



Cisco Nexus 5548UP

Switch Configuration Guide for Dell PS Series SANs

Dell Storage Engineering
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Revisions

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February 2013	Initial release
October 2013	Updated for firmware 6.0(2)N1(2)
March 2014	Updated for firmware 7.0(0)N1(1) and added DCB with iSCSI TLV configuration.
May 2014	Updated DCB bandwidth, jumbo frames configuration
October 2015	Added entry to now properly disable DCB

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1 Introduction

This document illustrates how to configure Cisco® Nexus 5548UP switches for use with Dell™ PS Series storage using Dell best practices. The recommended configuration uses link aggregation groups (LAGs) and Virtual Port Channel (vPC) for inter-switch connections.

For information on PS Series SAN design recommendations, see the [EqualLogic Configuration Guide](#).

1.1 Document conventions

Table 1 lists the formatting conventions used in this document.

Table 1 Document conventions

Format	Description	Example
Bold	User input	Dell> enable
<i>Italic</i>	Placeholder or variable	<i>your password</i>
< <i>Italic</i> > < <i>brackets</i> >	Separate variables	< <i>ip address</i> > < <i>mask</i> >

1.2 Audience

This switch configuration guide describes a verified configuration following Dell best practices for a PS Series iSCSI SAN and is intended for storage or network administrators and deployment personnel.

1.3 Switch details

Table 2 provides an overview of the switch configuration.

Table 2 Switch specifications

Cisco Nexus 5548UP	
Switch vendor	Cisco
Switch model	Nexus 5548UP
Switch firmware	v7.1(0)N1(1b)

Note: For proper functionality, the switch must be at the firmware version shown in the table above before proceeding with this configuration. Using previous firmware versions may have unpredictable results.

The latest firmware updates and documentation can be found at: www.cisco.com (requires login).



1.4 Cabling diagram

The cabling diagram shown below represents the Dell recommend method for deploying your servers and PS Series arrays.

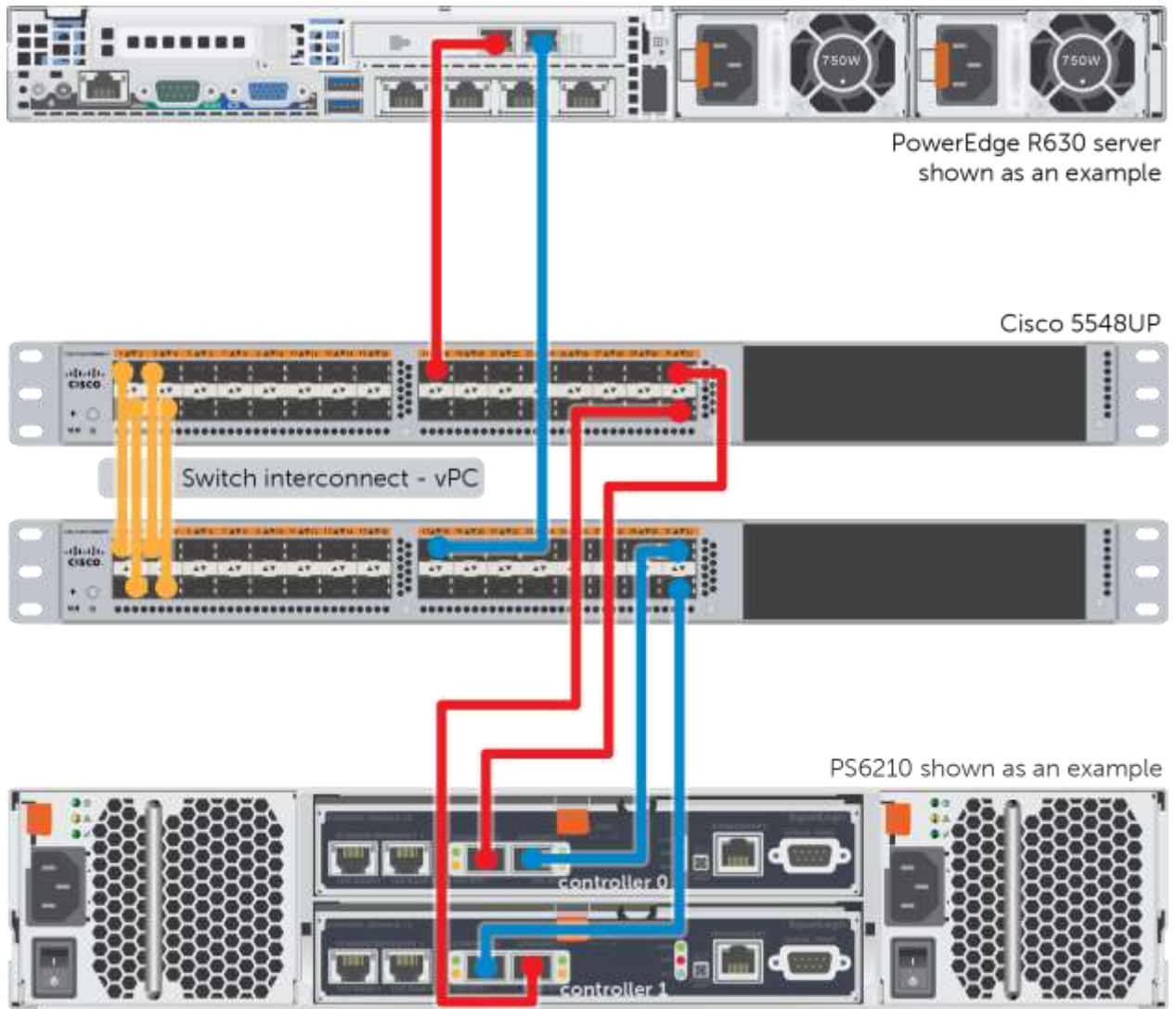


Figure 1 Cabling diagram



2 Dell recommended switch configuration

Follow the steps in this section to configure two Cisco Nexus 5548UP switches with a vPC interconnect. The switches are interconnected using four of the 10Gb ports configured as the vPC link.

Note: The configuration steps in this section are only recommended when the switch is used as a dedicated SAN for iSCSI traffic (not shared with LAN traffic).

2.1 Hardware configuration

1. Power on both switches.
2. Connect a serial cable to the management port.
3. Using PuTTY or another terminal utility, open a serial connection session to the switch.
4. Open your terminal emulator and configure it to use the serial port (usually COM1 but this may vary depending on your system). Configure serial communications for 9600,N,8,1 and no flow control.
5. Connect the cables between switch 1 and switch 2 as shown in Figure 1, for ports 1-4. This will be used as your vPC link.

2.2 Delete startup configuration

Note: This example assumes a switch at its default configuration settings. Using the `write erase` command will set the startup configuration file to its default settings. You should always back up your configuration settings prior to performing any configuration changes.

```
switch>enable
switch#write erase
Warning: This command will erase the startup-configuration
Do you wish to proceed anyway? (y/n) [n] y
switch# reload
WARNING: this command will reboot the system
Do you want to continue? (y/n) [n] y
```

Note: The switch will reboot.

2.3 Running the basic system configuration

The following steps use the setup utility to configure connectivity for basic management of the system.

After the switch fully reboots, the following prompts will appear:

```
Abort Power On Auto Provisioning and continue with normal setup ?(yes/no) [n]: y
---- System Admin Account Setup ----
Do you want to enforce secure password standard (yes/no): yes
Enter the password for "admin": my password
Confirm the password for "admin": my password
```



---- Basic System Configuration Dialog ----

This setup utility will guide you through the basic configuration of the system. Setup configures only enough connectivity for management of the system.

Please register Cisco Nexus 5000 Family devices promptly with your supplier. Failure to register may affect response times for initial service calls. Nexus devices must be registered to receive entitled support services.

Press Enter at anytime to skip a dialog. Use ctrl-c at anytime to skip the remaining dialogs.

```
Would you like to enter the basic configuration dialog (yes/no): yes
Create another login account (yes/no) [n]: n
Configure read-only SNMP community string (yes/no) [n]: n
Configure read-write SNMP community string (yes/no) [n]: n
Enter the switch name : my switch name
Continue with Out-of-band (mgmt0) management configuration? (yes/no) [y]: y
Mgmt0 IPv4 address : my IP address
Mgmt0 IPv4 netmask : my netmask
Configure the default gateway? (yes/no) [y]: y
IPv4 address of the default gateway : my gateway
Enable the telnet service? (yes/no) [n]: y
Enable the ssh service? (yes/no) [y]: n
Configure the ntp server? (yes/no) [n]: n
Enter basic FC configurations (yes/no) [n]: n
The following configuration will be applied:
switchname my switch name
interface mgmt0
ip address my ip address my netmask
no shutdown
exit
vrf context management
ip route 0.0.0.0/0 my gateway
exit
telnet server enable
no ssh server enable

Would you like to edit the configuration? (yes/no) [n]: n
Use this configuration and save it? (yes/no) [y]: y

[#####] 100%
Copy complete, now saving to disk (please wait)...
```

Log in with the credentials created in the previous steps.

Note: For Data Center Bridging (DCB) configuration, skip to section 3.



2.4 Disabling Data Center Bridging (DCB)

Note: All steps in this section are required in order to properly disable DCB. These steps are also required when upgrading from previous versions to this new version v7.1(0)N1(1b).

```
switch# configure
switch(config)#lldp tlv-select dcbxp
switch(config)#copy running-config startup-config
switch(config)#no lldp tlv-select dcbxp
switch(config)#exit
switch#copy running-config startup-config
```

Note: The above steps needed due to "CSCuo63486 LLDP - link err-disabled upon reload when dcbx tlv is disabled".

2.5 Configure the vPC domain

```
switch# configure
switch(config)#feature lacp
switch(config)#feature vpc
switch(config)#vpc domain 1
switch(config-vpc-domain)#peer-keepalive destination peer IP address
-----:: Management VRF will be used as the default VRF ::-----
```

Note: For the *peer IP address*, use the management IP address of the partner switch.

```
switch(config-vpc-domain)#exit
```

2.6 Configure Port Channel

```
switch(config)# interface port-channel 1
switch(config-if)# switchport mode trunk
switch(config-if)# spanning-tree port type network
switch(config-if)# vpc peer-link
```

Please note that spanning tree port type is changed to "network" port type on vPC peer-link. This will enable spanning tree Bridge Assurance on vPC peer-link provided the STP Bridge Assurance (which is enabled by default) is not disabled.

```
switch(config-if)# exit
switch(config)# interface ethernet 1/1-4
switch(config-if-range)# switchport mode trunk

switch(config-if-range)# channel-group 1 mode active
switch(config-if-range)# exit
```



```
switch(config)# interface port-channel 1
switch(config-if)#priority-flow-control mode off
switch(config-if)# flowcontrol send on
switch(config-if)# flowcontrol receive on
switch(config-if)# exit
```

2.7 Enable link level flow control (802.3x)

You must perform this step for each individual port that is connected to a storage controller or a host interface port, or you can specify a range of ports to configure.

```
switch(config)#interface ethernet 1/5-32
switch(config-if-range)#priority-flow-control mode off
switch(config-if-range)#flowcontrol send on
switch(config-if-range)#flowcontrol receive on
switch(config-if-range)#exit
```

2.8 Configure portfast on edge ports

```
switch(config)#interface ethernet 1/5-32
switch(config-if-range)#spanning-tree port type edge
```

Warning: edge port type (portfast) should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when edge port type (portfast) is enabled, can cause temporary bridging loops. Use with CAUTION.

Edge Port Type (Portfast) will be configured in 28 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode.

```
switch(config-if-range)#exit
```

2.9 Enable VLAN

The following example uses VLAN 101 and configures a range of ports. Any valid VLAN (between 2–4094) may be substituted.

```
switch(config)# vlan 101
switch(config-vlan)# exit
switch(config)# interface ethernet 1/5-32
```

Note: Switch ports 1–4 are part of port-channel 1 and are not included in the above range.

```
switch(config-if-range)# switchport access vlan 101
switch(config-if-range)# exit
```



2.10 Enable switch ports

The following example enables a range of ports. If preferred, you may enable individual ports as needed.

```
switch(config)# interface ethernet 1/1-32  
switch(config-if-range) # shutdown  
switch(config-if-range) # no shutdown  
switch (config-if-range) # exit
```

2.11 Configure the Nexus policy engine

The following example configures iSCSI traffic for Class of Service (CoS) 4 and Quality of Service (QoS) group 3.

2.11.1 Configure CoS for iSCSI

Repeat this step for each individual interface connected to host and array controller ports, or specify a range of ports to configure.

```
switch(config)# interface ethernet 1/5-32  
switch(config-if-range) # untagged cos 4  
switch(config-if-range) # exit
```

2.11.2 Define a QoS map for iSCSI

```
switch(config)# class-map type qos class-iscsi  
switch(config-cmap-qos) # match cos 4  
switch(config-cmap-qos) # exit
```

2.11.3 Define a QoS policy map for iSCSI

```
switch(config)# policy-map type qos policy-qos  
switch(config-pmap-qos) # class type qos class-iscsi  
switch(config-pmap-c-qos) # set qos-group 3  
switch(config-pmap-c-qos) # exit  
switch(config-pmap-qos) # exit
```

2.11.4 Define a network QoS class map

```
switch(config)# class-map type network-qos class-iscsi  
switch(config-cmap-nq) # match qos-group 3  
switch(config-cmap-nq) # exit
```

2.11.5 Define a no-drop policy map and enable jumbo frames

```
switch(config)# policy-map type network-qos policy-nq  
switch(config-pmap-nq) # class type network-qos class-iscsi  
switch(config-pmap-nq-c) # mtu 9216  
switch(config-pmap-nq-c) # pause no-drop
```



```
switch(config-pmap-nq-c) # exit
```

Note: The following steps are optional and will enable jumbo MTU for the default class (non-iSCSI traffic).

```
switch(config-pmap-nq) #class type network-qos class-default  
switch(config-pmap-nq-c) #mtu 9216  
switch(config-pmap-nq-c) # exit  
switch(config-pmap-nq) # exit
```

2.11.6 Define a queuing class-map

```
switch(config) # class-map type queuing class-iscsi  
switch(config-cmap-que) # match qos-group 3
```

2.11.7 Define a queuing policy-map

```
switch(config-cmap-que) # policy-map type queuing policy-queuing  
switch(config-pmap-que) # class type queuing class-default  
switch(config-pmap-c-que) # bandwidth percent 5  
switch(config-pmap-c-que) # class type queuing class-fcoe  
switch(config-pmap-c-que) # bandwidth percent 0  
switch(config-pmap-c-que) # class type queuing class-iscsi  
switch(config-pmap-c-que) # bandwidth percent 95  
switch(config-pmap-c-que) # exit  
switch(config-pmap-que) # exit
```

2.12 Apply the Nexus policies

```
switch(config) # system qos  
switch(config-sys-qos) # service-policy type qos input policy-qos  
switch(config-sys-qos) # service-policy type queuing output policy-queuing  
switch(config-sys-qos) # service-policy type queuing input policy-queuing  
switch(config-sys-qos) # service-policy type network-qos policy-nq  
switch(config-sys-qos) # exit  
switch(config) # exit
```

2.13 Save configuration

```
switch#copy running-config startup-config
```

2.14 Configure additional switch

Repeat the commands from sections 2.1 through 2.13 to configure the second switch.



3 Configure Data Center Bridging (DCB) (optional)

To enable DCB mode on the switch, use the procedures in this section.

Note: This section assumes a new switch that has a default startup configuration file. Always back up the startup configuration file prior to making any configuration changes.

Note: This section enables Data Center Bridging for implementing a converged network (LAN and SAN traffic sharing the same switch fabric). Hosts connecting to PS Series iSCSI storage must have a supported converged network adapter (CNA).

3.1 Enable DCB

```
switch# configure
switch(config)#lldp tlv-select dcbxp
switch(config)# exit
switch#copy running-config startup-config
```

3.2 Enable VLAN

The following example uses VLAN 100 for SAN storage and VLAN 200 for other traffic. Any valid VLAN (between 2–4094) may be substituted.

```
switch(config)# vlan 100,200
switch(config-vlan)# exit
```

Note: Switch ports 1-4 are part of port-channel 1 and are not included in the above range.

3.3 Configure the vPC domain

```
switch# configure
switch(config)#feature lacp
switch(config)#feature vpc
switch(config)#vpc domain 1
switch(config-vpc-domain)#peer-keepalive destination peer IP address
-----:: Management VRF will be used as the default VRF ::-----
```

Note: For the *peer IP address*, use the management IP address of the partner switch.

```
switch(config-vpc-domain)#exit
```

3.4 Configure Port Channel

```
switch(config)# interface port-channel 1
switch(config-if)# switchport mode trunk
```



```
switch(config-if)# switchport trunk allowed vlan 100,200  
switch(config-if)# spanning-tree port type network  
switch(config-if)# vpc peer-link
```

Please note that spanning tree port type is changed to "network" port type on vPC peer-link. This will enable spanning tree Bridge Assurance on vPC peer-link provided the STP Bridge Assurance (which is enabled by default) is not disabled.

```
switch(config-if)# exit
```

```
switch(config)# interface ethernet 1/1-4  
switch(config-if-range)# switchport mode trunk  
switch(config-if-range)# switchport trunk allowed vlan 100,200  
switch(config-if-range)# channel-group 1 mode active  
switch(config-if-range)# exit
```

3.5 Configure portfast on edge ports

```
switch(config)#interface ethernet 1/5-32  
switch(config-if-range)#spanning-tree port type edge
```

Warning: edge port type (portfast) should only be enabled on ports connected to a single host. Connecting hubs, concentrators, switches, bridges, etc... to this interface when edge port type (portfast) is enabled, can cause temporary bridging loops. Use with CAUTION.

Edge Port Type (Portfast) will be configured in 28 interfaces due to the range command but will only have effect when the interfaces are in a non-trunking mode.

```
switch(config-if-range)#exit
```

3.5.1 Configure VLANs for iSCSI

Repeat this step for each individual interface connected to host and array controller ports, or specify a range of ports to configure.

```
switch(config)# interface ethernet 1/5-32  
switch(config-if-range)# switchport mode trunk  
switch(config-if-range)# switchport trunk allowed vlan 100,200  
switch(config-if-range)#exit
```

3.6 Configure the Nexus policy engine

The following subsections configure iSCSI traffic for Class of Service (CoS) 4 and Quality of Service (QoS) group 4.



3.6.1 Define a QoS map for iSCSI

```
switch(config)# class-map type qos match-all class-iscsi
switch(config-cmap-qos)# match protocol iscsi
switch(config-cmap-qos)# match cos 4
switch(config-cmap-qos)# exit
```

3.6.2 Define a QoS policy map for iSCSI

```
switch(config)# policy-map type qos iscsi-in-policy
switch(config-pmap-qos)# class class-iscsi
switch(config-pmap-c-qos)# set qos-group 4
switch(config-pmap-c-qos)#exit
switch((config-pmap-qos)# exit
```

3.6.3 Define a queuing class-map

```
switch(config)# class-map type queuing class-iscsi
switch(config-cmap-que)# match qos-group 4
switch(config-cmap-que)# exit
```

3.6.4 Define a network QoS class map

```
switch(config)# class-map type network-qos class-iscsi
switch(config-cmap-nq)# match qos-group 4
switch(config-cmap-nq)# exit
```

3.6.5 Define a queuing policy-map

```
Switch(config)# policy-map type queuing iscsi-in-policy
switch(config-pmap-que)# class type queuing class-default
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# class type queuing class-fcoe
switch(config-pmap-c-que)# bandwidth percent 0
switch(config-pmap-c-que)# class type queuing class-iscsi
switch(config-pmap-c-que)# bandwidth percent 50
switch(config-pmap-c-que)# exit
switch(config-pmap-que)# exit
```

3.6.6 Define a no-drop policy map and enable jumbo frames

```
switch(config)# policy-map type network-qos iscsi-nq-policy
switch(config-pmap-nq)# class type network-qos class-iscsi
switch(config-pmap-nq-c)# set cos 4
switch(config-pmap-nq-c)# mtu 9216
switch(config-pmap-nq-c)# pause no-drop
switch(config-pmap-nq-c)# exit
```



Note: The following steps are optional and will enable jumbo MTU for the default class (non-iSCSI traffic).

```
switch(config-pmap-nq) #class type network-qos class-default
switch(config-pmap-nq-c) #mtu 9216
switch(config-pmap-nq-c) # exit
switch(config-pmap-nq) # exit
```

3.7 Apply the Nexus policies

```
switch(config) # system qos
switch(config-sys-qos) # service-policy type qos input iscsi-in-policy
switch(config-sys-qos) # service-policy type queuing input iscsi-in-policy
switch(config-sys-qos) # service-policy type queuing output iscsi-in-policy
switch(config-sys-qos) # service-policy type network-qos iscsi-nq-policy
switch(config-sys-qos) # exit
switch(config) # exit
```

3.8 Save configuration

```
switch#copy running-config startup-config
```

3.9 Configure Additional Switch

Repeat the commands from sections 3.1 through 3.8 to configure the second switch.

3.10 Disabling DCB (optional)

Note: With the current Cisco Nexus firmware, it is not possible to fully disable DCB functionality correctly. Using the configuration steps in section 2 of this document results in a proper non-DCB environment. In addition, disabling LLDP support can effectively prevent the negotiation of DCB by preventing the transmission of DCBx frames. However, disabling LLDP may also reduce functionality necessary for other protocols. **Only disable LLDP if instructed by Dell Support.** The following example disables LLDP support on ports 1 through 32.

```
switch#configure
switch(config) #interface ethernet 1/1-32
switch(config-if-range) # no lldp receive
switch(config-if-range) # no lldp transmit
```



Additional resources

Dell.com/support is focused on meeting your needs with proven services and support.

Support.cisco.com provides support and information regarding Cisco networking products.

DellTechCenter.com is an IT Community where you can connect with Dell customers and Dell employees for the purpose of sharing knowledge, best practices, and information about Dell products and your installations.

Referenced or recommended Dell publications:

- *Dell EqualLogic Configuration Guide:*
<http://en.community.dell.com/techcenter/storage/w/wiki/equallogic-configuration-guide.aspx>
- *Dell Storage Compatibility Matrix:*
<http://en.community.dell.com/dell-groups/dtcmedia/m/mediagallery/20438558/download.aspx>

For PS Series best practices white papers, reference architectures, and sizing guidelines for enterprise applications and SANs, refer to:

<http://en.community.dell.com/techcenter/storage/w/wiki/2660.equallogic-technical-content>

