows stack port errors detected by the command.

```
console#reload
Management switch has unsaved changes.
Are you sure you want to continue? (y/n)
```

```
Warning! Stack port errors detected on the following interfaces:
Interface         Error Count
----------------  ----------------
Gi1/0/1           12
Gi1/0/3           22

Stack port errors may indicate a non-redundant stack topology exists. Fail-
over on a non-redundant topology may cause the stack to split!

Are you sure you want to reload the stack? (y/n)
```

service unsupported-transceiver

Use this command to avoid the following on using an unsupported optic.

- Logging of a message.
- Generation of SNMP trap.

Use the **no** form of this command to set the transceiver support to the factory default.

Syntax

service unsupported-transceiver

no service unsupported-transceiver

Default Configuration

The default configuration is to log a message along with the SNMP trap generation on insertion or removal of an optic that is not qualified by Dell.

Command Mode

Global Configuration mode

User Guidelines

The switch logs a message and generates a trap on inserting or removing an optics not qualified by Dell. This command suppresses the above mentioned behavior.

Example

The following example bypasses logging of a message and trap generation on inserting or removing an optics not qualified by Dell.

```
console(config)# service unsupported-transceiver
```

set description

Use the **set description** command in Stack Configuration mode to associate a text description with a switch in the stack.

Syntax

set description *unit description*

- *unit* — The switch identifier. (Range: 1–<*maximum supported on platform*>)
- *description* — The text description. (Range: 1–80 alphanumeric characters)

Default Configuration

This command has no default configuration.

Command Mode

Stack Configuration mode

User Guidelines

This command has no user guidelines.

Example

The following example displays

```
console(config)#stack
console(config-stack)#set description 1 "unit 1"
```

slot

Use the **slot** command to configure a slot in the system. The unit/slot is the slot identifier of the slot located in the specified unit. The *cardindex* is the index to the database of the supported card types (see the command show supported cardtype) indicating the type of card being preconfigured in the specified slot. The card index is a 32-bit integer. If a card is currently present in the slot that is unconfigured, the configured information will be deleted and the slot will be reconfigured with default information for the card. The supported card types are:

- Dell EMC Networking N2024
- Dell EMC Networking N2024P
- Dell EMC Networking N2048
- Dell EMC Networking N2048P
- Dell EMC Networking N3024
- Dell EMC Networking N3024F
- Dell EMC Networking N3024P
- Dell EMC Networking N3048
- Dell EMC Networking N3048P
- Dell EMC Networking N4032
- Dell EMC Networking N4032F
- Dell EMC Networking N4064
- Dell EMC Networking N4064F
- Dell SFP+ Card
- Dell QSFP Card
- Dell 10GBase-T Card

Use the **no** form of the command to return the unit/slot configuration to the default value.

Syntax

slot *unit/slot cardindex*

no slot *unit/slot*

- *unit/slot* — The slot identifier of the slot.
- *cardindex* — The index into the database of the supported card types (see show supported cardtype) indicating the type of card being preconfigured in the specified slot. The card index is a 32-bit integer.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration

User Guidelines

The card index (CID) can be obtained by executing the show supported cardtype command.

Administrators may issue multiple consecutive slot commands addressing a particular unit/slot without issuing an intervening **no** slot command.

Example

```
console(config)#slot 1/3 3
console(config)#slot 1/3 4
```

show banner

Use the **show banner** command to display banner information.

Syntax

show banner

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console#show banner

Banner:Exec
```

```
Line Console..................... Enable
Line SSH......................... Disable
Line Telnet...................... Enable
===exec=====

Banner:Login
Line Console..................... Enable
Line SSH......................... Enable
Line Telnet...................... Disable
===login=====

Banner:MOTD
Line Console..................... Enable
Line SSH......................... Enable
Line Telnet...................... Enable
===motd=====
```

show buffers

Use the **show buffers** command to display the system allocated buffers.

Syntax

show buffers

Default Configuration

There is no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The internal message buffers are partitioned into one transmit group reserved for system generated messages and five receive priority groups. The receive priority groups are processed in strict priority order starting with the High group and proceeding down through the Mid0, Mid1 and Mid2 groups down to the Normal group. Small numbers of buffer failures in the low priority groups (Norm, Mid2, Mid1) may occur without affecting system operation, (for example, loss of an LLDP packet is not likely to cause any noticeable system disruption).

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show buffers

Message Buffer Utilization
--------------------------
0 of 246 total buffers used

Receive      Attempts       Failures   %Failure
-------------------------------------------------
Norm                0              0         0%
Mid2                0              0         0%
Mid1                0              0         0%
Mid0                0              0         0%
High                0              0         0%


Transmit      Attempts       Failures   %Failure
-------------------------------------------------
All                145              0         0%

Monitoring Parameters
---------------------
Rising Threshold...............................  0%
Falling Threshold..............................  0%
Trap Severity.................................. INFO
```

show checkpoint statistics

Use the **show checkpoint statistics** command to display the statistics for the checkpointing process.

Syntax

show checkpoint statistics

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

When nonstop forwarding is enabled on a stack, the stack's management unit checkpoints operational data to the backup unit. If the backup unit takes over as the management unit, the control plane on the new management unit uses the checkpointed data when initializing its state. Checkpoint statistics track the amount of data checkpointed from the management unit to the backup unit.

Example

```
console#show checkpoint statistics

Messages Checkpointed.....................6708
Bytes Checkpointed........................894305
Time Since Counters Cleared...............3d 01:05:09
Checkpoint Message Rate...................0.025 msg/sec
Last 10-second Message Rate...............0 msg/sec
Highest 10-second Message Rate............8 msg/sec
```

show cut-through mode

Use the **show cut-through mode** command to show the cut-through mode on the switch.

Syntax

show cut-through mode

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Default Configuration

This command has no default configuration.

User Guidelines

This command is not available on N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON switches.

Example

```
Console#show cut-through mode
Current mode    : Enable
Configured mode : Disable (This mode is effective on next reload)
```

show hardware profile portmode

Use the **show hardware profile portmode** command to display the hardware profile information for the hardware configurable ports.

Syntax

show hardware profile portmode [interface-id]

- **interface-id** — A configurable Ethernet interface identifier.

Default Configuration

By default, all configurable Ethernet interfaces are displayed.

Command Mode

Privileged Exec mode

User Guidelines

This command is not available on the N1100-ON/N1500/N2000/N2100-ON/N2200-ON/N3000-ON/N3100-ON/N3200-ON switches.

Examples

```
console#show hardware profile portmode

40G          10G          Cfg    Running
Interfaces   Interfaces   Mode   Mode
-----------  ------------ ------ -------
Fo1/0/1      Te1/0/25-28  1x40G  4x10G
Fo1/0/2      Te1/0/29-32  1x40G  1x40G

console#show hardware profile portmode fo1/0/1
```

```
40G          10G          Cfg    Running
Interfaces   Interfaces   Mode   Mode
------------ ------------ ------ -------
Fo1/0/25-28  Te1/0/25-28  4x10G  1x100G

console#show hardware profile portmode on1/0/1

100G         50G          40G          25G          10G          Cfg    Running
Interfaces   Interfaces   Interfaces   Interfaces   Interfaces   Mode   Mode
------------ ------------ ------------ ------------ ------------ ------ ----
---
On1/0/25-28  Fi1/0/25-28  Fo1/0/25-28  Tw1/0/25-28  Te1/0/25-28  1x100G
1x100G
```

Command History

N2200 capability added in the 6.6.1 firmware release. Updated command description and examples in version 6.7.0 firmware.

show idprom interface

Use this command to display the optics EEPROM contents in user-readable format.

Syntax

show idprom interface *interface-id*

- interface-id—The Ethernet interface.

Default Configuration

This command has no default configuration.

Command Modes

User Exec, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example shows the optic parameters in user readable format.

```
console#show idprom interface tengigabitethernet 1/0/9

Type............................ SFP+
Media........................... 10GBASE-LRM
Serial Number................... ANF0L5J
Dell EMC Qualified.............. Yes
```

The following example shows the optic parameters, but not the IDPROM content as the entered activation code in incorrect.

```
console#show idprom interface tengigabitethernet 1/0/9 debug abc

Type............................ SFP+
Media........................... 10GBASE-LRM
Serial Number................... ANF0L5J
Dell EMC Qualified.............. Yes
```

show interfaces

Use the **show interfaces** command to display the traffic statistics for one or multiple interfaces. If no parameter is given, all interfaces are shown.

Syntax

show interfaces *interface-id*

- *interface-id*—The ID for any valid Ethernet interface (that is, a 1G, 10G, or 40G interface in standard interface format or a port-channel identifier).

Default Configuration

This command has no default configuration.

Command Modes

All modes

User Guidelines

The **show interface** command shows the actual operational status of the interface, which is not necessarily the same as the configuration.

Input/output rate statistics are collected every 10 seconds.

The RX and TX utilization (sum of the individual active links) is shown for port-channels. The utilization is measured in kilobits per second.

Command History

Updated examples and guidelines in version 6.5 firmware.

Example

The following example shows the output for a 1G interface:

```
console#show interfaces gi1/0/1

Interface Name : ............................. Gi1/0/1
SOC Hardware Info :........................... BCM56342_A0
Link Status : ................................ Up
Keepalive Enabled............................. True
Err-disable Cause............................. None
VLAN Membership Mode: ........................ Trunk Mode
VLAN Membership: ............................. (1),2-3,101-113,813,3232
MTU Size : ................................... 1518
Port Mode [Duplex] : ......................... Full
Port Speed : ................................. 1000
Link Flaps : ................................. 0
Link Debounce Flaps : ........................ 0
Auto-Negotiation Status : ..................... Auto
Burned MAC Address : ......................... 001E.C9DE.B110
L3 MAC Address................................ 001E.C9DE.B112
Sample load interval : ....................... 300
Receive Rate Bits/Sec : ...................... 784
Receive Rate Packets/Sec : ................... 1
Receive Percent Utilization : ................ 0
Transmit Rate Bits/Sec : ..................... 1344
Transmit Rate Packets/Sec : .................. 1
Transmit Percent Utilization : ............... 9
Total Packets Received Without Errors.......... 102792
Unicast Packets Received...................... 0
Multicast Packets Received.................... 102792
Broadcast Packets Received.................... 0
Total Packets Received with MAC Errors......... 0
Jabbers Received.............................. 0
Fragments/Undersize Received.................. 0
Alignment Errors.............................. 0
FCS Errors.................................... 0
Overruns...................................... 0
```

```
Total Received Packets Not Forwarded........... 7
Total Packets Transmitted Successfully......... 147070
Unicast Packets Transmitted.................... 0
Multicast Packets Transmitted.................. 147070
Broadcast Packets Transmitted.................. 0
Transmit Packets Discarded..................... 0
Total Transmit Errors.......................... 0
Total Transmit Packets Discarded............... 0
Single Collision Frames........................ 0
Multiple Collision Frames...................... 0
Excessive Collision Frames..................... 0

Time since counters last cleared:

console#show interfaces po1
Intf Ports                   Ch-Type  Hash Min-link Local Prf TX Util RX Util
---- ------------------------ -------- ---- -------- --------- ------- -----
--
Po1  Active: Te1/0/1, Te1/0/2 Dynamic  7    1        Disabled   432344   83782

Utilization is shown in Kbps.

Hash Algorithm Type
1 - Source MAC, VLAN, EtherType, source module and port Id
2 - Destination MAC, VLAN, EtherType, source module and port Id
3 - Source IP and source TCP/UDP port
4 - Destination IP and destination TCP/UDP port
5 - Source/Destination MAC, VLAN, EtherType, source MODID/port
6 - Source/Destination IP and source/destination TCP/UDP port
7 - Enhanced hashing mode
```

show interfaces advanced firmware

Use the **show interfaces advanced firmware** command to display the firmware revision of the PHY for a port with upgradable firmware.

Syntax

show interfaces advanced firmware *interface*

- *interface*—A firmware upgradable Ethernet interface.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is only applicable to firmware upgradable interfaces. 1G interfaces are never shown in the command output. Some 10G interfaces may show as not firmware upgradable.

Example

```
console#show interfaces advanced firmware
Port      Revision   Part number
-------- ---------- -----------
Te1/0/1   0x411      BCM8727
Te1/0/2   0x411      BCM8727
Te1/0/3   0x411      BCM8727
Te1/0/4   0x411      BCM8727
Te1/0/5   0x411      BCM8727
```

show memory cpu

Use the **show memory cpu** command to check the total and available RAM space on the switch.

Syntax

show memory cpu

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

No specific guidelines.

Example

```
console#show memory cpu

Total Memory........................... 262144 KBytes
Available Memory Space................. 121181 KBytes
```

show msg-queue

Use the **show msg-queue** command to display the internal message queue allocations.

Syntax

show msg-queue

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode, and all sub-modes

User Guidelines

The following information is displayed.

Parameter	Description
Queue ID	The queue identifier.
Queue Name	The queue name
Messages in Queue	The number of messages currently queued.
Threads Waiting to Send	The number of threads waiting to send a message on the queue.
Threads Waiting to Receive	The number of threads waiting to receive a message from the queue.
Messages High	The maximum number of messages ever queued.
Send Wait	The task identifier waiting to send a message.
Recv Wait	The task identifier waiting to receive a message.

Command History

Command introduced in firmware release 6.6.1.

show nsf

Use the **show nsf** command to show the status of non-stop forwarding.

Syntax

show nsf

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The Global Status Parameters for NSF are explained as follows:

Parameter	Description	Range	Default
NSF Administrative Status	Whether nonstop forwarding is administratively enabled or disabled	Enabled Disabled	Enabled
NSF Operational Status	Indicates whether NSF is enabled on the stack.	Enabled Disabled	None

Parameter	Description	Range	Default
Last Startup Reason	The type of activation that caused the software to start the last time. There are four options. “Power-On” means that the switch rebooted. This could have been caused by a power cycle or an administrative “Reload” command. “Administrative Move” means that the administrator issued a command for the stand-by manager to take over. “Warm-Auto-Restart” means that the primary management card restarted due to a failure, and the system executed a nonstop forwarding failover. “Cold-Auto-Restart” means that the system switched from the active manager to the backup manager and was unable to maintain user data traffic. This is usually caused by multiple failures occurring close together.	Power-On Administrative-Move Warm-Auto-Restart Cold-Auto-Restart	None
Time Since Last Restart	Time since the current management card became the active management card. For the backup manager, the value is set to 0d 00:00:00	Time Stamp	0d 00:00:00
Restart in progress	Whether a restart is in progress. A restart is not considered complete until all hardware tables have been fully reconciled.	Yes or No	
Warm Restart Ready	Whether the initial full checkpoint has finished	Yes or No	
Status	Whether the running configuration on the backup unit includes all changes made on the management unit.	Current or Stale	

Parameter	Description	Range	Default
Time Since Last Copy	When the running configuration was last copied from the management unit to the backup unit.	Time Stamp	
Time Until Next Copy	The number of seconds until the running configuration will be copied to the backup unit. This line only appears when the running configuration on the backup unit is Stale.	0 - 120 seconds	

Example

The **show nsf** command is used to display which unit is the management unit and which is the backup unit.

```
console#show nsf

Administrative Status.......................... Enable
Operational Status............................. Enable
Last Startup Reason............................ Warm Auto-Restart
Time Since Last Restart........................ 0 days 16 hrs 52 mins 55 secs
Restart In Progress............................ No
Warm Restart Ready............................. Yes

Copy of Running Configuration to Backup Unit:
   Status...................................... Stale
   Time Since Last Copy........................ 0 days 4 hrs 53 mins 22 secs
   Time Until Next Copy........................ 28 seconds

    Unit    NSF Support
    ----    -----------
       1        Yes
       2        Yes
       3        Yes
```

show power-usage-history

Use the **show power-usage-history** command to display the history of unit power consumption for the unit specified in the command and total stack power consumption. Historical samples are not saved across switch reboots/reloads.

Syntax

show power-usage-history <*unit-id*>

- *unit-id*—Stack unit for which to display the power history. Range 1–<*maximum supported on platform*>.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Power draw is measured at the power supplies. Power draw is not measured at the interfaces.

This command is not available on the Dell EMC Networking N1100-ON Series switches.

Example

```
console#show power-usage-history 1

Sampling Interval (sec)....................... 30
Total No. of Samples to Keep.................. 168
Current Power Consumption (Watts)............. 56.2

Sample      Time Since          Power         Power
 No.        The Sample       Consumption   Consumption
           Was Recorded      On This Unit   Per Stack
                              (Watts)      (Watts)
------ --------------------  -----------   -----------
3       00:00:00:13           56.2          56.2
2       00:00:00:43           56.2          56.2
1       00:00:01:12           54.3          54.3
```

show process app-list

Use the **show process app-list** command to display the system applications.

Syntax

show process app-list

Default Configuration

This command does not have a default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Fields	Description
ID	Application ID assigned by the Process Manager.
Name	Application Name
PID	Application Linux Process ID.
Admin-Status	Flag indicating if the application is administratively enabled.
Auto-Restart	Flag indicating if the Process Manager should automatically restart the application if the application fails.
Running-Status	Flag indicating if the application is running.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show process app-list

                                Admin     Auto      Running
ID     Name                PID     Status    Restart   Status
---------------------------------------------------------
1      switchdrvr          280     Enabled   Enabled   Running
```

```
2     syncdb-test        0     Disabled Disabled Stopped
```

show process app-resource-list

This command lists the configured and in-use resources for each application known to the Process Manager.

Syntax

show process app-resource-list

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Fields	Description
ID	Application ID assigned by the Process Manager.
Name	Application Name
PID	Application Linux Process ID.
Memory-limit	Configured memory limit for the application, in Megabytes.
CPU Share	Configured CPU share in terms of percentage
Memory Usage	Current memory usage by this application, in Megabytes
Max Memory Usage	Maximum memory usage by this application, in Megabytes.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console#show process app-resource-list

                                   Memory          CPU      Memory   Max Mem
ID     Name             PID     Limit           Share    Usage    Usage
----------------------------------------------------------------------
1      switchdrvr       280     Unlimited     Unlimited 256MB    280MB
2      syncdb-test       0      10MB             20%        0MB      0MB
```

show process cpu

Use the **show process cpu** command to check the CPU utilization for each process currently running on the switch.

Syntax

show process cpu

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

No specific guidelines.

Example

```
console#show process cpu

Memory Utilization Report

status      bytes
------ ----------
   free   64022608
  alloc  151568112
```

```
CPU Utilization:

  PID     Name                       5 Sec    1 Min    5 Min
---------------------------------------------------------
  328bb20 tTffsPTask                 0.00%    0.00%    0.02%
  3291820 tNetTask                   0.00%    0.00%    0.01%
  3295410 tXbdService                0.00%    0.00%    0.03%
  347dcd0 ipnetd                     0.00%    0.00%    0.01%
  348a440 osapiTimer                 1.20%    1.43%    1.21%
  358ee70 bcmL2X.0                   0.40%    0.30%    0.12%
  359d2e0 bcmCNTR.0                  0.80%    0.42%    0.50%
  3b5b750 bcmRX                      0.00%    0.13%    0.12%
  3d3f6d0 MAC Send Task              0.00%    0.07%    0.10%
  3d48bd0 MAC Age Task               0.00%    0.00%    0.03%
  40fdbf0 bcmLINK.0                  0.00%    0.14%    0.46%
  4884e70 tL7Timer0                  0.00%    0.06%    0.02%
  48a1250 osapiMonTask               0.00%    0.32%    0.17%
  4969790 BootP                      0.00%    0.00%    0.01%
  4d71610 dtlTask                    0.00%    0.06%    0.05%
  4ed00e0 hapiRxTask                 0.00%    0.06%    0.03%
  562e810 DHCP snoop                 0.00%    0.00%    0.06%
  58e9bc0 Dynamic ARP Inspection     0.00%    0.06%    0.03%
  62038a0 dot1s_timer_task           0.00%    0.00%    0.03%
  687f360 dot1xTimerTask             0.00%    0.06%    0.07%
  6e23370 radius_task                0.00%    0.00%    0.01%
  6e2c870 radius_rx_task             0.00%    0.06%    0.03%
  7bc9030 spmTask                    0.00%    0.09%    0.01%
  7c58730 ipMapForwardingTask        0.00%    0.06%    0.03%
  7f6eee0 tRtrDiscProcessingTask     0.00%    0.00%    0.01%
  b1516d0 dnsRxTask                  0.00%    0.00%    0.01%
  b194d60 tCptvPrtl                  0.00%    0.06%    0.03%
  b585770 isdpTask                   0.00%    0.00%    0.02%
  bda6210 RMONTask                   0.00%    0.11%    0.11%
  bdb24b0 boxs Req                   0.00%    0.13%    0.10%
  c2d6db0 sshd                       0.00%    0.00%    0.01%
---------------------------------------------------------
Total CPU Utilization              2.40%    3.62%    3.45%
```

show process proc-list

This command lists the configured and in-use resources for each application known to the Process Manager.

Syntax

show process proc-list

Default Configuration

There is no default configuration for this command.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The following fields are displayed.

Fields	Description
PID	Application Linux Process ID
Process-Name	Linux process name
Application ID-VRID-Name	Name of the application that started the process and the application ID assigned by the Process Manager. The VRID is the virtual router with which this application is associated. The VRID is 0 for processes associated with the default router and on platforms which do not support the virtual routing feature.
Child	Flag indicating if this process is started directly by the Process Manager or if it is a child process started by the application process.
VM Size	Virtual Memory consumed by this process in Kilobytes
VM Peak	Maximum Virtual Memory consumed by this process in Kilobytes
FD Count	Number of file descriptors open in this process.

Command History

Introduced in version 6.2.0.1 firmware.

Example

```
console##show process proc-list

          Process           Application                  VM Size  VM Peak
PID    Name         ID-VRID-Name  Child    (KB)    (KB)   FD Count
-----------------------------------------------------------------
280    switchdrvr   1-0-switchdrvr  No    220992 230724    36
281    syncdb       2-0-syncdb      No      2656   2656     8
281    proctest     3-55-proctest   No      2656   2656     8
```

show router-capability

Use this command to display the router capabilities of the loaded firmware image.

Syntax

show router-capability

Command Mode

Privileged Exec mode, Global Configuration mode and all sub-modes.

User Guidelines

The capabilities in the switch firmware are determined during the build process.

Command History

Introduced in version 6.3.0.1 firmware. Updated in version 6.5 firmware.

Examples

This example displays the capabilities of an N3000-ONv6.5.x.x firmware build.

```
console# show router-capability
This firmware supports a stack of up to twelve switches. MVRP/MMRP
capabilities and up to 4093 VLANs may be configured.
```

This example displays the capabilities of an N3000-ONBGPv6.3.x.x firmware mixed stacking build.

```
console#show router-capability
This firmware supports a stack of up to eight switches. MVRP/MMRP
capabilities are not available.
```

show sessions

Use the **show sessions** command to display a list of the open sessions from remote hosts.

Syntax

show sessions

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

The following example displays a list of open sessions from remote hosts.

```
console#show sessions
Session User Name              Connection from   Idle     Session  Session
ID                                               Time     Time     Type
------- ---------------------- ----------------- -------- -------- ---------
0                              EIA-232           00:00:00 00:01:03 Serial
1       admin                  10.130.128.17     00:00:05 00:00:10 Telnet
11      admin                  10.27.192.56      00:00:27 00:00:28 HTTP
```

The following table describes the significant fields shown in the display.

Field	Description
Session ID	The session identifier. Use with the **disconnect** command.
User Name	The login ID associated with the session.
Connection from	The origin of the connection.
Idle Time	The elapsed time since session activity was last detected.
Session Time	The elapsed time since the session was connected.
Session Type	The type of connection (Serial, Telnet, SSH, HTTP, HTTPS).

show slot

Use the **show slot** command to display information about all the slots in the system or detailed information for a specific slot.

Syntax

show slot [*slot/port*]

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

Switch slots are populated with cards (see the show supported cardtype command below). However, not all slots are available to be externally populated. Slots which may be populated in the field are marked as pluggable. Every switch has a least one slot, which is populated with the base switching *card*. Systems with an external CPU will show an additional slot which is populated with the external CPU. Both of these slots are marked as non-pluggable.

The following table explains the output parameters.

Parameter	Description
Slot	The slot identifier in a slot/port format.
Slot Status	The slot is empty, full, or has encountered an error.
Admin State	The slot administrative mode is enabled or disabled.
Power State	The slot power mode is enabled or disabled.
Configured Card Model Identifier	The model identifier of the card preconfigured in the slot. Model identifier is a 32-character field used to identify a card.
Pluggable	Cards are pluggable or non-pluggable in the slot.

If you supply a value for slot/port, the following additional information appears as shown in the table below.

Parameter	Description
Inserted Card Model Identifier	The model identifier of the card inserted in the slot. Model identifier is a 32-character field used to identify a card. This field is displayed only if the slot is full.
Inserted Card Description	The card description. This field is displayed only if the slot is full.
Configured Card Description	The description of the card preconfigured in the slot.

Example

```
console>show slot

              Admin    Power           Configured Card
Slot  Status  State    State              Model ID              Pluggable
----- ------ ------- ------- -------------------------------- ---------
```

```
1/0   Full   Enable  Enable  Dell Networking N4032              No
1/1   Empty  Disable Disable                                    Yes
```

Command History

Description updated in the 6.4 release.

show supported cardtype

Use the **show supported cardtype** command to display information about all card types supported in the system.

Syntax

show supported cardtype [*cardindex*]

- *cardindex* — Displays the index into the database of the supported card types. This index is used when preconfiguring a slot.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

If a card index is entered, then the command displays information about specific card types supported in the system. Card index values are specific to each family of products. Use the generic form (without specifying an index) to display all the card types for a product family.

The CID information is used when preconfiguring cards using the **slot** command.

The following table explains the output parameters.

Parameter	Description
Card Index (CID)	The index into the database of the supported card types. This index is used when preconfiguring a slot.
Card Model Identifier	The model identifier for the supported card type.

If you supply a value for *cardindex*, the following additional information appears as shown in the table below.

Parameter	Description
Card Type	The 32-bit numeric card type for the supported card.
Model Identifier	The model identifier for the supported card type.
Card Description	The description for the supported card type.

Example

This example shows the supported card types for the Dell EMC Networking N3000-ON switch.

```
console#show supported cardtype

CID          Card Model ID
--- --------------------------------
1   Dell EMC N3000-ON SFP+ Card
2   Dell EMC N3000-ON 10GBase-T Card
3   Dell EMC Networking N3048EP-ON
4   Dell EMC Networking N3132PX-ON
5   Dell EMC N3100 QSFP Card
6   Dell EMC N3100 Stacking Card
7   Dell EMC Networking N3024ET-ON
8   Dell EMC Networking N3024EF-ON
9   Dell EMC Networking N3048ET-ON
10  Dell EMC Networking N3024EP-ON
```

Command History

Description updated in the 6.4 release.

show supported switchtype

Use the **show supported switchtype** command to display information about all supported switch types.

Syntax

show supported switchtype [*switchindex*]

- *switchindex* — Specifies the index into the database of the supported switch types, indicating the type of the switch being preconfigured. The switch index is a 32-bit integer. (Range: 0–65535)

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The switch SID is used when preconfiguring switches in a stack using the **member** command in config-stack mode.

The following table describes the fields in the first example.

Field	Description
Switch Index (SID)	This field displays the index into the database of supported switch types. This index is used when preconfiguring a member to be added to the stack.
Model Identifier	This field displays the model identifier for the supported switch type.
Management Preference	This field indicates the management preference value of the switch type.

Field	Description
Code Version	This field displays the code load target identifier of the switch type.

The following table describes the fields in the second example.

Field	Description
Switch Type	This field displays the 32-bit numeric switch type for the supported switch.
Model Identifier	This field displays the model identifier for the supported switch type.
Switch Description	This field displays the description for the supported switch type.

Example

The following example displays the information for supported switch types.

```
console#show supported switchtype
SID         Switch Model ID
--- --------------------------------
1   N4032
2   N4032F
3   N4064
4   N4064F
```

The following example displays the format of the **show supported switchtype** command.

```
console#show supported switchtype 1

Switch Type....................... 0xd8420001
Model Identifier.................. N4032
Switch Description................ Dell Networking N4032

Supported Cards:
   Slot........................... 0
   Card Index (CID)............... 1
   Model Identifier............... Dell Networking N4032

   Slot........................... 1
   Card Index (CID)............... 5
   Model Identifier............... Dell QSFP Card
```

```
Slot.......................... 1
Card Index (CID).............. 6
Model Identifier.............. Dell SFP+ Card

Slot.......................... 1
Card Index (CID).............. 7
Model Identifier.............. Dell 10GBase-T Card
```

show switch

Use the **show switch** command to display information about units in the stack.

Syntax

show switch [**stack–standby** | *unit*]

show switch stack–ports

show switch stack–ports counters { **all** | <*unit*>}

show switch stack–ports diag {**all** | <*unit*> } { **verbose** }

show switch stack–ports stack-path {**all** | *from-unit to-unit* }

- *unit*—The stack member number.
- **stack–ports**—Display summary stack-port information for all units.
- **counters**—Display summary data counter information for all units.
- **diag**—Display stacking diagnostics for each unit.
- **stack-path**—Display the active path from one stacking unit to another.
- *From-unit*—The first unit to be listed.
- **all**—Displays all unit paths.
- *To-unit*—The last unit to be listed.
- **stack–standby**—Display the configured or automatically selected standby unit number.
- verbose—Display detailed information.

Default Configuration

By default, the information for all units is displayed.

Command Mode

User Exec, Privileged Exec, Global Configuration mode and all Configuration submodes

User Guidelines

The **show switch** command shows the configuration and status of the stacking units, including the active and standby stack management units, the pre-configured model identifier, the plugged in model identifier, the switch status and the current code version. Both the pre-configured switch types (as set by the **member** command in stack mode) and the currently connected switchtypes, if any, are shown.

The **show switch stack-member-number** command also shows details of the switch configuration including the SFS last attempt status for the specified unit. If there is a stack firmware synchronization (SFS) operation in progress, the switch status will show as **Updating Code**.

The **show switch** command may show an SDM Mismatch value in the Switch Status field. This value indicates that the unit joined the stack, but is running a different SDM template than the management unit. This status should be temporary; the stack unit should automatically reload using the template running on the stack manager.

Use the **show supported switchtype** command to display switch SIDs.

Use the **show switch stack-ports** command to display details regarding stacking links.

Use the **show slot** command to display details regarding slot configuration.

Use the **show sdm prefer** command to display the SDM template configuration.

The **show switch stack-ports stack-path** command is useful in tracking the path a packet may take when traversing stacking links. The command shows active paths only, not those that may be taken after a stack failover or stack reconvergence.

The following table describes the fields in the switch stack status example.

Unit	Description
Switch	This field displays the unit identifier assigned to the switch.
Management Status	This field indicates whether the switch is the Management Switch, a stack member, or the status is unassigned.
Switch Type	This field displays the 32-bit numeric switch type.
Preconfigured Model Identifier	This field displays the model identifier for this switch. Model Identifier is a 32-character field assigned by Dell to identify the switch.
Plugged-in Model Identifier	This field displays the model identifier for this switch. Model Identifier is a 32-character field assigned by Dell to identify the switch. If no physical unit is present for the unit number, this field is empty.
Switch Status	This field displays the switch status. Possible values are OK, Unsupported, Code Mismatch, Config Mismatch, SDM Mismatch Not Present, Updating Code, or STM Mismatch
Switch Description	This field displays the switch description.
Detected Code Version	This field displays the version of code running on this switch. If the switch is not present and the data is from preconfiguration, the code version is "None."
Detected Code in Flash	This field displays the version of code that is currently stored in FLASH memory on the switch. This code will execute after the switch is reset. If the switch is not present and the data is from preconfiguration, then the code version is "None."
SFS Last Attempt Status	This field displays the Stack Firmware Synchronization status. The possible values are: Success, Failure, Min bootcode version not present, None.
Serial Number	This field displays the Switch serial number.

Unit	Description
Up Time	This field displays the system up time.

The additional fields in the all units example are as follows:

Unit	Description
Switch	This field displays the unit identifier assigned to the switch.
Management Status	This field indicates whether the switch is the Management Switch, a stack member, or the status is unassigned.
Standby Status	This field indicates whether the switch is the Standby Switch.
Preconfigured Model Identifier	This field displays the model identifier of a preconfigured switch ready to join the stack. The Model Identifier is a 32-character field assigned by Dell to identify the switch.
Plugged-In Model Identifier	This field displays the model identifier of the switch physically present in the stack. The Model Identifier is a 32-character field assigned by Dell to identify the switch.
Switch Status	This field indicates the switch status. Possible values for this state are: OK, Unsupported, Code Mismatch, Cfg Mismatch, SDM Mismatch, STM Mismatch, or NotPresent
Code Version	This field indicates the detected version of code on this switch.

Per Unit Status Parameters are explained as follows:

Parameter	Description	Range	Default
NSF Support	Whether a unit supports NSF	Yes or No	Yes

Examples

Example – Stack Status for the Switch

```
console#show switch 1

Switch............................ 1
Management Status................. Management Switch
Switch Type....................... 0xd8460001
Preconfigured Model Identifier.... N4064
Plugged-in Model Identifier....... N4064
Switch Status..................... OK
Switch Description................ Dell Networking N4064
Detected Code Version............. 6.0.0.0
Detected Code in Flash............ 6.0.0.0
SFS Last Attempt Status........... None
Serial Number..................... CN0H0F6C2829831P0023A00
Up Time........................... 3 days 1 hrs 16 mins 20 secs
```

Example-Stack Ports

This example displays information about the stack ports.

```
console#show switch stack-ports

                 Configured Running
                 Stack      Stack      Link         Link         Admin
Interface        Mode       Mode       Status       Speed (Gb/s) Status
---------------- ---------- ---------- ------------ ------------ -----------
Tw1/0/1          Stack      Stack      Link Down    21           Enabled
Tw1/0/2          Stack      Stack      Link Up      21           Disabled
Tw2/0/1          Stack      Stack      Link Down    21           Disabled
Tw2/0/2          Stack      Stack      Link Up      21           Enabled
```

Example – All Units in the Stack

This example displays information about all units in the stack.

```
console>show switch
    Management Standby   Preconfig     Plugged-in    Switch        Code
SW  Status     Status    Model ID      Model ID      Status        Version
--- ---------- --------- ------------- ------------- ------------- ---------
1   Mgmt Sw              N3048         N3048         OK           6.0.0.0
```

Example-Stacking Links Path

This command tracks the path a packet may take when traversing stacking links. The command shows active paths only, not those that may be taken after a stack failover or stack reconvergence.

```
console#show switch stack-ports stack-path 3 1

Packet-path from unit 3 to unit 1:

1  unit-3 port gi3/0/49 to unit-2
2  unit-2 port gi2/0/49 to unit-1
```

Example – Switch Firmware Stack Status

The following example displays the Switch Firmware stack status information for the switch.

```
console#show switch

    Management  Standby    Preconfig     Plugged-in     Switch        Code
SW    Switch    Status     Model ID      Model ID       Status        Version
--- ---------- --------- ------------- ------------- ------------- ---------
1   Mgmt Sw              N3024         N3024         OK            6.0.0.0
2   Stack Mbr            N3024         N3024         Updating Code 6.0.0.0

console#show switch 1

Switch............................ 1
Management Status................. Management Switch
Switch Type....................... 0x63400004
Preconfigured Model Identifier.... N3048P
Plugged-in Model Identifier....... N3048P
Switch Status..................... OK
Switch Description................ Dell Networking N3048P
Detected Code Version............. 6.0.0.0
Detected Code in Flash............ 6.0.0.0
SFS Last Attempt Status........... None
Serial Number..................... 13820M0230LF
Up Time........................... 0 days 3 hrs 1 mins 13 secs
```

Example – SDM Templates

This example shows the SDM Mismatch value in the Switch Status field.

```
console(config)#show switch

    Management Standby    Preconfig     Plugged-in    Switch        Code
SW  Status     Status     Model ID      Model ID      Status        Version
```

```
--- ---------- --------- ------------ ------------ ------------ ---------
1   Mgmt Sw              N4032F        N4032F       SDM Mismatch 10.7.14.21
```

Example – show switch stack–ports diag <unit> { verbose }

```
console#show switch stack-ports diag 1 verbose

-----------------------------------------
HPC RPC statistics/counters from unit 1
-----------------------------------------
Registered functions.......................... 98
Client requests............................... 0
Server requests............................... 203
Server duplicate requests..................... 0
Server replies................................ 203
Client remote Tx.............................. 0
Client remote retransmit count................ 0
Tx without errors............................. 203
Tx with errors................................ 0
Rx timeouts................................... 0
Rx early exits................................ 0
Rx out of sync................................ 0
No buffer..................................... 0
Collect sem wait count........................ 0
Collect sem dispatch count.................... 0

-------------------------------------
RPC statistics/counters from unit 1
-------------------------------------
Client RPC request count...................... 0
Client RPC reply count........................ 0
Client RPC fail to xmit count................. 0
Client RPC response timedout count............ 0
Client RPC missing requests................... 0
Client RPC detach/remove count................ 0
Client RPC current sequence number............ 0
Server RPC request count...................... 2334
Server RPC reply count........................ 2334
Server RPC processed transactions............. 2334
Server RPC received wrong version req......... 0
Server RPC no handlers........................ 0
Server RPC retry transmit count............... 0
Server RPC repetitive Tx errors............... 0

-------------------------------------
ATP statistics/counters from unit 1
-------------------------------------
```

```
Transmit pending count......................... 0
Current number of TX waits..................... 0
Rx transactions created........................ 2699
Rx transactions freed.......................... 2699
Rx transactions freed(raw)..................... 0
Tx transactions created........................ 3695
BET Rx dropped pkts count...................... 0
ATP Rx dropped pkts count...................... 0
Failed to add key pkt count.................... 0
Source lookup failure count.................... 0
Old Rx transactions pkts drop count............ 0
No of CPUs found in ATP communication.......... 2

-----------------------------------------------
CPU transport statistics/counters from unit 1
-----------------------------------------------
State initialization........................... Done
Rx setup....................................... Done
Tx setup....................................... Done
Tx CoS[0] reserve.............................. 100
Tx CoS[1] reserve.............................. 100
Tx CoS[2] reserve.............................. 100
Tx CoS[3] reserve.............................. 100
Tx CoS[4] reserve.............................. 60
Tx CoS[5] reserve.............................. 40
Tx CoS[6] reserve.............................. 20
Tx CoS[7] reserve.............................. 0
Tx pkt pool size............................... 500
Tx available pkt pool size..................... 499
Tx failed/error count.......................... 0
Rx pkt pool size............................... 8

------------------------------------------
Next hop statistics/counters from unit 1
------------------------------------------
State initialization........................... Done
Component setup................................ Done
Thread priority................................ 100
Rx priority.................................... 105
Local CPU key.................................. e4:f0:04:38:03:57
MTU size....................................... 2048
Vlan id........................................ 4094
CoS id......................................... 7
Internal priority for pkt transmission......... 7
Rx pkt queue size.............................. 256
Tx pkt queue size.............................. 64
Rx pkt dropped count........................... 0
```

```
Tx failed pkt count........................... 0

---------------------------------------
RLink statistics/counters from unit 1
---------------------------------------
State initialization.......................... Done
L2 notify in pkts............................. 0
L2 notify in pkts discarded................... 0
L2 notify out pkts ........................... 0
L2 notify out pkts discarded.................. 0
Linkscan in pkts.............................. 0
Linkscan in pkts discarded.................... 0
Linkscan out pkts ............................ 1
Linkscan out pkts discarded................... 0
Auth/unauth in callbacks...................... 0
Auth/unauth in callbacks discarded............ 0
Auth/unauth out callbacks..................... 0
Auth/unauth out callbacks discarded........... 0
RX tunnelling in pkts......................... 0
RX tunnelling in pkts discarded............... 0
RX tunnelling out pkts........................ 3
RX tunnelling out pkts discarded.............. 0
OAM events in................................. 0
OAM events in discarded....................... 0
OAM events out................................ 0
OAM events out discarded...................... 0
BFD events in................................. 0
BFD events in discarded....................... 0
BFD events out................................ 0
BFD events out discarded...................... 0
Fabric events in.............................. 0
Fabric events in discarded.................... 0
Fabric events out............................. 0
Fabric events out discarded................... 0
Scan add requests in.......................... 8
Scan del requests in.......................... 0
Scan notify(run handlers) out................. 0
Scan notify(traverse processing).............. 0
```

Example – show switch stack–ports diag <unit>

```
console#show switch stack-ports diag 1

Legend:

RBYT : Received Bytes                          RPKT : Received Packets
TBYT : Transmitted Bytes                       TPKT : Transmitted Packets
```

```
RFCS : Received Frame Check Sequence Errors   RFRG : Received Fragment Errors
RJBR : Received Jabber Errors                  RUNT : Received Packets with
size 2 to 63 bytes
RUND : Received Undersize Packets            ROVR : Received Oversize Packets
TFCS : Transmit Frame Check Sequence Errors   TERR : Transmit Errors

1 - Tw1/0/1:
RBYT:4132621 RPKT:6525 TBYT:3108325 TPKT:6395
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0


1 - Tw1/0/2:
RBYT:0 RPKT:0 TBYT:0 TPKT:0
RFCS:0 RFRG:0 RJBR:0 RUND:0 RUNT:0
TFCS:0 TERR:0
```

Command History

Syntax updated in firmware release 6.6.1.

show system

Use the **show system** command to display system information.

Syntax

show system [*unit*]

- *unit* — The unit number.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The temperature and power sections are only displayed for switches that have temperature or power monitoring capability.

Example

```
console#show system

System Description: Dell Networking Switch
System Up Time: 0 days, 03h:02m:30s
System Contact:
System Name:
System Location:
Burned In MAC Address: 001E.C9DE.B41B
System Object ID: 1.3.6.1.4.1.674.10895.3060
System Model ID: N3048P
Machine Type: Dell Networking N3048P

System Thermal Conditions:

Unit Temperature State
      (Celsius)
---- ----------- -----------
1    34          Good

Temperature Sensors:

Unit Description        Temperature
                         (Celsius)
---- ------------------ -----------
1    MAC                33
1    PHY                34

Fans:

Unit Description Status
---- ----------- -------
1    Fan-1       Failure
1    Fan-2       Failure

Power Supplies:

Unit  Description    Status     Average     Current          Since
                                 Power       Power         Date/Time
                                (Watts)     (Watts)
----  -----------  -----------  ----------  --------  -------------------
1     System       Non-critical 39.8        39.8
1     PS-1         Failure
1     PS-2         No Power     N/A         N/A       01/01/1970 00:00:00

USB Port Power Status:
```

```
----------------------
Device Not Present
```

show system fan

Use the **show system fan** command to explicitly display the fan status.

Syntax

show system fan

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command has no user guidelines.

Example

```
console>show system fan
Fans:
Unit Description Status
---- ----------- ------
1    Fan 1       OK
1    Fan 2       OK
1    Fan 3       OK
```

show system id

Use the **show system id** command to display the system identity information.

Syntax

show system id [*unit*]

- *unit* — The unit number.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The tag information is on a switch by switch basis.

Example

The following example displays the system service tag information.

```
console#show system id

Service Tag: at-N3024-X00-0010
Serial Number: sn-a128
Asset Tag:
Unit Service tag       Serial number           Asset tag
---- ------------      --------------          ------------
1    at-N3024-X00-0010 sn-a128
```

show system power

Use the **show system power** command to display information about the system level power consumption.

Syntax

show system power

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command is only available on switches with a power monitoring circuit. It is not available on the Dell EMC Networking N1100-ON Series switches.

Examples

```
console#show system power

Power Supplies:

Unit  Description    Status      Average     Current          Since
                                  Power       Power         Date/Time
                                 (Watts)     (Watts)
----  -----------  -----------  ----------  --------  -------------------
1     System       Non-critical 39.8        39.8
1     PS-1         Failure
1     PS-2         No Power     N/A         N/A       01/01/1970 00:00:00
```

show system temperature

Use the **show system temperature** command to display information about the system temperature and fan status.

Syntax

show system temperature

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The system temperature is read from one or more sensors placed at critical locations on the PCB. Status ranges are subdivided into Ok (Cool), Non-critical (Warm), and Critical (Hot). Each status range has a lower, mid-range, and upper limit with the upper limit of the lower temperature status being the same as the lower limit of the adjacent higher temperature status. Within a range, the fans run at a reduced speed for the lower temperature part of the range and an increased speed for the higher temperature part of the range. Each range runs the fans at increasingly higher speeds for increasingly higher temperatures. Above the Critical status upper limit, the system is shut down. Typically, the shutoff temperature for the switch is 90-105° C.

To avoid fan speed oscillation around a temperature limit, a small hysteresis is added to the limit such that the temperature for increasing the fan speed is higher than the temperature for lowering the fan speed. This implies that the higher fan speed (and status) is maintained until the switch is cooled 3-5 degrees below the threshold for increasing the fan speed (and possibly changing the status). The exact thresholds for increasing or lowering the fan speed are determined during thermal analysis and are different for each switch family.

Examples

```
console#show system temperature

System Thermal Conditions:

Unit Temperature State
      (Celsius)
---- ----------- -----------
1    34           OK

Temperature Sensors:

Unit Description        Temperature
                         (Celsius)
---- ------------------ -----------
1    MAC                33
1    PHY                34
```

show tech-support

Use the **show tech-support** command to display system and configuration information for use in debugging or contacting technical support. The output of the show tech-support command combines the output of the following commands:

- show interfaces transceiver
- show power inline

- show switch stack-port counters
- show nsf
- show slot
- show interfaces advertise
- show interfaces advanced firmware
- show lldp remote-device all
- show interfaces counters errors
- show fiber-ports optical-transceiver
- show process cpu
- show ethernet cfm errors (N2200/N3000-ON/N3100-ON/N3200-ON series only)
- show power inline firmware-version
- show version
- show interfaces transceiver properties

Syntax

show tech-support [**bgp** | **bgp-ipv6** | **ospf** | **ospfv3** | **bfd**] [**file** | **usb**]

- **bgp** — Show detailed information specific to BGP.
- **bgp-ipv6** — Show detailed information specific to BGP IPv6.
- **ospf** — Show detailed information specific to OSPF.
- **ospfv3** — Show detailed information specific to OSPFv3.
- **bfd** — Show detailed information specific to BFD.
- **file** — Write the output to a file in the local flash instead of the console.
- **usb** — Write the output to a file on the USB drive instead of the console. A USB storage device must be inserted into the front panel USB port.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The output of the show tech-support command combines the output of the following commands at a minimum:

- **show interfaces transceiver**
- **show power inline**
- **show switch stack-port counters**
- **show nsf**
- **show slot**
- **show interfaces advertise**
- **show interfaces advanced firmware**
- **show lldp remote-device all**
- **show interfaces counters errors**
- **show fiber-ports optical-transceiver**
- **show process cpu**
- **show ethernet cfm errors** (N2200/N3000-ON/N3100-ON/N3200-ON series only)
- **show power inline firmware-version**
- **show version**
- **show interfaces transceiver properties**

Tech support files are named tech-supportXXX.txt, where XXX is the date and time stamp of the form YYMMDDHHMMSS. YY is the last two digits of the year, MM is the month, DD is the day of the month, HH is the hour in 24-hour format, MM is the minute, and SS is the second.

Use the copy flash://techsupportXXX.txt <destination> form of the copy command to copy the tech-support file from the switch.

A USB device must be plugged in to the USB port, and cleanly mounted, if the **usb** parameter is given.

Default Value

This command has no defaults.

Example

```
console#show tech-support
```

```
 **************** Show Version *****************

Switch: 1

System Description................ Dell Networking N4032, 6.0.0.0, Linux
                                    2.6.32.9

Machine Description............... Dell Networking Switch
System Model ID................... N4032
Machine Type...................... Dell Networking N4032
Serial Number..................... 0000
Manufacturer...................... 0xbc00
Operating System.................. Linux 2.6.32.9
Burned In MAC Address............. 0011.2233.4455
System Object ID.................. 1.3.6.1.4.1.674.10895.3042
CPU Version....................... XLP308H-B2
SOC Version....................... BCM56842_A1
HW Version........................ 3
CPLD Version...................... 17

unit active      backup      current-active next-active
---- ----------- ----------- -------------- --------------
1    6.0.0.0     <none>      6.0.0.0        6.0.0.0


Operating System............................. Linux 2.6.32
Additional Packages.......................... FTOS QoS
                                              FTOS Multicast
                                              FTOS Stacking
                                              FTOS Routing
                                              FTOS Data Center

 **************** Show SysInfo *****************

System Location..............................
System Contact...............................
System Object ID............................. 1.3.6.1.4.1.674.10895.3042
System Up Time............................... 0 days 0 hrs 14 mins 53 secs
10/100 Ethernet/802.3 interface(s)............ 1
Gig Ethernet/802.3 interface(s)................ 0
10Gig Ethernet/802.3 interface(s)............. 0
40Gig Ethernet/802.3 interface(s)............. 0
Virtual Ethernet/802.3 interface(s)........... 1

System Thermal Conditions:
```

The following example writes the tech-support output to a file on a USB stick.

```
console#show tech-support usb
```

Command History

Description updated in the 6.4 release.

show users

Use the **show users** command to display information about the active users.

Syntax

show users [**long**]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The command also shows which administrative profiles have been assigned to local user accounts and to show which profiles are active for logged-in users.

Example

The following example displays a list of active users and the information about them.

```
console#show users
Username     Protocol       Location       Profile(s)
--------     --------       ---------      ------------
admin        Serial         EIA-232        net-admin
console#show users accounts

UserName Privilege  Password Password      Lockout
                       Aging Expiry date
-------  ---------  -------- ------------- -------
admin     15         ---     ---           False
```

```
          Administrative Profile(s): network-admin
user      1          ---     ---           False
          Administrative Profile(s): network-operator
```

show version

Use the **show version** command in User Exec mode to displays the system version information.

Syntax

show version [*unit*]

- *unit* — The unit number.

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command shows the version information for the management unit in the stack if no arguments are given.

Example

```
console#show version

Machine Description............... Dell Networking Switch
System Model ID................... N4064
Machine Type...................... Dell Networking N4064
Serial Number..................... X01-64C-55
Manufacturer...................... 0xbc00
Burned In MAC Address............. D067.E5C0.D19B
System Object ID.................. 1.3.6.1.4.1.674.10895.3045
CPU Version....................... XLP308H-A1
SOC Version....................... BCM56846_A1
HW Version........................ 3
CPLD Version...................... 14
Boot Version...................... v1.0.21
Image File........................ N3000-ONv6.0.0.1
```

```
Software Capability.............. Stack Limit = 12, VLAN Limit = 4093

unit active      backup      current-active next-active
---- ----------- ----------- -------------- --------------
1    6.0.0.1     5.1.0.1     6.0.0.1        5.1.0.1


console#show version 2

SOC Version...................... BCM56842_B1
HW Version....................... 1
CPLD Version..................... 14
Boot Version..................... v1.0.21

Unit  Image 1      Image 2      Current Active    Next Active
----- ------------ ------------ ----------------- -----------------
2     6.0.0.1      5.1.0.1       6.0.0.1          6.0.0.1

console#show version

Machine Description.............. Dell EMC Networking Switch
System Model ID.................. N2224X-ON
Machine Type..................... Dell EMC Networking N2224X-ON
Serial Number.................... CN07VY62CES0096I0001
Manufacturer..................... 0xbc00
Burned In MAC Address............ 3C2C.307C.B100
System Object ID................. 1.3.6.1.4.1.674.10895.3097
CPU Version...................... C3336
SOC Version...................... BCM56172_B0
HW Version....................... 1
CPLD Versions.................... System 01.06 CPU 00.05 LED 00.05
Image File....................... N2200v6.26.11.1
Software Capability.............. Stack Limit = 12, VLAN Limit = 4093
```

stack

Use the **stack** command in Global Configuration mode to enter Stack Configuration mode.

Syntax

stack

Default Configuration

This command has no default mode.

Command Mode

Global Configuration mode

User Guidelines

If no stack configuration appears in the saved config, it is built at runtime and appears in the running config. The operator can save the stack configuration. Switches that do not match the saved config (are of a different type than as configured) after a reboot will show a config mismatch and do not join the stack. Units that do not join the stack will show their interfaces as detached.

Example

The following example sets the console command mode to Stack Config.

```
console(config)#stack
console(config-stack)#
```

stack-port

Use the **stack-port** command in Stack Configuration mode to configure ports as either Stacking ports or as Ethernet ports.

NOTE: This command is only valid on the N1100-ON, N1500, N2100-ON, N2200-ON, N3100-ON, and N3200-ON switches. It issues an error response if used on any other switch model.

Syntax

stack-port {fiftygigabitethernet | fortygigabitethernet | twentyfivegigabitethernet| twentygigabitethernet|tengigabitethernet} unit/slot/port {ethernet | stack [speed { 40g | 21g }]}

- speed {40g|21g}—Set the stack port speed. The speed parameter is only available on the Dell EMC Networking N2100/N3100-ON Series switches.

Default Configuration

By default, Ethernet ports are configured to operate in Ethernet mode. By default, stacking ports are configured to operate in stacking mode. The default port speed on the Dell EMC Networking N2100/N2200/N3000E/N3100 Series stacking ports is 21 Gigabit. The default speed on the Dell EMC Networking N2200 stacking ports is 40 Gigabit. The default speed on the N3200 stacking ports is 2 × 50 Gigabit.

Command Mode

Stack Configuration mode

User Guidelines

This command is used to configure Ethernet ports to operate as either stacking or Ethernet ports, or to configure stacking ports to operate as Ethernet ports or stacking ports. A switch family supports only a subset of the syntax options listed above. The stack-port command syntax only allows the supported options for the relevant switch family.

Once this command has been issued, the switch must be rebooted in order for the command to take effect. Issuing multiple stack-port commands for a single interface without intervening reboots results in undefined behavior and is not supported. Reboot the switch and examine the output of the **show switch stack-ports** command to determine the active configuration. The **clear config** command does not change the stacking port mode. Only the **stack-port** command can change the operating mode of the stacking port and it only takes effect after a reboot.

The stack-port configuration mode does not appear in the running config. Use the **show switch stack-port** command to display configuration and status of stacking ports. Ethernet ports that are configured to operate as stacking ports will show as detached in the **show interfaces status** command output.

Use the show switch command to display information regarding the switches in a stack. Redundant stacking links between any two units must operate at the same speed. The available stacking speeds (and corresponding syntax) varies depending on the switch model.

Up to eight stack ports can be configured per stacking unit (four in each direction) on switches with more than two stacking ports.

The N3000-ON/N3100-ON/N3200-ON Series switches support up to twelve units configured in a stack and can only utilize the rear panel mini-SAS ports for stacking. The N2000/N2100-ON/N2200-ON Series switches support up to eight units configured in a stack using the fixed stacking ports. The N1100-ON and N1500 Series switches support stacking up to four units in a stack and can utilize pairs of SFP+ ports for stacking.

On the N1100-ON/N1500 Series switch, configuring an SFP+ port as stacking will always configure the adjacent port on the unit being configured in stacking mode as well (i.e., configuring Te1/0/1 as stacking configures Te1/0/2 as stacking and configuring Te1/0/3 as stacking configures Te1/0/4 as stacking).

Changing the stacking link speed requires a reboot of the affected switch. All stacking links in a stack must be configured to use the same speed.

Changing the speed of one stacking link changes the speed on the adjacent stack port as well. The connected switch stack port(s) must be similarly configured. It is not possible to operate the stacking links on a switch at different speeds. Clearing the configuration does not affect the stack port speed settings.

The use of 10G stacking links on the N3200-ON is not recommended when 100G uplinks are utilized. If packet loss on the stacking links or stack splits are encountered in this configuration, the stacking links must be upgraded to at least 50G.

Command History

Added the speed parameter in version 6.5. Syntax updated in firmware release 6.6.1. The 100g/10g syntax was added in firmware release 6.6.2.

Example

```
console(config-stack)#stack-port tengigabitethernet 1/0/3 stack
```

stack-port shutdown

Use this command to enable or disable the stack port administratively. This command is usually used to diagnose the stack in case any one of the stack ports is exhibiting errors.

Syntax

stack-port *interface-id* **shutdown**

no stack-port *interface-id* **shutdown**

- *interface-id*—The stacking interface identifier.

Default Configuration

There no default configuration for this command.

Command Modes

Stack Configuration mode

User Guidelines

This command must be used with caution, as disabling a stack port causes the stack to attempt to reconverge. Ensure that the stack is in an active ring topology in order to avoid a stack split. Check the stack ports for errors and also verify that NSF is synced before shutting down any stacking links. Application messages will appear in the logs during stack convergence.

This command persists across reboots, therefore, administrators should use this command with caution during stack upgrade procedures.

Example

```
console(config-stack)#stack-port tengigabitethernet 1/2/1 shutdown

Disabling a stack port will cause the stack to attempt to re-converge.
Application messages will appear in the logs during stack convergence.
Before shutting down a stack link, please ensure that your stack is in an
active ring topology in order to avoid a stack split. Continue? (y/n)

console(config-stack)#no stack-port twentygigbitethernet 1/0/1 shutdown
```

standby

Use the **standby** command to configure the standby unit in the stack. This unit comes up as the primary when the stack failover occurs. Use the **no** form of this command to reset to default, in which case, a standby is automatically selected from the existing stack units if there no preconfiguration.

Syntax

standby *unit*

no standby

- *unit* — Valid unit number in the stack. (Range: 1 - <*maximum supported on platform*>) (less on stacks with a restricted stack size, for example, AdvLite). The range is limited to the number of units available on the stack.

Default Configuration

The default configuration is to allow the software to automatically select a standby unit.

Command Mode

Stack Configuration mode

User Guidelines

This unit comes up as the primary when the stack failover occurs. Use the **no** form of this command to reset to default, in which case, a standby is automatically selected from the existing stack units if there is no preconfiguration.

Examples

```
console(config)#stack
console(config-stack)#standby 2
```

Command History

User Guidelines updated in the 6.4 release.

switch renumber

Use the **switch renumber** command in Global Configuration mode to change the identifier for a switch in the stack.

Syntax

switch *oldunit* **renumber** *newunit*

- *oldunit* — The current switch identifier. (Range: Dependent on Series/Model)
- *newunit* — The updated value of the switch identifier. (Range: Dependent on Series/Model)

Command Mode

Global Configuration mode

User Guidelines

Upon execution, the switch is configured with the configuration information for the new switch if any is available. The old switch configuration information is retained; however, the original switch will be operationally detached. This means the interfaces show as detached in **show interfaces status** output and no switch type will show for the *Plugged-in Model Id* in the output of the show switch command.

This command may be executed on the management unit in the stack or a standalone unit. This command reboots the renumbered switch. After renumbering a switch, it is important to let the primary switch synchronize the NSF state before proceeding with additional stack management operations. Use the **show nsf** command to check the NSF state. If the switch shows *Warm Restart Ready* as **Yes**, then the primary switch state is synchronized with the standby switch. Failure to observe this caution may result in the primary unit spontaneously resetting due to configuration mismatch in order to re-elect a primary unit. The range of switch numbers is 1 to maximum stack size. The maximum stack size varies, depending on the switch model. The switch renumber command prompt will display the valid range.

Example

The following example displays how to reconfigure switch number “1” to an identifier of “2.”

```
console(config)#switch 1 renumber 2
```

telnet

Use the **telnet** command to log into a host that supports Telnet.

Syntax

telnet {*ip-address* | *hostname*} [*port*] [*keyword1......*]

- *ip-address*—Valid IPv4 address of the destination host.
- *hostname*—Hostname of the destination host. (Range: 1–256 characters).
- *port*—A decimal TCP port number.
- *keyword*—One or more keywords from the keywords table in the user guidelines (see Keywords Table below).

Keywords Table

Options	Description
/debug	Enable telnet debugging mode.
/line	Enable telnet linemode.
/localecho	Enable telnet localecho.
<cr>	Press ENTER to execute the command.
port	Enter the TCP port number.

Default Configuration

port — Telnet TCP port (decimal 23) on the host.

Command Mode

User Exec, Privileged Exec mode

User Guidelines

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Example

Following is an example of using the **telnet** command to connect to 176.213.10.50.

```
console#telnet 176.213.10.50
Trying 176.213.10.50...

Connected to 176.213.10.50

Entering character mode...
Escape character is'^^'.
```

traceroute

Use the **traceroute** command to discover the routers that packets traverse when traveling to their destination.

Syntax

traceroute [**vrf** *vrf-name*] [**ip**] *ipaddress*|*hostname* [**init-ttl** *initTtl*] [**max-ttl** *maxTtl*] [**max-fail** *maxFail*] [**interval** *interval*] [**count** *count*] [**port** *port*] [**size** *size*][**source** {*src-ip-address*|**vlan** *vlan-id*|**loopback** *loopback-id*}]

- *vrf-name*—The name of the VRF associated with the routing table context used by the command. If no vrf is specified, the global routing table context is used.
- *ipaddress*—Valid IP address of the destination host.
- *hostname*—Hostname of the destination host. (Range: 1–256 characters). The command allows spaces in the host name when specified in double quotes. For example, `console(config)#snmp-server host "host name"`
- *initTtl*—The initial time-to-live (TTL); the maximum number of router hops between the local and remote system (Range: 1–255).
- *maxTtl*—The largest TTL value that can be used (Range:1–255).
- *maxFail*—Terminate the traceroute after failing to receive a response for this number of consecutive probes (Range: 1–255).
- *interval*—The timeout period. If a response is not received within this period of time, then traceroute considers that probe a failure (printing *) and sends the next probe. If traceroute does receive a response to a probe, then it sends the next probe immediately. (Range: 1–60 seconds).
- *count*—The number of probes to be sent at each TTL level (Range:1–10).

- *port*—The destination UDP port of the probe. This should be an unused port on the remote destination system (Range: 1–65535).
- *size*—The size, in bytes, of the payload of the Echo Requests sent (Range: 0–39936 bytes).
- *src-ip-address*—The IPv4 source address to use in the ICMP echo request packets.
- *vlan-id*—A valid VLAN interface.
- *loopback-id*—A configured loopback ID

Default Configuration

The default count is 3 probes.

The default interval is 3 seconds.

The default size is 0 data bytes.

The default port is 33434.

The default initTtl is 1 hop.

The default maxTtl is 30 hops.

The default maxFail is 5 probes.

Command Mode

User Exec mode and Privileged Exec mode

User Guidelines

Use of the optional VRF parameter executes the command within the context of the VRF-specific routing table.

Traceroute operates by sending a sequence of Internet Control Message Protocol (ICMP) echo request packets. The time-to-live (TTL) value, is used in determining the intermediate routers through which the packet flows toward the destination address. Routers decrement a packet's TTL value and discard packets whose TTL equals 0. On discarding a packet, the router returns an ICMP time exceeded message to the source.

The VRF identified in the parameter must have been previously created or an error is returned.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Only IPv4 addresses are supported with the **vrf** parameter. The **vrf** parameter is only available on the N3000-ON/N3100-ON/N3200-ON switches.

Loopback interfaces are not supported on the N1100-ON Series switches.

Examples

The following example discovers the routes that packets will actually take when traveling to the destination specified in the command.

```
(console)# traceroute 10.240.10.115 init-ttl 1 max-ttl 4 max-fail 0 interval
1 count 3 port 33434 size 43
Traceroute to 10.240.10.115, 4 hops max, 43 byte packets:
1 10.240.4.1   708 msec     41 msec     11 msec
2 10.240.10.115   0 msec     0 msec     0 msec

Hop Count = 1 Last TTL = 2 Test attempt = 6 Test Success = 6
```

Command History

Syntax updated in 6.4 release.

traceroute ipv6

Use the **traceroute** command to discover the routers that packets traverse when traveling to their destination.

Syntax

traceroute ipv6 *ipv6address*|*hostname* [**init-ttl** *initTtl*] [**max-ttl** *maxTtl*] [**max-fail** *maxFail*] [**interval** *interval*] [**count** *count*] [**port** *port*] [**size** *size*] [**source** {*src-ip-address*|**vlan** *vlan-id*|**loopback** *loopback-id*}]

- *ipv6address*—Valid IPv6 address of the destination host.
- *hostname*—Hostname of the destination host. (Range: 1–256 characters). The command allows spaces in the host name when specified in double quotes. For example, `console(config)#snmp-server host "host name"`

- *initTtl*—The initial time-to-live (TTL); the maximum number of router hops between the local and remote system (Range: 1–255). the default is 1.
- *maxTtl*—The largest TTL value that can be used (Range:1–255). The default is 30. This must be larger or equal to the value specified in initTtl.
- *maxFail*—Terminate the traceroute after failing to receive a response for this number of consecutive probes (Range: 1–255).
- *interval*—The timeout period. If a response is not received within this period of time, then traceroute considers that probe a failure (printing *) and sends the next probe. If traceroute does receive a response to a probe, then it sends the next probe immediately. (Range: 1–60 seconds). The default is 3.
- *count*—The number of probes to be sent at each TTL level (Range:1–10).
- *port*—The destination UDP port of the probe. This should be an unused port on the remote destination system (Range: 1–65535).
- *size*—The size, in bytes, of the payload of the Echo Requests sent (Range: 0–39936 bytes). The default is 0.
- *src-ip-address*—The IPv4 source address to use in the ICMP echo request packets.
- *vlan-id*—The source VLAN over which to send the echo request.
- *loopback-id*—A configured loopback ID

Default Configuration

The default count is 3 probes.

The default interval is 3 seconds.

The default size is 0 data bytes.

The default port is 33434.

The default initTtl is 1 hop.

The default maxTtl is 30 hops.

The default maxFail is 5 probes.

Command Mode

Privileged Exec mode

User Guidelines

Traceroute operates by sending a sequence of Internet Control Message Protocol (ICMP) echo request packets. The time-to-live (TTL) value, is used in determining the intermediate routers through which the packet flows toward the destination address. Routers decrement a packet's TTL value and discard packets whose TTL equals 0. On discarding a packet, the router returns an ICMP time exceeded message to the source. Loopback interfaces are not supported on the N1100-ON Series switches.

The hostname parameter may be a fully or partially qualified domain name. A hostname consists of a series of labels separated by periods. Each label may be a maximum of 63 characters in length. The maximum length of the hostname parameter is 256 characters. Refer to RFC 1035 Section 2.3.1 for more information.

Examples

The following example discovers the routes that packets will actually take when traveling to the destination specified in the command.

```
(console)# traceroute ipv6 2001::2 init-ttl 1 max-ttl 4 max-fail 0 interval 1
count 3 port 33434 size 43

Traceroute to 2001::2, 4 hops max, 43 byte packets:
1 2001::2   708 msec     41 msec     11 msec
2 2001::2    12 msec     13 msec     12 msec
3 2001::2    14 msec      9 msec     11 msec
```

Command History

Syntax and description updated in 6.4 release.

update bootcode

Use the **update bootcode** command to update the bootcode on one or more switches. For each switch, the bootcode is extracted from the active image and programmed to flash.

Syntax

update bootcode [*unit*]

- *unit* —Unit number.

Default Configuration

By default, all units in the stack are updated.

Command Mode

Privileged Exec mode

User Guidelines

This command applies to the N1100/N1500/N2000/N2100-ON/N2200-ON/N3000/N3100-ON/N3200-ON Series switches only.

It is not required to update the boot code unless directed to do so in the release notes. Dell EMC Networking switches utilize a universal boot loader and do not contain version specific dependencies in the boot loader. If *unit* is not specified, all units in the stack are updated.

This command does not reboot the stack members after the update completes. Do not reload or power off stack members during the update process as it may cause a switch to fail on a subsequent boot.

It is recommended that the stack be rebooted after a bootcode update to ensure that all stack members are properly updated.

Example

The following example updates the bootcode on stack unit 2.

```
console#update bootcode 2
```

Telnet Server Commands

The Telnet protocol (outlined in RFC 854) allows users (clients) to connect to multiuser computers (servers) on the network. Telnet is often employed when a user communicates with a remote login service.

Telnet is the terminal emulation protocol in the TCP/IP suite. Telnet uses TCP as the transport protocol to initiate a connection between server and client. After connecting, the telnet server and client enter a period of option negotiation that determines the options each side is capable of supporting for the connection. The connected systems can negotiate new options or renegotiate old options at any time. In general, each end of the Telnet connection attempts to implement all options that maximize performance for the systems involved.

When a Telnet connection is initiated, each side of the connection is assumed to originate and terminate at a Network Virtual Terminal, or NVT. Therefore, the server and user hosts do not maintain information about the characteristics of each other's terminals and terminal-handling conventions.

Telnet Client Behaviors

Different telnet clients operate differently with respect to the display of the login banner, the MOTD banner and acknowledgments. The following behaviors have been observed for some widely used telnet clients with a MOTD banner configured with the following text:

```
If you need to utilize this device or otherwise make changes to the
configuration, you may contact the owner at x38525.
Please, be advised this unit is under test.
```

and a login banner configured with the following text:

```
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
```

Examples

1 SSH (putty):

```
login as: dellradius
If you need to utilize this device or otherwise make changes to the
configuration, you may contact the owner at x38525.
Please, be advised this unit is under test.
dellradius@192.168.12.84's password:
```

```
Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
console
```

2 SSH (Linux Terminal):

```
[root ~]# ssh 192.168.12.84 -l dellradius
If you need to utilize this device or otherwise make changes to the
configuration, you may contact the owner at x38525.
Please, be advised this unit is under test.
dellradius@192.168.12.84's password:

Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
console
```

3 SSH (xterm):

```
[root ~]# ssh 192.168.12.84 -l dellradius
If you need to utilize this device or otherwise make changes to the
configuration, you may contact the owner at x38525.
Please, be advised this unit is under test.
dellradius@192.168.12.84's password:

Press 'y' to continue (within 30 seconds) (y/n)
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
console
```

4 Telnet:

```
If you need to utilize this device or otherwise make changes to the
configuration, you may contact the owner at x38525.
Press 'y' to continue (within 30 seconds) (y/n) y

Please, be advised this unit is under test.
User:root
Password:******
Welcome to the N3024 in the Bottom Chassis - 192.168.12.190. This unit is
located in A2 and is currently under test.
```

Command History

Examples updated in 6.4 release.

ip telnet server disable

The ip telnet server disable command is used to enable/disable the Telnet service on the switch.

Syntax

ip telnet server disable

no ip telnet server disable

Command Mode

Global Configuration

User Guidelines

No specific guidelines.

Default Value

This feature is enabled by default.

Dell EMC Networking N-Series switches support the Telnet service over IPv4 and IPv6.

Example

```
console#configure
console(config)#ip telnet server disable
console(config)# no ip telnet server disable
```

ip telnet port

The **ip telnet port** command is used to configure the Telnet TCP port number on which the switch listens for Telnet connections.

Syntax

ip telnet port *port number*

- *port number* — Telnet TCP port number (Range: 1025–65535)

Default Configuration

The default value for the Telnet TCP port is 23.

Command Mode

Global Configuration

User Guidelines

The Telnet server TCP port should not be set to a value that might conflict with other well-known protocol port numbers used on this switch.

UDP, TCP and RAW ports reserved by the switch and unavailable for use or configuration are:

Ports 1, 17, 58, 255, 546, 547, 2222, 4567, 6343, 49160

Example

```
console(config)#ip telnet port 1045
console(config)#no ip telnet port
```

show ip telnet

The **show ip telnet** command displays the status of the Telnet server and the Telnet TCP port number.

Syntax

show ip telnet

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec, Global Configuration mode and all Configuration submodes

Example

```
console#show ip telnet
Telnet Server is Enabled. Port:23
```

Time Ranges Commands

Time ranges are used with time-based ACLs to restrict their application due to specific time slots.

time-range [name]

Use the **time-range** command with no parameter to globally enable or disable the event notification service of the time range component. Use the time range command with a parameter to create a new time range or edit an existing time range.

Use the **no** form of the command with no parameter to disable the event notification service. Use the **no** form of this command with the optional *name* parameter to delete a time-range.

Syntax

time-range [*name*]

no time-range [*name*]

- *name*—A case-sensitive alphanumeric string from 1 to 31 characters uniquely identifying the time range. An alpha-numeric string is defined as consisting of only alphabetic, numeric, dash, underscore, or space characters.

Default Configuration

Time range event notification is enabled by default.

Command Mode

Global Configuration

User Guidelines

The CLI mode changes to Time-Range Configuration mode when you successfully execute this command. If the time range event notification service is disabled, ACLs using time ranges are not started.

Use the optional name parameter to create a time range consisting of one absolute time entry and/or one or more periodic time entries. If a time range with the name already exists, the command enters Time-Range Configuration mode to allow updating the named time range entries.

Adding a conflicting periodic time range to an absolute time range will cause the time range to become inactive. For example, consider an absolute time range from 8:00 AM Tuesday March 1st 2011 to 10 PM Tuesday March 1st 2011.

Adding a periodic entry using the *weekend* keyword will cause the time-range to become inactive because Tuesdays are not on the weekend.

Example

```
console(config)#time-range timeRange_1
```

absolute

Use the absolute command in Time Range Configuration mode to add an absolute time entry to a time range.

Use the **no** form of this command to delete the absolute time entry in the time range.

Syntax

absolute {[**start** *time date*] [**end** *time date*]}

no absolute

- **start** *time date*—Time and date at which the configuration that referenced the time range is in effect. The time is expressed in a 24-hour clock, in the form of hours:minutes. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm. The date is expressed in the format day month year. If no start time and date are specified, the configuration statement is in effect immediately.
- **end** *time date*—Time and date at which the configuration that referenced the time range is no longer in effect. Same time and date format as described for the start. The end time and date must be after the start time and date. If no end time and date are specified, the configuration statement is in effect indefinitely.

Default Configuration

This command has no default configuration.

Command Mode

Time Range Configuration

User Guidelines

Only one absolute time entry is allowed per time-range. The *time* parameter is referenced to the currently configured time zone.

Adding a conflicting periodic time range to an absolute time range will cause the time range to become inactive. For example, consider an absolute time range from 8:00 AM Tuesday March 1st 2011 to 10 PM Tuesday March 1st 2011. Adding a periodic entry using the *weekend* keyword will cause the time-range to become inactive because Tuesdays are not on the weekend.

Example

```
console#time-range timeRange_1
console(config-time-range)#absolute end 12:00 16 Dec 2010
```

periodic

Use the periodic command to add a periodic time entry to a time range. The *time* parameter is based off of the currently configured time zone. Use the **no** form of this command to delete a periodic time entry from a time-range.

Syntax

periodic {*days-of-the-week time*} to {[*days-of-the-week*] *time*}

no periodic

- *days-of-the-week*—The first occurrence of this argument is the starting day or days from which the configuration that referenced the time range starts going into effect. The second occurrence is the ending day or days from which the configuration that referenced the time range is no longer in effect. If the end days-of-the-week are the same as the start, they can be omitted.

  This argument can be any single day or combinations of days: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday.

Other possible values are:

– daily -- Monday through Sunday
– weekdays -- Monday through Friday
– weekend -- Saturday and Sunday
– If the ending days of the week are the same as the starting days of the week, they can be omitted.

- *time*—The first occurrence of this argument is the starting hours:minutes which the configuration that referenced the time range starts going into effect. The second occurrence is the ending hours:minutes at which the configuration that referenced the time range is no longer in effect.

  The hours:minutes are expressed in a 24-hour clock. For example, 8:00 is 8:00 am and 20:00 is 8:00 pm.

Default Configuration

This command has no default configuration.

Command Mode

Time Range Configuration

User Guidelines

Multiple periodic entries can exist in a time range, but periodic time entries cannot overlap each other. Periodic time entries can also coexist with an absolute time entry in a time range.

When both periodic and absolute time entries are specified within a time range, the periodic time entries limit the time range to only those times specified within the periodic time range and bounded by the absolute time range. In this case, the absolute time entry specifies the absolute start and end dates/times and the periodic entries specify the start/stop times within the limits of the absolute time entry dates and times.

If a periodic time entry is added to an active time-range with an existing absolute time entry, the absolute time entry immediately becomes inactive. For example, an administrator applies a absolute time-range configured for a week's work hours (08/09-08/13 9am to 6pm) and later adds multiple periodic entries for same days configured individually (Monday, Tuesday, Wednesday, Thursday, Friday) but with after-work hours (9pm to 11pm). The administrator wants to permit/deny HTTP traffic for this time-range, but the entire time-range is invalid due to conflicting entries. The absolute entry is forced to inactive because the periodic entry time is not yet in effect.

Examples

```
console#time-range timeRange_2
console(config-time-range)#periodic monday 00:00 to tuesday 12:30
console(config-time-range)#periodic tuesday 13:00 to wednesday 12:00
console(config-time-range)#periodic wednesday 12:30 to thursday 20:00
console(config-time-range)#periodic weekend 18:00 to 20:00
```

show time-range

Use the show time-range command to display a time range and all the absolute/periodic time entries that are defined for the time range. The [**name**] parameter is used to identify a specific time range to display. When the [**name**] parameter is not specified, all the time ranges defined in the system are displayed.

Syntax

show time-range [name]

- **name**—A specific time range to display

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

This command outputs the following.

Parameter	Description
Number of Time Ranges	Number of time ranges configured in the system.
Time Range Name	Name of the time range.
Time Range Status	Status of the time range (active/inactive).
Absolute start	Start time and day for absolute time entry.
Absolute end	End time and day for absolute time entry.
Periodic Entries	Number of periodic entries in a time-range.
Periodic start	Start time and day for periodic entry.
Periodic end	End time and day for periodic entry.

Examples

```
console#show time-range

Admin mode: Enabled
Current number of all Time Ranges: 1
Maximum number of all Time Ranges: 100

                                        Periodic
Time Range Name                 Status   Entry count Absolute Entry
------------------------------- -------- ----------- --------------
t1                              Active       0       Does not exist
```

USB Flash Drive Commands

When available, a USB flash drive can be used to configure, upgrade and provide consistency to a switching network. A USB flash drive can be plugged in sequentially to a set of routers/switches to upgrade to newer software versions without depending on the network to upgrade the switches with new firmware. New switches can be preloaded with configuration prior to deployment.

The USB Configuration Port provides access to an optional secondary storage capability to the switch. A USB flash drive can be used to store and deploy configurations and images from USB flash drive to the switch. A USB flash drive can be used easily to move and copy configuration and image files from one switch to other. Files from the switch can be copied to a USB flash device and can be used to deploy on other switches in the network.

Validation of Files Downloaded/Uploaded from USB Device

Image files are validated before downloading from the USB flash drive to the switch. Files other than image files and scripts are copied with no validation.

Downloaded image files will be validated against the following conditions:

- File exists- Check if the file being downloaded from the USB flash drive exists on the device.
- Valid CRC checksum.- Verify CRC for the file downloaded from the USB flash drive to switch.
- Valid STK format - Check if the file is of type STK.
- Target device validation – Check if the file being downloaded is compatible with the target switch.

Validation for Files Uploaded from Switch to USB Flash Drive

- Memory insufficient -Check memory availability on the USB flash drive to upload the file.

Files downloaded from USB flash drive are not copied to RAM to perform validations. Instead, the file is directly read from the USB flash device and copied to buffers to perform the necessary validations.

Downloading and Uploading of Files

After the file validations are successful, the switch proceeds with downloading of files from the USB flash device to the switch or uploading of files from the switch to the USB flash drive. The status of file download / upload is shown on the console. Detailed messages are logged in the system log for further reference.

unmount usb

Use the **unmount usb** command to make the USB flash device inactive.

Syntax

unmount usb

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

Once a flash drive has been unmounted, it must be removed and reinserted in order to be accessed again. If a file is open on the USB, the unmount will fail. The USB drive can be unmounted after the file operation completes.

Example

```
console#unmount usb
```

Command History

Description updated in 6.4 release.

show usb

Use the **show usb** command to display the USB flash device details.

Syntax

show usb device

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

The following table explains the output parameters.

Parameter	Description
Device Status	This field specifies the current status of device. • **Active** if device is plugged-in and the device is recognized by the switch. • **Inactive** if device is not mounted. • **Invalid** if device is not present or invalid device is plugged-in.
Manufacturer	Manufacturer details
Serial Number	Serial number of the device.
USB Version Compliance	Version of the USB device.
Class Code	Device Class.
Subclass Code	Device SubClass.
Protocol	Device Protocol.
Vendor ID	Vendor specific details of device- Vendor ID.
Product ID	Vendor specific details of device- Product ID.

Example

The following example is the output if the device is plugged into the USB slot.

```
console#show usb device
Device Status................................... Active
Manufacturer.................................... JetFish
Product Name.................................... Mass Storage Device
Device Serial Number............................ 4JC25PTQ
Class Code...................................... 0x0000
Subclass Code................................... 0x0000
Protocol........................................ 0x0000
Vendor ID....................................... 0x8564
Product ID...................................... 0x1000
USB Version Compliance.......................... 2.0
```

The following example is the output if the device is not plugged into the USB slot.

```
console#show usb device
USB flash device is not plugged in.
```

dir usb

Use the **dir usb** command to display the USB device contents and memory statistics.

Syntax

dir usb [subdir]

- A subdirectory that exists on the USB flash drive. Multiple levels of sub-directories may be specified in a single string using the forward slash (/) path separator.

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec

User Guidelines

Only the first 32 characters of the file name are displayed, even if the file name is longer.

Examples

```
console#dir usb

Attr  Size(bytes)  Creation Time         Name
drwx         2640  Feb 02 2022 00:26:43  .
drwx            0  Feb 19 2014 15:22:53  ..
 -rw-          96  Jan 28 2022 23:05:45  snmpOprData.cfg
 -rw-    14363703  Jan 22 2022 03:36:08  image1.stk
drwx         1024  Jan 22 2022 03:36:08  examples


Total Size: 1001914368
Bytes Used: 128319488
Bytes Free: 873594880
console#dir usb examples

Attr  Size(bytes)  Creation Time         Name
drwx         1024  Feb 02 2022 00:26:43  .
drwx            0  Feb 19 2014 15:22:53  ..
 -rw-          96  Jan 28 2022 23:05:45  examples/example.txt


Total Size: 1001914368
Bytes Used: 128319488
Bytes Free: 873594880

console#dir usb examples/..

Attr  Size(bytes)  Creation Time         Name
drwx         2640  Feb 02 2022 00:26:43  .
drwx            0  Feb 19 2014 15:22:53  ..
 -rw-          96  Jan 28 2022 23:05:45  examples/../snmpOprData.cfg
 -rw-    14363703  Jan 22 2022 03:36:08  examples/../image1.stk
drwx         1024  Jan 22 2022 03:36:08  examples/../examples

Total Size: 1001914368
Bytes Used: 128319488
Bytes Free: 873594880
```

recover

The recover command is implemented as a u-boot environment variable. It mounts the USB stick, copies the image from the USB root level directory into RAM, and executes the image.

Syntax

recover <image-name>

- image-name—The name of a valid firmware stack file located in the root of the mounted USB stick.

Default Configuration

This command has no default configuration.

Command Mode

u-boot mode

User Guidelines

There is no validation of the image.

There is no validation that the image exists on the USB stick (other than the copy fails). Incorrect use of this capability can stop a switch. Stopped switches are not recoverable. Recovery of the switch from the booted image is as needed. No guidelines are provided.

User Interface Commands

configure terminal

Use the configure terminal command to enter Global Configuration mode. This command is equivalent to the **configure** command with no terminal argument.

Syntax

configure [**terminal**]

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

Example

```
console#conf t
console(config)#

console#configure terminal
console(config)#
```

do

Use the **do** command to execute commands available in Privileged Exec mode from Global Configuration or any Configuration submode with command line completion.

Syntax

do ***line***

do ?

- *line* — Command to be executed. It must be an unambiguous command from the Privileged Exec mode. Commands such as **configure** are forbidden. Command line completion for the line parameter is supported. Users may only execute commands for which they have the appropriate privileges.

Default Configuration

This command has no default configuration.

Command Mode

All modes except Privileged Exec and User Exec modes.

User Guidelines

Command completion using the space bar is available when using this command.

Example #1

```
console>en
console#configure
console(config)#interface gi1/0/1
console(config-if-Gi1/0/1)#d?
description              dhcp                     do
dot1x                    duplex
console(config-if-Gi1/0/1)#do ?    ! Help from privileged Exec level

console(config-if-Gi1/0/1)#do ?

application              Start or stop an application.
arp                      Purge a dynamic or gateway ARP entry.
boot                     Select a boot image for use on the next reload.
captive-portal           Manage captive portal clients.
clear                    Clear learned configuration or statistics.
configure                Enter global config mode.
connect                  Connect console session to another stack unit.
copy                     Copy files to or from the switch.
debug                    Configure debug flags.
delete                   Delete a file.
dir                      Display directory information.
disconnect               Close remote console session(s).
dot1x                    Initialize dot1x or reauthenticate clients.
enable                   Enter into user privilege mode.
```

```
erase                        Delete a file.
exit                         Exit privileged exec mode.
filedescr                    Set a text description for an image file.
help                         Display help for various special keys.
locate                       Blink the locator LED.
logout                       Exit this session. Any unsaved changes are lost.
monitor                      Configure packet monitoring.
ping                         Send ICMP echo packets to a specified IP address.
quit                         Exit this session. Any unsaved changes are lost.
release                      Release an in-band DHCP assigned address.
reload                       Reload stack or a switch in the stack.
rename                       Rename a file.
renew                        Renew an in-band DHCP assigned address.
script                       Manage and execute configuration scripts.
show                         Show configured settings and operational status.
telnet                       Open a telnet connection to another system.
terminal                     Configure console session parameters.
test                         Test a copper port. Disable EEE modes first!
traceroute                   Trace route to destination.
udld                         Reset UDLD disabled interfaces.
unmount                      Flush cache and un-mount a USB device.
write                       Copy running configuration to startup configuration.

console(config-if-Gi1/0/1)#do a?

application                  arp
```

enable

Use the **enable** command in User Exec mode to enter the Privileged Exec mode.

Syntax

enable

Default Configuration

The default privilege level is 15.

Command Mode

User Exec and Privileged Exec modes

User Guidelines

If there is no authentication method defined for enable, then a privilege level 1 user is not allowed to execute this command.

Example

The following example shows how to enter privileged mode.

```
console>enable
console#
```

end

Use the **end** command to return the CLI command mode back to the privileged execution mode or user execution mode.

Syntax

end

Default Configuration

This command has no default configuration.

Command Mode

All command modes

User Guidelines

The first invocation of **end** from Global Configuration mode, or any configuration submode, returns the command mode to Privileged Exec mode. This command is equivalent to using the Ctrl-Z key press.

Example

```
console(config)#end
console#end
console>
```

exit

Use the **exit** command to go to the next lower command mode or, in User Exec mode, to close an active terminal session by logging off the switch.

Syntax

exit

Default Configuration

This command has no default configuration.

Command Mode

All command modes. In User Exec mode, this command behaves identically to the **quit** command.

User Guidelines

There are no user guidelines for this command.

Example

The following example changes the configuration mode from Interface Configuration mode to User Exec mode to the login prompt.

```
console(config-if-Gi1/0/1)# exit
console(config)# exit
console#exit
console>exit

User:
```

quit

Use the **quit** command in User Exec mode to close an active terminal session by logging off the switch.

Syntax

quit

Default Configuration

This command has no default configuration.

Command Mode

User Exec command mode

User Guidelines

There are no user guidelines for this command.

Example

The following example closes an active terminal session.

```
console>quit
```

Web Server Commands

If enabled, the Dell EMC Networking is manageable via industry standard web browsers. User privilege levels are the same as for the CLI. Over 95% of the management functions are available via the web interface, including configuration and firmware upgrades.

Web Sessions

The HTTP protocol does not provide support for persistent connections. Connections are constantly made and broken so there is no way to know who is accessing the web interface or for how long they are doing so. Additionally, with the use of basic authentication the user authorization is handled by the client browser. This means that once entered, the user name and password are cached in the browser and given to the server on request. Effectively, once a user logs in to the switch, they have access until the browser closes, even across reboots of the switch. This poses a security threat.

The Web Sessions feature makes use of cookies to control web connections, sessions. Cookies must be enabled on the browser. The Set-Cookie directive is sent only once at initiation of the session. With the introduction of Web Sessions the client connections can be monitored and controlled. Web Sessions put the authentication control in the Dell EMC Networking switch instead of the client browser resulting in a more efficient implementation that allows web access while using RADIUS or TACACS+ for authentication. The **exec-timeout** command in line telnet command mode also sets the timeout for the web interface.

The web login is implemented in the login page itself instead of a client browser popup. Additionally, there is a logout button, always present on the web interface. There are various commands that have been modified or added to support Web Sessions. Similarly there are modifications to some of the web pages. Support of SNMP configuration for Web Sessions is also available.

When the authentication method set for web login authentication is set to TACACS+, the exec shell configuration on the TACACS+ server is used to determine user permissions (read-only or read/ write). If the configured value on the server is 15, the user is given read-write permissions. Any other value is read-only. If exec shell feature is not enabled on the server, the user is given read-only permissions.

common-name

Use the **common-name** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the common-name for the switch.

Syntax

common-name *common-name*

- *common-name* —Specifies the fully qualified URL or IP address of the switch. If left unspecified, this parameter defaults to the lowest IP address of the switch when the certificate is generated. (Range: 1–64 characters.)

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certification mode

User Guidelines

This common name mode is entered using the **crypto certificate request** or **crypto certificate generate** command. Most browsers will compare the common name in a certificate against the FQDN of the switch obtained from DNS when connecting over HTTPS. A mismatch may result in denied access.

Example

The following example displays how to specify the name of "router.gm.com."

```
console(config-crypto-cert)#common-name router.gm.com
```

country

Use the **country** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the country.

Syntax

country *country*

- *country* — Specifies the country name. (Range: 2 characters)

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command. The user can enter any two printable characters other than a question mark.

Example

The following example displays how to specify the country as "us."

```
console(config-crypto-cert)#country us
```

crypto certificate generate

Use the **crypto certificate generate** command to generate a self-signed HTTPS certificate.

Syntax

crypto certificate *number* **generate**

- *number*—Specifies the certificate number. (Range: 1–2)
- **generate**—Regenerates the SSL RSA key.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

This command is not saved in the router switch configuration; however, the certificate and keys generated by this command are saved in the private configuration. If the RSA keys do not exist, the key-generate command in Crypto Certificate Generation mode must be used. The key-generate sub-command regenerates the RSA key pair. At least the common name must be configured for a certificate to be valid.

To save the generated certificate and keys on the local switch and distribute the certificate across a stack, save the configuration. Otherwise, the certificate and keys will not be available after the next reboot.

If the common-name is not configured, the certificate is generated with a common name equal to the lowest IP address of the switch. If a duration is not configured, the certificate is generated with a duration of 365 days.

As of firmware release 6.6.1, the key length of the certificate is increased to 2048 bits and the switch uses SHA-256 to sign the generated certificate. Any previously generated certificates are left unaltered.

This command generates two files:

- sslt_certN.pem
- sslt_keyN.pem

where N is the certificate number.

To use a signed certificate on the switch, perform the following steps:

- Generate the RSA and DSA keys using the **crypto key generate** command for RSA followed by DSA. or the key-generate command in crypto certificate generate mode.
- Generate a self signed certificate using the **crypto key generate** command, or optionally…
- Generate a certificate request using the **crypto certificate request** command. This command uses the DSA keys and the self signed certificate.
- Copy the certificate request displayed on the screen and send it to a CA.
- When the signed certificate is received, copy the signed certificate onto the switch using the **crypto certificate import** command

Example

The following example generates a self-signed HTTPS certificate. The exit command attempts to generate the self-signed certificate. Use the end command to exit Crypto Certificate Generate mode without generating a certificate.

```
console(config)#crypto certificate 1 generate
console(config-crypto-cert)#key-generate
console(config-crypto-cert)#common-name DELL-Switch101
console(config-crypto-cert)#country US
console(config-crypto-cert)#duration 3650
console(config-crypto-cert)#email no-reply@dell.com
console(config-crypto-cert)#location “Round Rock”
console(config-crypto-cert)#organization-unit “Dell Networking”
console(config-crypto-cert)#organization-name “Dell EMC, Inc.”
console(config-crypto-cert)#state TX
console(config-crypto-cert)#exit

Certificate Generation Successful…
```

The generated certificate can be displayed using the **show crypto certificate** command. Copy the certificate text into a text file with a .scr extension for importing into a web browser.

Example

The following example generates a certificate signing request.

```
console(config)#crypto certificate 1 request
console(config-crypto-cert)#common-name DELL-Switch102
console(config-crypto-cert)#country US
console(config-crypto-cert)#email no-replay@dell.com
console(config-crypto-cert)#location “Round Rock”
console(config-crypto-cert)#organization-unit “Dell Networking”
console(config-crypto-cert)#organization-name “Dell EMC, Inc.”
console(config-crypto-cert)#state TX
console(config-crypto-cert)#exit

-----BEGIN CERTIFICATE REQUEST-----
MIIB0TCCAToCAQIwgZAxETAPBgNVBAMMCEJST0FEQ09NMRcwFQYDVQQKDA5CUkNN
LUhZREVSQUJBRDERMA8GA1UECwwIQlJPQURDT00xETAPBgNVBAcMCEJSQ00tSFlE
MQswCQYDVQQIDAJBUDELMAkGA1UEBhMCSU4xIjAgBgkqhkiG9w0BCQEWE3NoeWFt
a0Bicm9hZGNvbS5jb20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAMiUQ8wx
CvIcoxpC5vQETaDPpa5X69eDA9rpNmtcyvB+0YLA9xLwJm8kb/YcYVLBduAP+gNa
CBucufXlbryai7fhSDFbkRPbkzjiSgRIvPub81/wqwwVe30EPArJpHUP+AtV35x0
```

```
YDi3nj9rk3XjyT5pq5VR4YnECfGKcvKsz5fDAgMBAAGgADANBgkqhkiG9w0BAQUF
AAOBgQCd7MvbUt2yb0+piCazzvwyEpfXZckgY8B9tFaUgxD6plc88xbfRDIKQXor
K85z4bDogjxDZuYTnvZV4aZJLshGUmUZS4cin2TaxHHIf5gI597x5FFYBFTKqSl4
YhfgJtA2BJ/W23xmCrIT00ZINIfwf+PN6cDt2R3ag3hC/+otXw==
-----END CERTIFICATE REQUEST-----
```

crypto certificate import

Use the **crypto certificate import** command in Global Configuration mode to import a certificate signed by a Certification Authority for HTTPS.

Syntax

crypto certificate *number* **import**

- *number* — Specifies the certificate number. (Range: 1–2)

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

Use this command to enter an external certificate (signed by a Certification Authority) to the switch. To end the session, add a period (.) on a separate line after the input, and press ENTER.

The imported certificate must be based on a certificate request created by the **crypto certificate request** command.

If the public key found in the certificate does not match the switch's SSL RSA key, the command fails.

Regenerating the RSA key will render existing certificates invalid.

Certificates are validated on input. The system log will show any encountered certificate errors such as invalid format or if the certificate could not be validated against the switch private key. Invalid certificates are not imported. The signed certificate must contain the switch public key and match the RSA key on the switch and must be in X509 PEM text format.

Depending on the browser, browser version, and level of checking, it may be possible to use the switch generated self-signed certificate to enable HTTPS connections.

First generate the certificate using the switch fully-qualified domain name for the certificate common name. For example, if the switch FQDN is dhcp-1-2-3-4.dns.dell.com, set the certificate common name to dhcp-1-2-3-4.dns.dell.com when generating the certificate. Add the certificate to the host and/or browser trusted certificate store. It may also be necessary to add the IP address and hostname of the switch to the local hosts file to pass browser identity checks.

This command is not saved in the router configuration; however, the certificate imported by this command is saved in the private configuration. Certificates are propagated across the stack.

Example

The following example imports a certificate signed by the Certification Authority for HTTPS.

```
console(config)#crypto certificate 1 import

Please paste the input now, add a period (.) on a separate line after the
input, and press Enter.
-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
.
```

```
Certificate imported successfully

console(config)#show crypto certificate mycertificate 1

-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
Issued by: Dell Networking
Valid from to Oct 22 17:46:02 2017 GMT
Subject: /CN=DELL/OU=Dell Networking/L=Round Rock/ST=TX/C=US/emailAddress=
no-reply@dell.com
Fingerprint: FA06E0DD138FA22A4D696A80171FF3D8
```

crypto certificate request

Use the **crypto certificate request** command to generate and display a certificate request for HTTPS. This command takes you to Crypto Certificate Request mode.

Syntax

crypto certificate *number* **request**

- *number* — Specifies the certificate number. (Range: 1–2)

Default Configuration

This command has no default configuration.

Command Mode

Privileged Exec mode

User Guidelines

Use this command to generate a certificate request to send to a Certification Authority. The certificate request is generated in Base64-encoded X.509 format.

Before generating a certificate request, you must first generate a self-signed certificate using the **crypto certificate generate** command in order to sign the certificate request. Make sure to reenter the identical values in the certificate request fields as were entered in the self-signed certificate generated by the **crypto certificate generate** command.

After receiving the certificate from the Certification Authority, use the **crypto certificate import** command in Global Configuration mode to import the certificate into the switch. This certificate replaces the self-signed certificate. Use the end command to exit Crypto Certificate Request mode without generating a certificate request. Use the exit command to exit Crypto Certificate Request mode and generate a certificate request.

Example

```
console(config)#crypto certificate 1 request
console(config-crypto-cert)#common-name DELL
console(config-crypto-cert)#country US
console(config-crypto-cert)#email no-reply@dell.com
console(config-crypto-cert)#location “Round Rock”
console(config-crypto-cert)#organization-name “Dell EMC”
console(config-crypto-cert)#organization-unit “Dell Networking”
console(config-crypto-cert)#state TX
console(config-crypto-cert)#exit

-----BEGIN CERTIFICATE REQUEST-----
MIIBujCCASMCAQIwejENMAsGA1UEAwwEREVMTDEYMBYGA1UECwwPRGVsbCBOZXR3
b3JraW5nMRMwEQYDVQQHDApSb3VuZCBSb2NrMQswCQYDVQQIDAJUWDELMAkGA1UE
BhMCVVMxIDAeBgkqhkiG9w0BCQEWEW5vLXJlcGx5QGRlbGwuY29tMIGfMA0GCSqG
SIb3DQEBAQUAA4GNADCBiQKBgQCb7gWKpCLsG32fSX1sWwRygJrU/m5IOYdJhtss
7Qg37uWlkQCBu8lWY6UFORcEP9yCVY+j0OMjEjAueE8VTVfNiGR8anaCdO63sG77
1z6gVS5M6xFnNM6OsO0rLjpnaqeQ85eHNXK0cKRWA5wRFQcYGS+GfDCk9DEBGID2
/sumDwIDAQABoAAwDQYJKoZIhvcNAQEFBQADgYEAahrQQ/Oi0Gn+R2eQnlyBfW59
caq+68/GtmeLJdOlTOpQQhT1NgNdRZG0W/TmG2PAumRrPlXf/bnnBobwCTlMPbE0
HBEoTKlAbGhXnSDHfrvpGyH8sphWDvCgZ2fSljY6e4SEE5Lu1J1MRJaLstpZGaQf
mB0MBPXsPJbIlIT+vPM=
```

```
-----END CERTIFICATE REQUEST-----
```

duration

Use the **duration** command in Crypto Certificate Generation mode to specify the duration of certificate validity.

Syntax

duration *days*

- *days* — Specifies the number of days a certification would be valid. If left unspecified, the parameter defaults to 365 days. (Range: 30–3650 days)

Default Configuration

This command defaults to 365 days.

Command Mode

Crypto Certificate Generation mode

User Guidelines

This command mode is entered using the **crypto certificate generate** command.

Example

The following example displays how specify that a certification is valid for a duration of 50 days.

```
console(config-crypto-cert)#duration 50
```

email

Use the **email** command to identify the email address used to contact your organization. The maximum length is 64 characters.

Syntax

email ***address***

- *address*—A valid email address conforming to the addr-spec in RFC 5322.

Default Configuration

By default, no email address is configured.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

An email address consists of a local-port, an @ symbol, and a case-sensitive domain name. Embedded spaces are not supported. The domain name should be a fully-qualified domain name.

The email address is not validated by the switch.

ip http port

Use the **ip http port** command to specify the TCP port on which the switch listens for HTTP connections. To use the default TCP port, use the **no** form of this command.

Syntax

ip http port *port-number*

no ip http port

- *port-number* — Port number on which the switch HTTP server listens for connections. (Range: 1025–65535)

Default Configuration

This default port number is 80.

Command Mode

Global Configuration mode

User Guidelines

The HTTP TCP port should not be set to a value that might conflict with other well-known protocol port numbers used on this switch.

Example

The following example shows how the http port number is configured to 10013.

```
console(config)#ip http port 10013
```

ip http server

Use the **ip http server** command to enable the switch to allow HTTP access to the switch. To disable this function use the **no** form of this command.

Syntax

ip http server

no ip http server

Default Configuration

The default mode is enabled.

Command Mode

Global Configuration mode

User Guidelines

This command enables HTTP access to the switch. Use the **ip http secure-server** command to enable HTTPS access. It is recommended that administrators enable HTTPS access in preference to HTTP access in order to ensure that management activity is not snooped.

Example

The following example enables the switch to be configured from a browser.

```
console(config)#ip http server
```

ip http secure-certificate

Use the **ip http secure-certificate** command to configure the active certificate for HTTPS. To return to the default setting, use the **no** form of this command.

Syntax

ip http secure-certificate *number*

no ip http secure-certificate

- *number*—Specifies the certificate number. (Range: 1–2)

Default Configuration

The default value of the certificate number is 1.

Command Mode

Global Configuration mode

User Guidelines

The HTTPS certificate is imported using the **crypto certificate import** command in Global Configuration mode.

Example

The following example configures the active certificate for HTTPS.

```
console(config)#ip http secure-certificate 1
```

ip http secure-port

Use the **ip http secure-port** command to configure a TCP port on which the switch listens for HTTPS connections. To use the default port, use the **no** form of this command.

Syntax

ip http secure-port *port-number*

no ip http secure-port

- *port-number*— Port number for use by the secure HTTP server. (Range: 1025–65535)

Default Configuration

This default port number is 443.

Command Mode

Global Configuration mode

User Guidelines

The HTTPS TCP port should not be set to a value that might conflict with other well known protocol port numbers used on this switch. It is not possible for the administrator to directly configure the port number to 443 as 443 is out of range. Use the no form of the command to set the port number to the default value of 443.

Example

The following example configures the HTTPS port number to 4545.

```
console(config)#ip http secure-port 4545
```

ip http secure-server

Use the **ip http secure-server** command to enable the switch to be accessed via HTTPS clients. To disable HTTPS access, use the **no** form of this command.

Syntax

ip http secure-server

no ip http secure-server

Default Configuration

The default for the switch is disabled.

Command Mode

Global Configuration mode

User Guidelines

The switch must be configured with RSA and DSA keys (**crypto key generate)** prior to enabling the HTTP server. Optionally, the switch may be provisioned with up to two signed certificates.

Dell EMC Networking N-Series switches support HTTPS over IPv4 and IPv6.

Example

The following example enables the switch to be configured from a browser using HTTPS.

```
console(config)#ip http secure-server
```

ip scp server enable

Use the **ip scp server enable** command to enable the internal SCP server. Use the **no** form of the command to disable the SCP server.

Syntax

ip scp server enable

no ip scp server enable

Default Configuration

The SCP server is enabled by default.

Command Mode

Global Configuration mode

User Guidelines

The SCP server command enables SCP push operations, which allows clients to copy files to the switch using the SCP protocol. During the the file transfer operation, management operations on the switch are blocked. After completion of the file transfer, the switch performs file validations similar to operations performed using the **copy** command.

SCP transfers are initiated from a client, not on the switch.

Command History

Command introduced in version 6.6 firmware.

Example

This example shows the command used on a host computer to copy the startup configuration onto the switch located at 192.168.0.1 using the admin account.

key-generate

Use the **key-generate** command in Crypto Certificate Generation mode to generate a new RSA key prior to generating the certificate key. The certificate generated by a **crypto certificate generate** command is not a signed certificate and is used to generate a certificate signing request. Once a signed certificate is received, download the certificate to the switch.

Syntax

key-generate [*length*]

- *length* — Specifies the length of the SSL RSA key. If left unspecified, this parameter defaults to 1024. (Range: 512–2048)

Default Configuration

By default, the certificate generation process will utilize existing RSA keys.

Command Mode

Crypto Certificate Generation mode

User Guidelines

This command mode is entered using the **crypto certificate request** command. If no RSA key has been previously generated, you must use the key-generate command prior to exiting the crypto certificate request mode to properly generate a certificate request.

Example

The following example displays how to generate the SSL RSA key 2048 bytes in length.

```
console(config-crypto-cert)#key-generate 2048
```

location

Use the **location** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the location or city name.

Syntax

location *location*

- *location* — Specifies the location or city name. (Range: 1–64 characters)

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Example

The following example displays how to specify the city location of "austin."

```
console(config-crypto-cert)#location austin
```

no crypto certificate

Use the **no crypto certificate** command to delete a certificate.

Syntax

no crypto certificate { **openflow** | *number* }

- **number**— The number of the SSH certificate to remove(between 1 to 2).
- **openflow**—Remove the openflow certificate and associated information.

Default Configuration

This command has no default configuration.

Command Mode

Global Configuration mode

User Guidelines

The **no crypto certificate openflow** command erases the Certificate Authority certificates used for validating the OpenFlow Controllers from the switch. Issuing this command automatically disables and re-enables the OpenFlow feature. New SSL certificates may be reloaded from the OpenFlow Controller or may be manually loaded with the **copy** command.

Example

The following example removes the OpenFlow certificates from the switch and resets the OpenFlow feature.

```
console(config)#no crypto certificate openflow
```

organization-name

Use the **organization-name** command to identify the legal name of the organization requesting the certificate.

Syntax

organization-name *name*

- *name*— The legal name of the organization requesting the certificate. Maximum length is 64 characters.

Default Configuration

By default, no organization name is configured.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

The name should not be abbreviated and should contain suffixes, such as Inc., Corp., or LLC. Enclose the parameter in quotes to embed spaces within the name.

The organization name is not validated by the switch.

organization-unit

Use the **organization-unit** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the organization unit.

Syntax

organization-unit *organization-unit*

- *organization-unit* — Specifies the organization-unit or department name. (Range: 1–64 characters)

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Example

The following example displays how to specify the Dell EMC Networking organization-unit.

```
console(config-crypto-cert)#organization-unit "Dell EMC Networking"
```

quit

Use the **quit** command to exit from crypto certificate generate mode, crypto certificate import mode, or crypto certificate request mode without performing the action.

Syntax

quit

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certificate Request, Crypto Certificate Generate

User Guidelines

This command exits from the crypto certificate request or crypto certificate generate mode and discards any information entered. The certificate or certificate request is not generated.

If the key-generate command was used in crypto certificate generate mode, the new keys are not discarded.

Command History

Command introduced in firmware release 6.6.1.

show crypto certificate mycertificate

Use the **show crypto certificate mycertificate** command to view the SSL certificates of your switch.

Syntax

show crypto certificate mycertificate [*number*]

- **number —** Specifies the certificate number. (Range: 1–2 digits)

Default configuration

This command has no default configuration.

Command Mode

Privileged Exec mode, Global Configuration mode and all Configuration submodes

Example

The following example displays the SSL certificate of a sample switch.

```
console(config)#show crypto certificate mycertificate 1

-----BEGIN CERTIFICATE-----
MIIDBDCCAewCCQCP5mFCRmauaDANBgkqhkiG9w0BAQUFADCBkTELMAkGA1UEBhMC
VVMxCzAJBgNVBAgMAk5DMRAwDgYDVQQHDAdSYWxlaWdoMRIwEAYDVQQKDAlEZWxs
LEluYy4xEzARBgNVBAsMCk5ldHdvcmtpbmcxGDAWBgNVBAMMD0RlbGwgTmV0d29y
a2luZzEgMB4GCSqGSIb3DQEJARYRbm9yZXBsYXlAZGVsbC5jb20wHhcNMTYwNjA5
MTc0NjAyWhcNMTcxMDIyMTc0NjAyWjB6MQ0wCwYDVQQDDARERUxMMRgwFgYDVQQL
DA9EZWxsIE5ldHdvcmtpbmcxEzARBgNVBAcMClJvdW5kIFJvY2sxCzAJBgNVBAgM
AlRYMQswCQYDVQQGEwJVUzEgMB4GCSqGSIb3DQEJARYRbm8tcmVwbHlAZGVsbC5j
b20wgZ8wDQYJKoZIhvcNAQEBBQADgY0AMIGJAoGBAJvuBYqkIuwbfZ9JfWxbBHKA
mtT+bkg5h0mG2yztCDfu5aWRAIG7yVZjpQU5FwQ/3IJVj6PQ4yMSMC54TxVNV82I
ZHxqdoJ07rewbvvXPqBVLkzrEWc0zo6w7SsuOmdqp5Dzl4c1crRwpFYDnBEVBxgZ
L4Z8MKT0MQEYgPb+y6YPAgMBAAEwDQYJKoZIhvcNAQEFBQADggEBAOXMcQZBLMCP
lgf0Jnpv74buMNEGsNi1OoeDuAnn4E9Pcv76nPVzUarlc8T67V5WGZRWTZ9XY48r
BYY2a2YOtjoGcY7sBiEPJQbji+U9W7xCjz1q/Un8YRshdW/7dNmTwFTh55S2QmXV
RN/UVjShWRmMn0vbiyyzHaKAON+9fBt3rMQCYiRyEuWISb31/3SlWY9iQJezwoOh
ZX9DEgnxvzUjLMoYVRhqCE0+LoBWikhy6ROS+b4cubJpzTdv2n+zY8dbM9jSwiky
6rFhVznvamGap8Aw0rUnEvU5kM9MM0hsVU95H+QzWJwychy9Fhh1zhYzNTpr+VQs
c4psyXEd8GE=
-----END CERTIFICATE-----
Issued by: Dell Networking
Valid from to Oct 22 17:46:02 2017 GMT
Subject: /CN=DELL/OU=Dell Networking/L=Round Rock/ST=TX/C=US/emailAddress=
no-reply@dell.com
Fingerprint: FA06E0DD138FA22A4D696A80171FF3D8
```

show ip http server status

Use the **show ip http server status** command to display the HTTP server status information.

Syntax

show ip http server status

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The displayed information includes the following:

Field	Description
HTTP Mode	The unsecure HTTP server administrative mode.
HTTP Port	The HTTP server port number.
Java Mode	The Java applet administrative mode which applies to both secure and unsecure web connections.
Maximum Allowable HTTP Sessions	The number of allowable unsecure HTTP sessions.
HTTP Session Hard Timeout	The hard timeout for unsecure HTTP sessions in hours.
HTTP Session Soft Timeout	The soft timeout for unsecure HTTP sessions in minutes.

Example

The following example displays the HTTP server configuration.

```
console#show ip http server status

HTTP Mode: .......................................... Disabled
HTTP Port: .......................................... 80
JAVA Mode: .......................................... Enabled
Maximum Allowable HTTP Sessions: .................... 0
Max HTTP Sessions Allowed: .......................... 5
HTTP Session Hard Timeout (hours): .................. 1
HTTP Session Soft Timeout (minutes): ................ 15
```

Command History

Output updated in version 6.7.0 firmware.

show ip http server secure status

Use the **show ip http server secure status** command to display the HTTP secure server status information.

Syntax

show ip http server secure status

Default Configuration

This command has no default configuration.

Command Mode

User Exec mode, Privileged Exec mode, Global Configuration mode and all Configuration submodes

User Guidelines

The displayed information includes the following:

Field	**Description**
HTTP Mode (Secure)	The secure HTTP server administrative mode.
Secure Port	The secure HTTP server port number.
Secure Protocol Levels	The protocol level may have the values of SSL3, TSL1, or both SSL3 and TSL1.
Maximum Allowable HTTPS Sessions	The number of allowable secure HTTP sessions.
HTTPS Session Hard Timeout	The hard timeout for secure HTTP sessions in hours.
HTTPS Session Soft Timeout	The soft timeout for secure HTTP sessions in minutes.
Certificate Present	Indicates whether the secure-server certificate files are present on the device.

Active Certificate	Displays the active certificate configured for secure HTTP.
Certificate Generation Status	Indicates whether certificate generation is currently in progress.

Example

The following shows example CLI display output for the command.

```
console#show ip http server secure status

HTTPS Mode (Secure): .............................. Disabled
Secure Port: ............................. 443
Secure Protocol: ......................... TLS1
Maximum Allowable HTTPS Sessions: ......... 5
HTTPS Session Hard Timeout (hours): ....... 2
HTTPS Session Soft Timeout (minutes): ..... 15
Certificate Present: ..................... Yes
Certificate Generation Status: ............ Inactive
Active Certificate: ...................... 1
Validity (not before): ................... Aug 11 13:58:57 2020 GMT
Validity (not after): .................... Aug 11 13:58:57 2021 GMT
Issued by: ............................... 10.52.132.228
Subject: ................................. /CN=10.52.132.228
Fingerprint: ............................. B1B0761088AE0B2DD4C452DF70A14101
```

Command History

Command updated in version 6.7.0 firmware.

state

Use the **state** command in Crypto Certificate Generation or Crypto Certificate Request mode to specify the state or province name.

Syntax

state *state*

- *state* — Specifies the state or province name. (Range: 1–64 characters)

Default Configuration

This command has no default configuration.

Command Mode

Crypto Certificate Generation or Crypto Certificate Request mode

User Guidelines

This command mode is entered using the **crypto certificate request** or **crypto certificate generate** command.

Example

The following example shows how to specify the state of "TX."

```
console(config-crypto-cert)#state TX
```

subject-alternative-name

Use this command to add a subject alternative name to a certificate request.

Syntax

subject-alternative-name *san*

- *san* — A list of one or more subject alternative names.

Default Configuration

By default, no subject alternative names are configured.

Command Mode

Crypto certification mode

User Guidelines

The subject alternative name is entered using the crypto certificate request or crypto certificate generate command.

The Subject Alternative Name (SAN) is an extension to the X.509 specification that allows users to specify additional host names to be protected by a single SSL certificate. Some browsers do not accept the Common Name field in an SSL certificate and require the SAN field instead.

Both DNS: format and IP: format names are accepted. Multiple names may be specified, separated by commas with no spaces. Wildcard domain formats are also accepted.

The following sample SAN formats are supported.

```
DNS:example.com
DNS:*.example.com
IP:10.10.20.1
DNS:xyz.com,IP:10.10.20.1
DNS.1:myserver.com,DNS.2:xyz.com,IP:10.10.32.1
```

Example

```
console(config-crypto-cert-req)#subject-alternative-name ?
<subjectAltName> Subject Alternative name {(DNS:<name>, (IP:<Addr>)}.
```

Command History

Command introduced in version 6.7.0 firmware.

Appendix A: List of Commands

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