Active Fabric Manager (AFM)
User Guide 2.6

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Contents

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Introduction

Active Fabric Manager (AFM) is a network automation and orchestration tool with a graphical user interface (GUI) that allows you to design, build, deploy, and optimize a Layer 3 distributed core, Layer 3 with Resiliency (Routed VLT), and Layer 2 VLT fabric for your current and future capacity requirements. This tool helps you simplify network operations, automate tasks, and improve efficiency in the data center.

Use AFM to monitor performance at the network, fabric, switch, and port level or display additional performance statistics through AFM using a Dell OpenManage Network Manager (OMNM) server. It automates common network management operations and provides advanced network element discovery, remote configuration management, and system health monitoring to proactively alert network administrators to potential network problems. OMNM provides SOAP-based web services to provide integration with non-Dell products. AFM supports Dell Networking S4810, S4820T, S55, S60, S5000, S6000, IOA blade, MXL blade, and Z9000 switches.

NOTE: Before you begin, review the Getting Started page. To learn how to install AFM, including instructions on completing the Initial Setup, refer to the *Active Fabric Manager Deployment Guide*.

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Getting Started

NOTE: To view this document in AFM, select the **User Guide** option from the **Help** drop-down menu in the upper right.

Figure 1. Help Menu — User Guide

Designing and Deploying a Fabric

This section provides an overview of the steps required to design and deploy a fabric, including the information you need before you begin.

NOTE: If you are using the **OpenStack Neutron Managed** option, refer to the *AFM Plug-in for OpenStack Guide*.

After completing the installation, configure AFM using the **Getting Started** configuration wizard on the **Home** > **Getting Started** screen. AFM automatically launches this wizard after you complete the installation process. The **Getting Started** configuration wizard provides launch points for designing, pre-deploying, and deploying the fabric. With this wizard, you can also edit and expand an existing fabric design , import an existing design, and discover an existing fabric.

To design and deploy a Layer 2 VLT, Layer 3 distributed core fabric, or Layer 3 with Resiliency (Routed VLT)

1. Gather useful information.
   Related links.
   - Gather Useful Information for Layer 2 VLT Fabric
   - Gathering Useful Information for a Layer 3 Distributed Core Fabric.
   - Gathering Useful Information for a Layer 3 with Resiliency (Routed VLT) Fabric
2. Design the fabric.
   Related links for designing a Layer 2 VLT fabric:
   - Overview of VLT
   - Key Considerations for Designing a VLT Fabric
   - Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design

   Related links for designing a Layer 3 distributed core fabric:

- Overview of a Distributed Core
- Terminology
- Selecting a Distributed Core Design

Related links for designing a Layer 3 with Resiliency (Routed VLT):

- Key Considerations for Designing Layer 3 with Resiliency (Routed VLT)
- Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design

3. Build the physical network.
4. Configure the following settings:

   - TFTP/FTP
   - SNMP
   - CLI Credentials
5. Prepare the Fabric for Deployment
6. Deploy and Validate the Fabric
7. Validate the deployed fabric against the fabric design.
8. Monitor the fabric health and performance. Refer to Performance Management.

NOTE: To provision the fabric, enter the Dell Networking operating system user's CLI credentials and enable the configuration credential for all the switches in the fabric. For information, refer to CLI Credentials.

CAUTION: Reset any pre-deployed switches to factory settings. Switches must be in Bare Metal Provision (BMP) mode.

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Site Map

To navigate the AFM user interface, refer to the following site map.

Home	**Getting Started Wizard** Step 1: Design/ Discover the Fabric Step 2: Pre-Deployment Configuration Step 3: Deploy the Fabric	**Dashboard**				
Network Level	**Summary** Map Network View Graphical and Tabular View **Actions** • View Fabric Topology • Load Background Map • Delete Background Map **Topology Options** • Show Tooltips • Enable Move	**Alerts and Events** Current Historical **Acknowledge/ Unacknowledge/Clear**	**Performance** Average Bandwidth Utilization Link Usage Switch Statistics	**Design Fabric** New Fabric Discover Fabric Edit Fabric Delete Fabric View Wiring Plan Discovery Status	**Inventory Management** Network Inventory Port, Port Channel, and Hardware Details	

	• Revert to Last Saved • Save Move Search by fabric name					
Fabric Level	**Summary** Fabric View **Actions** • View Switch Topology • Manage/ Unmanage Switch **Topology Options** • Show Tooltips • Hide Links Search by switch name	**Alerts and Events** Current Historical **Acknowledge/ Unacknowledge/Clear**	**Performance** Average Bandwidth Utilization Link Usage Switch Statistics	**Maintenance** Schedule Switch Software Image Update Schedule Activate Standby Partition	**Configure and Deploy Fabric** **Deploy Fabric** • Device MAC Association • Device MAC Association Status • Pre-deployment Configuration • Deploy and Validate • View DHCP Configuration **Errors** **CLI Configuration** • Manage Templates • Associate Templates • Custom Configuration • View Custom Configuration History	**Inventory Management** Fabric Inventory

					View Wiring Plan	
Switch Level	**Summary** Device View Graphical and Tabular View	**Alerts and Events** Current Historical **Acknowledge/ Unacknowledge/Clear**	**Performance** Switch and Port Real-time and Historical data	**Troubleshooting** Ping SSH Traceroute Telnet	**Switch Replacement** Decommission Switch Replace Switch Deploy Switch	
Jobs	**Job Results**	**Scheduled Jobs** **Add** • Switch Backup • Switch Software Image Update • Switch Software Image Activation Edit Run Now Delete Enable Disable	**Data Collections** Schedule data collection Edit threshold	**Reports** New Report Run Edit Duplicate Delete		
Administration	**Audit Log**	**Administration** TFTP/FTP Settings SNMP Configuration CLI Credentials	**User Account** Add User Delete Edit Unlock	**User Session** Force Logoff	**Server Update** Update Server Activate Available Version	

		Syslog IP Addresses System Information Active Link Settings Data Retention Settings Client Settings NTP Server Settings DHCP Server Settings Secure SMTP Email Settings				

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Supported Fabric Types

The fabric design wizard defines the basic configuration for a Layer 2 VLT, Layer 3 distributed core, and Layer 3 with Resiliency (Routed VLT) fabric.

- Use the Layer 3 distributed core fabric for large fabric deployments. For information about distributed core fabrics, refer to Conventional Core Versus Distributed Core and Selecting a Layer 3 Distributed Core Fabric Design.
- Use the Layer 2 VLT fabric for workload migration over virtualized environments. For information about Layer 2 fabrics, refer to VLT and Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design.
- Use the Layer 3 with Resiliency (Routed VLT) fabric to extend equal cost multipathing capabilities. For information about supported tiers, refer to Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design.
- Use the IOA fabric design wizard to design a Layer 2 fabric with an I/O Aggregator (IOA) blade switch in a M1000e chassis. For more information about the IOA Fabric Design Wizard, refer to IOA Fabric Design Wizard.

For more information on supported topologies, refer to Deployment Topology Use Cases. For information about tiers, refer to Deployment Topology.

To design a fabric based on current or prospective capacity requirements, use the fabric design wizard at the **Network > Configure Fabric > Design New Fabric** screen. When you start AFM, the **Getting Started** configuration wizard in the **Welcome to Active Fabric Manager** screen starts automatically.

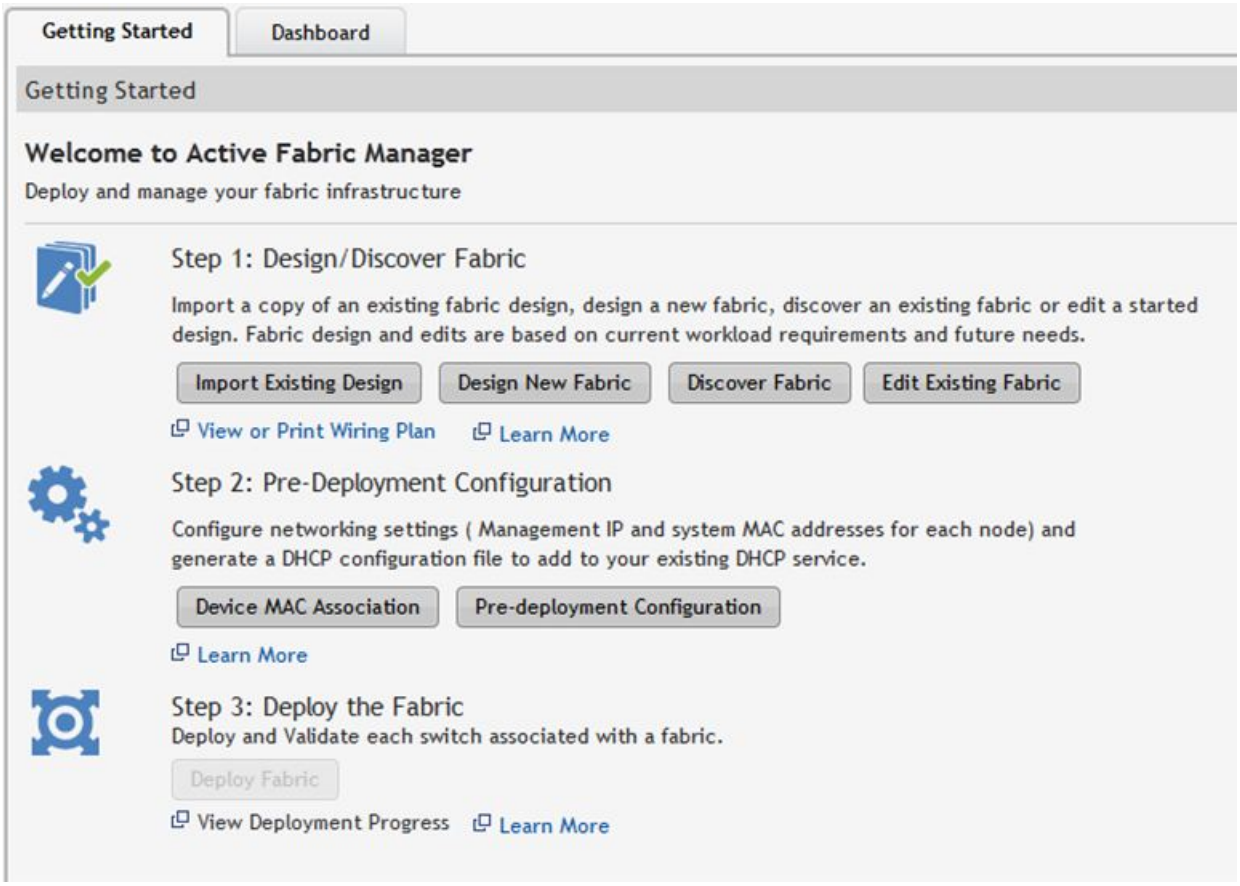


Figure 2. Getting Started Tab

Key Considerations for Designing a Layer 3 with Resiliency (Routed VLT) Fabric

To extend equal cost multipathing capabilities, use the Layer 3 with Resiliency (Routed VLT) fabric. When designing a Layer 3 with Resiliency (Routed VLT) fabric, consider the following:

- You can deploy up to 10 fabric designs. However, the fabric designs do not communicate with each other.
- AFM manages Dell Networking S4810, S4820T, S6000, and Z9000 switches.

NOTE: If you are using a deployed switch, reset the factory settings. The switch must be in BMP mode.

For more information on BMP, refer to DHCP Integration and the *Configuration Guide* for the Dell Networking S4810, S4820T, S6000, and Z9000 switches.

The number and type of switches in a Layer 3 with Resiliency (Routed VLT) fabric are based on the following:

- The number of current uplinks (at least two) and downlinks for the access switches.

- The number of planned edge ports (future uplinks and downlinks) for the access switches.
- Whether the access switches need to act as a ToR or access.
- Fabric interlink bandwidth (the links between the aggregation and access switches).
- Downlinks (1 Gb, 10 Gb, or 40 Gb).
- The fabric interlink bandwidth (10 Gb or 40 Gb) is fixed and based on the fabric type.

NOTE: If you do not specify additional links for future expansion in the fabric design in the **Bandwidth and Port Count** screen, you can only expand the downlinks on the existing fabric.

For information on how to expand a fabric, refer to Editing and Expanding an Existing Fabric Design. For information about tiers, refer to Deployment Topology and Deployment Topology Use Cases.

Gathering Useful Information for a Layer 3 with Resiliency (Routed VLT) Fabric

Gather the following useful information for a Layer 3 with Resiliency (Routed VLT) fabric before you begin:

- Obtain the CSV file with the system MAC addresses, Service Tag, and serial numbers for each Dell-provided switch, or manually enter this information.
- Obtain the location of the switches, including the rack and row number, from the network administrator or network operator.
- Obtain the remote Trivial File Transfer Protocol (TFTP) / File Transfer Protocol (FTP) address from the network administrator or network operator. To specify a TFTP/FTP site, go to the **Administration** > **Settings >TFTP/FTP** screen. For information about which software packages to use, refer to the Release Notes.
- Download the software image for each type of switch in the fabric. Each type of switch within the fabric must use the same version of the software. Place the software images on the TFTP/FTP site so that the switches can install the appropriate Dell Networking OS software image and configuration file.
- Obtain the Dynamic Host Configuration Protocol (DHCP) server address for the fabric from your DHCP network administrator or network operator. If a remote DHCP server is not available, AFM also provides local DHCP. The DHCP server must be in the same subnet as the switches.

  After you power cycle the switches, the switches communicate with the DHCP server to obtain a management IP Address based on the system MAC Address. The DHCP server contains information about where to load the correct software image configuration file for each type of switch from the TFTP/FTP site during BMP. For information about BMP, refer to DHCP Integration.
- Obtain the pool of IP addresses for the management port for each switch in the fabric.
- Obtain an even number of IP addresses for the uplink configuration from the ISP service. The uplink port number range is based on the selected bandwidth (10 Gb or 40 Gb).
  - For 10 Gb uplink bandwidth, AFM supports 2–32 uplinks.
  - For 40 Gb uplink bandwidth, AFM supports 2–8 uplinks.
- Obtain IP addresses or VLAN IDs for the downlink configuration of the server or ToR connection.
- Gather protocol configuration for uplinks and downlinks.

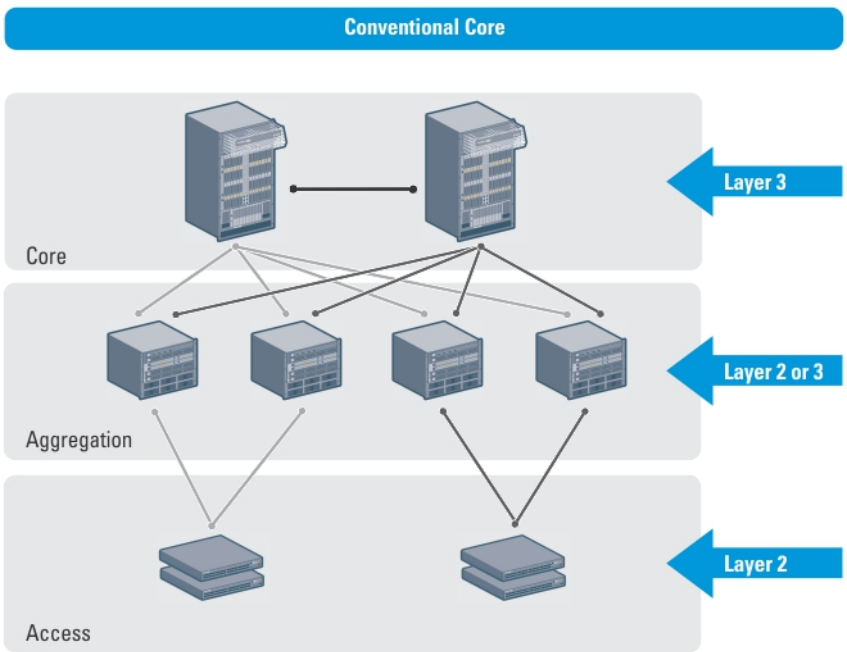
Conventional Core Versus Distributed Core

This section describes the differences between a conventional core and a distributed core.

Conventional Core

A conventional core is a three-tier network that is typically chassis-based and is composed of the following:

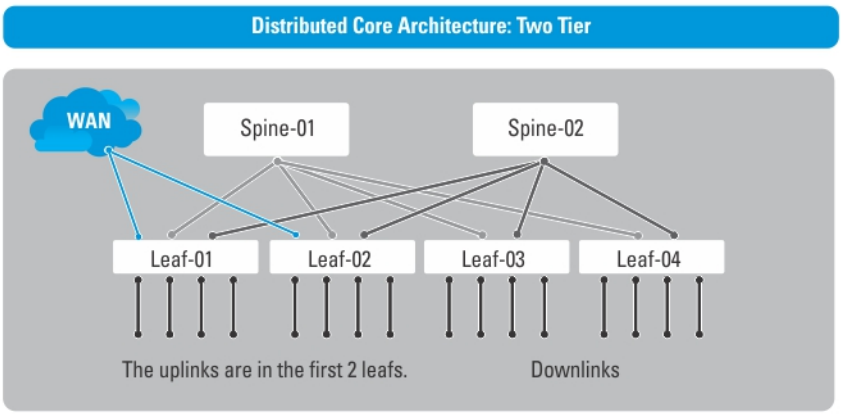
- **Core** — The core layer routes traffic to and from the internet and the extranet. High availability, which provides redundancy and resiliency, requires chassis-based core routers.
- **Aggregation layer** — The aggregation layer connects with top of rack (ToR) switches and aggregates the traffic into fewer high-density interfaces such as 10GbE or 40GbE. This layer aggregates the traffic to the core layer.
- **Access layer (ToR)** — The access layer typically contains ToRs. A ToR is a small form-factor switch that sits on top of the rack and allows all the servers in the rack to be cabled into the switch. A ToR has a small 1–2 rack unit (RU) form factor.



Distributed Core

A distributed core is a two-tier architecture composed of multiple interconnected switches, providing a scalable, high-performance network that replaces the traditional and aggregation layers in a conventional core. Switches are arranged as spines and leaves. The spines in the fabric connect the leaves using a routing protocol. The leaves' edge ports connect to the switches, ToR switches, servers, other devices, and the WAN. The spines move traffic bidirectionally between the leaves to provide redundancy and load balancing. Collectively, the spine and leaf architecture forms the distribute core fabric.

This two-tier network design allows traffic to move more efficiently in the core and at a higher bandwidth with lower latencies than most traditional three-tier networks. Since there is no single point of failure that can disrupt the entire fabric, the distributed core architecture is more resilient and there is less impact on the network if a link or node failure occurs. AFM views the distributed core as one logical switch.



NOTE: There are no uplinks on the spines. All the leaves have downlinks. Configure the uplink in the first two leaves.

Key Advantages

The key advantages of a distributed core architecture are:

- Simplified fabric
- Higher bandwidth
- Highly resilient
- Higher availability
- Low power consumption
- Less cooling
- Lower latency
- Lower cost
- Less rack space
- Easier to scale

Distributed Core Terminology

The following terms are unique to the design and deployment of a Layer 3 distributed core fabric.

- **Leaf** — A switch that connects switches, servers, storage devices, or top-of-rack (TOR) elements. The role of the leaf switches is to provide access to the fabric. The leaf switch connects to all of spines above it in the fabric.
- **Spine** — A switch that connects to the leaves switches. The role of the spine is to provide an interconnect to all the leaves switches. All the ports on the spine switches are used to connect the leaves, various racks together. The spines provide load balancing and redundancy in the distributed core. There are no uplinks on the spines.

- **Edge ports** — The uplinks and downlinks on the leaves.
- **Uplinks** — An edge port link on the first two leaves in the distributed core fabric that connects to the edge WAN, which typically connects to an internet server provider (ISP). The uplink can also connect to a router gateway or an external switch.
- **Downlinks** — An edge port link that connects the leaves to the data access layer; for example, servers or ToR elements.

  NOTE: Specify an even number of uplinks. The minimum number of uplinks is two. One uplink is for redundancy.
- **Fabric Interlinks** — Links that connect the spines to the leaves. The fabric interlink bandwidth is fixed: 10 Gb or 40 Gb.
- **Fabric over-subscription ratio** — Varies the maximum number of available interconnect links. This ratio determines the number of fabric interlinks (the number of communication links between the spine and leaf devices). The specified ratio depends on the bandwidth, throughput, and edge port requirements. The interlink over-oversubscription ratio does not come off the edge port downlinks.

  As you increase the fabric over-subscription ratio:

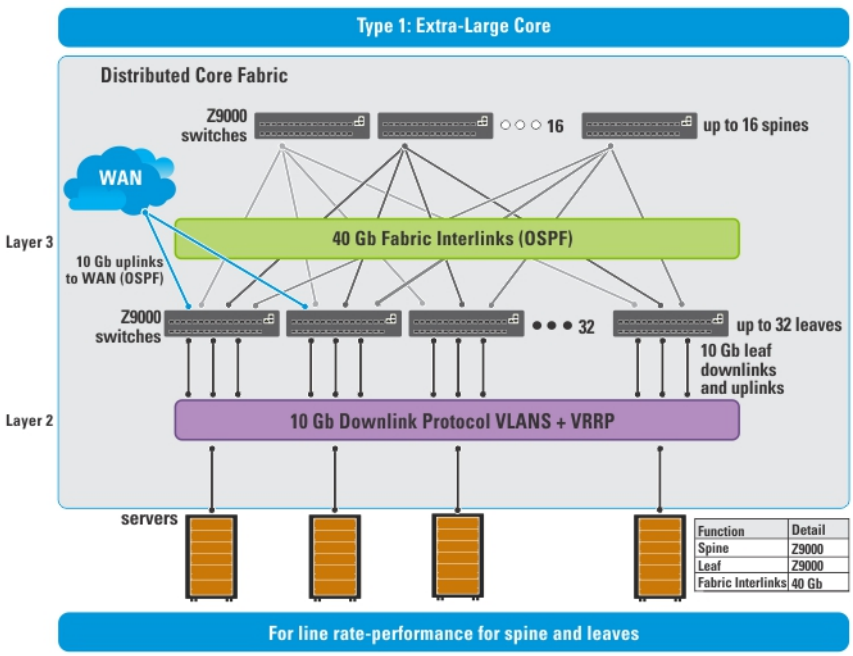
  – The total number of ports for the downlinks increases.

  – The number of interconnect links from the leaves to the spines decreases.

  – The maximum number of available ports increases.

  For non-blocking (line rate) between the leaves and spines, select the 1:1 fabric over-subscription ratio. This ratio is useful when you require a large amount of bandwidth but not many ports.

  The following image illustrates a distributed core fabric.



NOTE: The AFM does not configure or manage anything beyond the distributed core fabric.

NOTE: In a single distributed fabric, all the leaves can act as a non-ToR or as a ToR, not both at the same time.

Gathering Useful Information for a Distributed Core

Gather the following useful information for a Layer 3 distributed core fabric before you begin:

- The comma-separated values (CSV) file that contains the system media access control (MAC) addresses, Service Tag, and serial numbers for each switch provided from Dell manufacturing or manually enter this information
- The location of the switches, including the rack and row number from your network administrator or network operator
- The Remote Trivial File Transfer Protocol (TFTP) or File Transfer Protocol (FTP) address from your network administrator or network operator. To specify a TFTP/FTP site, go to **Administration** > **Settings** > **TFTP/FTP** screen. For information about which software packages to use, refer to the Release Notes.
- The software image for each type of switch in the fabric. Each type of switch must use the same version of the software image within the fabric. Place the software images on the TFTP or FTP site so that the switches can install the appropriate FTOS software image and configuration file.
- The Dynamic Host Configuration Protocol (DHCP) server address for the fabric from your DHCP network administrator or network operator. If a remote DHCP server is not available, AFM also provides a local DHCP server. The DHCP server must be in the same subnet where the switches are located. After you power cycle the switches, the switches communicate with the DHCP server to obtain a management IP address based on the system MAC address. The DHCP server contains information about where to load the correct software image configuration file for each type of switch from the TFTP/FTP site during BMP. For information about BMP, see DHCP Integration.
- The pool of IP addresses for the management port for each switch in the fabric
- The IP addresses (must be an even number) for the uplink configuration from the ISP service. The uplink port number range is based on whether a 10 Gb or 40 Gb bandwidth is selected
  - For a 10 Gb bandwidth, AFM supports 2–32 uplinks.
  - For a 40 Gb bandwidth, AFM supports 2–8 uplinks.
- The IP addresses for the downlink configuration for connecting to the server or ToR.
- The IP addresses for the fabric link configuration for the spine and leaf switches.
- The protocol configuration for uplinks, downlinks and fabric link configuration

Selecting a Layer 3 Distributed Core Fabric Design

For large fabric deployments, use the Layer 3 distributed core fabric. AFM supports the following distributed core fabric designs:

- Type 1: Extra Large Core Fabric
- Type 2: Large Distributed Core Fabric
- Type 3: Medium Distributed Core Fabric
- Type 4: Small Distributed Core Fabric

To select the appropriate Layer 3 distributed core fabric design, use the following table as a guide. For more information about a Layer 3 distributed core, see:

- Overview of a Distributed Core
- Key Core Design Considerations

For a Layer 3 distributed core topology, select the **Layer 3** option in the Design Wizard on the **Deployment Topology** screen. For information about distributed core fabric, refer to Selecting a Distributed Core Design.

DL BW — Downlink Bandwidth

UL BW — Uplink Bandwidth

FLBSL — Fabric Link bandwidth between the spine and leaf

MND — Maximum number of downlinks

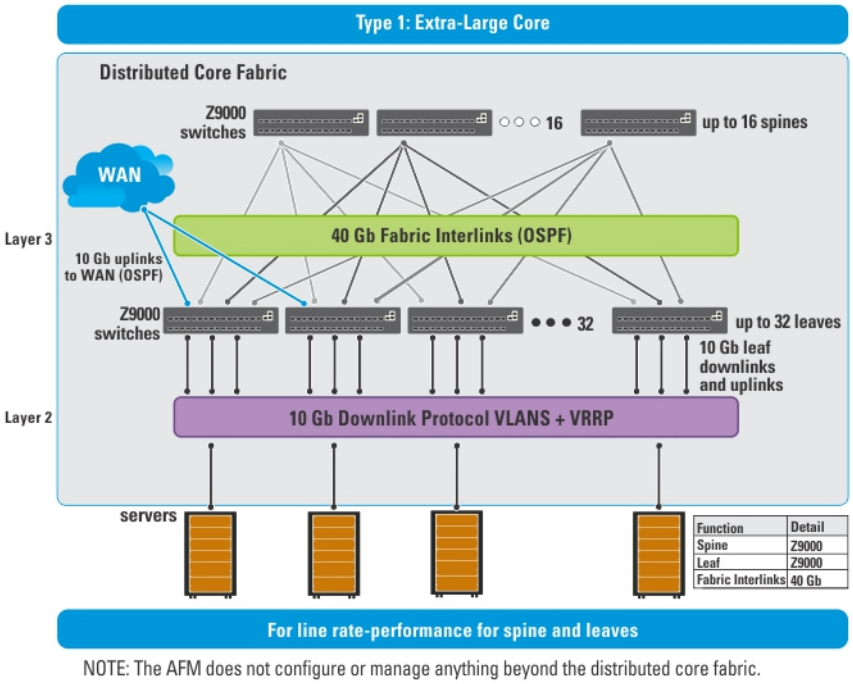
NOTE: The maximum number of downlinks is based on two uplinks.

Table 1. 2 Tier Layer 3 Distributed Core Topologies

Type	OS Ratio	DL BW	MND	Maximum # of Spines	Maximum # of Leafs	UL BW	FLBSL	Possible Topologies (Spine and Leaf)
Type 1-Extra Large Core	1:1	10G	2046	16	32	10G	40G	Z9000/Z9000 or S6000/S6000
Type 2-Large Core	1:1	10G	2046	32	64	10G	10G	S4810/S4810
Type 3-Medium Core	3:1	10G	766	4	32	10G	10G	S4810/S4810
Type 3-Medium Core	4:1	10G	1662	3	32	10G	40G	Z9000/S4810 or S6000/S4810
Type 4-Small Core	5:1	10G	894	2	8	10G	10G	S4810/S4810
Type 4-Small Core	3:1	10G	1534	4	16	10G	40G	Z9000/S4810 or S6000/S4810

Type 1: Extra Large Distributed Core Fabric

With a Type 1: Extra Large Distributed Core fabric design, the Z9000 or S6000 spines connect to the Z9000 or S6000 leaves at a fixed 40 Gb line rate. The maximum number of leaves is based on the maximum number of ports on the spine (for example, 32 ports for the Z9000, as shown in the following figure).



NOTE: The AFM does not configure or manage anything beyond the distributed core fabric.

Figure 3. Type 1: Extra Large Distributed Core Fabric Design

Use the Type 1: Extra Large Distributed Core fabric design when:

- The line rate-performance with a fabric oversubscription ratio of 1:1 between the spines and leaves.
- The current and planned uplinks and downlinks on the leaves for the distributed core is less than or equal to 2048 ports.

For redundancy, each leaf in a large core design can connect 2–16 spines. The Type 1: Extra Large Distributed Core Design uses a 1:1 spine-to-leaf ratio. As a result, the maximum number of spines for this design is 16 and the maximum number of leaves is 32.

Each Z9000 or S6000 leaf for the Type 1: Extra Large Distributed Core design has the following:

- 640 Gigabits of fabric interlink (fabric links) maximum capacity to the Spine (16 x 40 Gb)
- 48 ports for server connectivity and WAN connectivity (10 Gb)

Type 2: Large Distributed Core Fabric

Use the Type 2: Large Distributed Core fabric design when:

- You require a 10 Gb fabric interlink (fabric links) bandwidth between the spines and leaves.
- The current and planned uplinks and downlinks on the leaves for the fabric is less than or equal to 2048 ports.
- The leaves act as a switch or ToR-leaf switch. Within the ToR, the downlink protocol can be either **VLAN** or **VLAN and LAG**.

With a Type 2: Large Distributed Core fabric design, the S4810 spines connect to the S4810 leaves at a fixed rate of 10 Gb. The maximum number of spines is 32 and the maximum number of leaves is 64, as shown in the following figure.

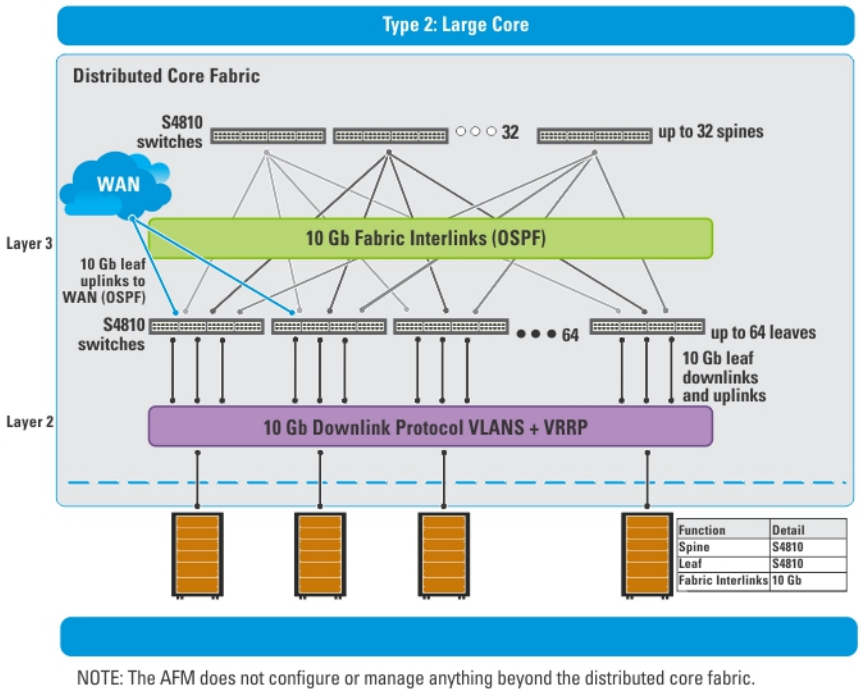


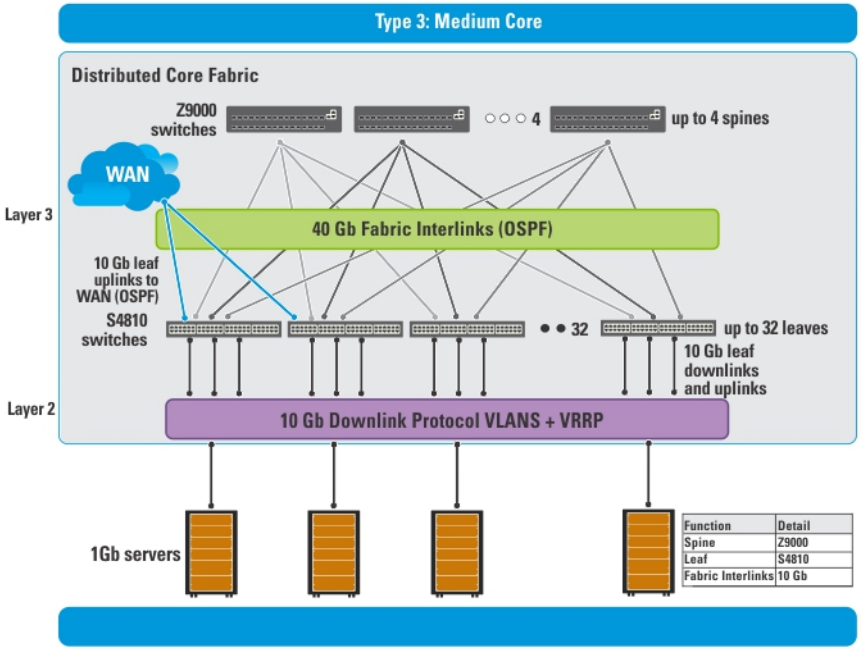
Figure 4. Type 2: Large Distributed Core Fabric Design

Each S4810 leaf for the Type 2: Large Distributed Core fabric design has the following:

- 40 Gb of fabric interlink (fabric links) maximum capacity to the spine (4x 10 Gb)
- 32 ports are used for fabric links (10 Gb) and 32 ports are used for the downlinks (10 Gb)

Type 3: Medium Distributed Core Fabric

With a Type 3: Medium Distributed Core design, the Z9000 spines (S6000 spines) connect to the S4810 leaves at a fixed 40 Gb line rate as shown in the following figure. The maximum number of leaves is based on the maximum number of ports on the spine (for example, 32 ports for the Z9000). The maximum number of spines is 16 and the maximum number of leaves is 32, as shown in the following illustration. This illustration shows a networking system architecture in a data center as a distributed core fabric containing a set of ToRs that connect to servers, storage devices, and network appliances (such as load balancers or network security appliances). You can run application services, network services, and network security services either on physical machines or virtual machines.



NOTE: The AFM does not configure or manage anything beyond the distributed core fabric.

Figure 5. Type 3: Medium Distributed Core Fabric Design

Use the Type 3: Medium Distributed Core design if:

- You require a 40 Gb fabric interlink (fabric links) bandwidth between the spines and leaves.
- The current and planned uplinks and downlinks on the leaves for your distributed core fabric are less than or equal to 1536 ports.
- The leaves act as a switch or ToR-leaf switch. Within the ToR, the protocol can be either **VLAN** or **VLAN and LAG**.

Each Z9000 spine (S6000 spine) for the Type 3: Medium Distributed Core design has the following:

- 640 Gigabit of interlink (fabric links) maximum capacity to the spine (16 x 40 Gig)
- 640 Ethernet ports for WAN connectivity (10 Gig)

Each S4810 leaf for the Type 3: Medium Distributed Core design has the following:

- 160 Gb of interlink (fabric links) maximum capacity to the spine (4x 40 Gig)
- 48 Ethernet ports for WAN connectivity (10 Gb)

Type 4: Small Distributed Core Fabric

Use the Type 4: Small Distributed Core design when:

- You require a fabric interlink (fabric links) bandwidth between the spines and leaves of 10 Gb.
- The current and planned uplinks and downlinks on the leaves for your core are less than or equal to 960 ports.
- The maximum port count for a Type 4: Small Distributed Core fabric with an OS ratio of 3:1 is 768. For an OS ratio of 5:1, the maximum port count is 896.
- The leaves act as a switch or ToR-leaf switch. Within the ToR, the downlink protocol can be either **VLAN** or **VLAN and LAG**.

With a Type 4: Small Distributed Core fabric design, the S4810 spines connect to the S4810 leaves at a fixed 10 Gb. The maximum number of spines is 4 and the maximum number of leaves is 16, as shown in the following figure.

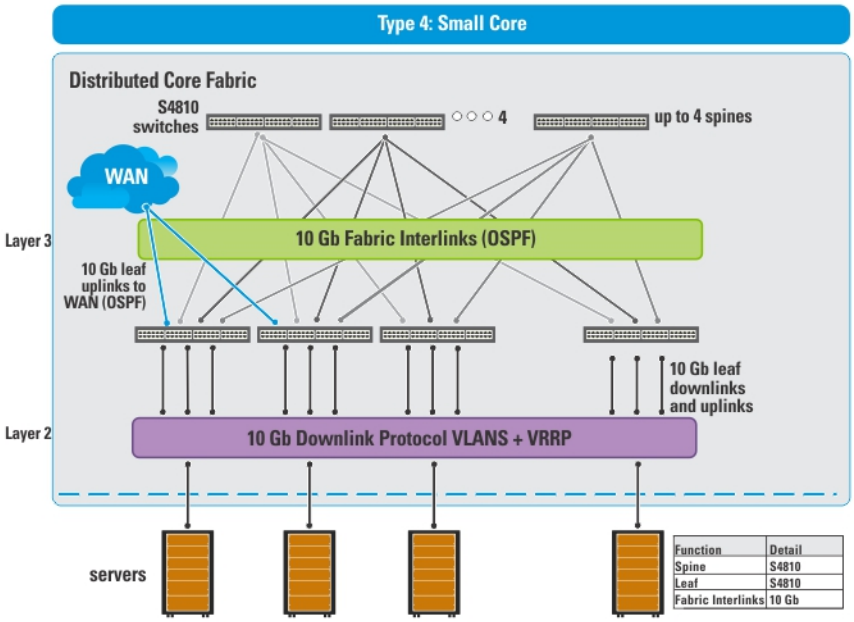


Figure 6. Type 4: Small Distributed Core Fabric Design

Each S4810 leaf for the Type 4: Small Distributed Core design has the following:

- 16 ports of fabric interlink (fabric links) port capacity to the spine (10 Gb)
- 48 Ethernet downlinks (10 Gb)
- 60 Ethernet ports for servers per node and WAN connectivity (10 Gb)

VLT

Virtual link trunking (VLT):

- Allows a single device to use a LAG across two upstream devices
- Eliminates ports blocked due to Spanning Tree Protocol (STP)
- Provides a loop-free topology
- Uses all available uplink bandwidth
- Provides fast convergence if either the link or a device fails
- Optimized forwarding with Virtual Router Redundancy Protocol (VRRP)
- Provides link-level resiliency
- Assures high availability

VLT allows physical links between two chassis to appear as a single virtual link to the network core or other switches such as Edge, Access or Top of Rack (ToR). VLT provides Layer 2 multipathing, creates redundancy through increased bandwidth, and enables multiple parallel paths between nodes and load-balancing traffic where alternative paths exist. VLT reduces the role of STP:

- by allowing LAG terminations on two separate distribution or core switches
- by supporting a loop-free topology, similar to how STP prevents any initial loops that may occur prior to VLT being established

NOTE: After VLT is established, RSTP may be used to prevent loops from forming with new links that are incorrectly connected and outside the VLT domain.

For information about VLT, refer to the *Dell Networking Configuration Guide* for the S4810, S6000, or the Z9000, or refer to Selecting a Layer 2 and Layer 3 with Resiliency (Routed VLT) Fabric Design.

NOTE:
Dell Networking recommends that you do not enable stacking and VLT simultaneously.

If both are enabled at the same time, unexpected behavior occurs.

Multidomain VLT

A multidomain VLT (mVLT) configuration connects two different VLT domains in a standard Link Aggregation Control protocol (LACP) LAG to form a loop-free Layer 2 topology in the aggregation layer. This configuration supports up to four units, increasing the number of available ports and enabling dual redundancy for VLT. For more information about mVLT deployments, refer to Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design.

VLT Terminology

- **Virtual link trunk (VLT)** — The combined port channel between an attached device and the VLT peer switches.
- **VLT backup link** — The backup link that monitors the health of VLT peer switches. The backup link sends configurable periodic messages (also known as keep-alive messages) between VLT peer switches.
- **VLT interconnect** (**VLTi**) — The link used to synchronize states between the VLT peer switches. Both ends of the link must use 10 Gb or 40 Gb interfaces.
- **VLT domain** — Includes both VLT peer devices, the VLT interconnect, and all port channels connected to the attached VLT devices. It is also associated with the configuration mode used to assign VLT global parameters.
- **VLT peer device** — One of a pair of devices that are connected with to the port channel specified as the VLTi.

VLT Fabric Terminology

The following terms are unique to the design and deployment of a Layer 2 VLT fabric.

- **Core** — A switch that connects to aggregation switches. The role of the core is to provide an interconnect to all the aggregation switches. All ports on the core switch connect to the aggregation switches and racks.
- **Access** — A switch that connects switch, servers, storage devices, or top-of-rack (TOR) elements. The role of the access switch is to provide connectivity to the fabric. The access switch connects to all of aggregation switches above it in the fabric.
- **Aggregation** — A switch that connects to access switches. The role of the aggregation layer is to provide an interconnect to all the access switches. All the ports on the aggregation switches are used to connect the access, various racks together. The aggregation switch provides redundancy.
- **Edge ports** — The uplinks on the aggregation and downlinks on the access.

- **Uplinks** — An edge port link on the first two aggregation switches in the VLT fabric that connects to outside the fabric.
- **Downlinks** — An edge port link that connects the access switches to the access layer. For example, servers or ToR elements.
- **Fabric Interlinks (**Fabric Links**)** — The fabric interlink bandwidth is fixed: 10 Gb or 40 Gb.
  - For a one-tier fabric, fabric interlinks connect a pair of aggregation switches.
  - For a two-tier fabric, fabric interlinks connect the aggregation switches to the access switches.
  - For a three-tier fabric, fabric interlinks connect the core, aggregation, and access switches together.

VLT Components

VLT peer switches have independent management planes. A VLT interconnect (VLTi) between the VLT chassis maintains synchronization of Layer 2 and Layer 3 control planes across the two VLT peer switches. The VLTi uses either 10 Gb or 40 Gb ports on the switch.

A separate backup link maintains heartbeat messages across an out-of-band (OOB) management network. The backup link ensures that node failure conditions are correctly detected and are not incorrectly identified as VLTi failures by the software. VLT ensures that local traffic on a chassis does not traverse the VLTi and takes the shortest path to the destination using direct links.

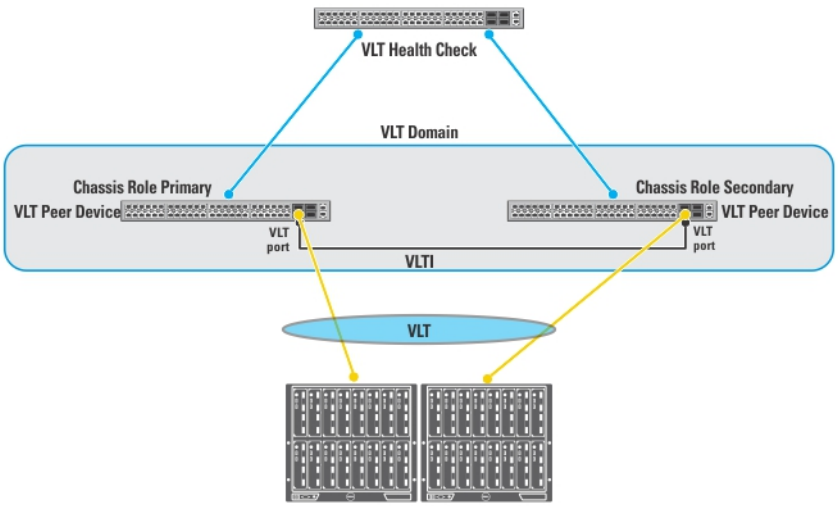


Figure 7. VLT Components

Typical VLT Topology

The VLT domain uses VLTi links between VLT peers and VLT port-channels to connect to a single access switch, a switch stack, a server supporting LACP on its NIC, or another VLT domain. The backup-link connects through the OOB management network. Some hosts can connect through the non-VLT ports.

Key Considerations for Designing a Layer 2 VLT Fabric

Use the Layer 2 VLT fabric for workload migration over virtualized environments. When designing the Layer 2 VLT fabric, consider the following:

- You can deploy up to 10 fabrics. However, the fabrics do not communicate with each other.
- For a VLT fabric, AFM manages Dell Networking S4810, S4820T, S55, S60, S5000, S6000, Z9000, IOA blade and MXL blade switches.

CAUTION: If you are already using a deployed switch, you must reset the factory settings. The switch must be in BMP mode.

For more information on BMP, see DHCP Integration and the *Configuration Guide* for the Dell Networking S4810, S4820T, S55, S60, S6000, Z9000, IOA blade and MXL blade switches.

The number and type of switches in a VLT fabric are based on the following:

- The number of current uplinks (minimum of 2) and downlinks for the access switches.
- The number of planned edge ports (future uplinks and downlinks) for the access switches.
- Whether the access switch needs to act as a switch or ToR.
- Fabric interlink bandwidth (the links between the aggregation and access switches).
- Downlinks which can be 1Gb, 10Gb, or 40 Gb.
- The fabric interlink bandwidth, 10 Gb or 40 Gb, is fixed and based on the fabric type.

NOTE: If you do not specify additional ports in the fabric design for future expansion in the **Bandwidth and Port Count** screen, you can only expand the downlinks on the existing fabric.

For information on how to expand a fabric, refer to Editing and Expanding an Existing Fabric Design.

Gathering Useful Information for a Layer 2 VLT Fabric

Gather useful information for a Layer 2 VLT fabric before you begin:

- The CSV file Dell provides that contains the system MAC addresses, Service Tag and serial numbers for each switch or manually enter this information.
- The location of the switches, including the rack and row number, from your network administrator or network operator.
- The remote Trivial File Transfer Protocol (TFTP) / File Transfer Protocol (FTP) address from your network administrator or network operator. To specify a TFTP/FTP site, go to **Administration** > **Settings >TFTP/FTP** screen. For information about which software packages to use, refer to the Release Notes.
- The software image for each type of switch in the fabric. Each switch type within the fabric must use the same version of the software. Place the software images on the TFTP/FTP site so that the switches can install the appropriate Dell Networking OS software image and configuration file.
- The Dynamic Host Configuration Protocol (DHCP) server address to use for the fabric from your DHCP network administrator or network operator. If a remote DHCP server is not available, AFM also provides local DHCP. The DHCP server must be in the same subnet as the switches. After you power cycle the switches, the switches communicate with the DHCP server to obtain a management IP Address based on the system MAC Address. The DHCP server contains information about where to

load the correct software image configuration file for each type of switch from the TFTP/FTP site during BMP. For information about BMP, refer to DHCP Integration.

- The pool of IP addresses for the management port for each switch in the fabric.
- The IP addresses (must be an even number) for the uplink configuration from the ISP service. The uplink port number range is based whether a 10 Gb or 40 Gb bandwidth is selected.
  - For a 10 Gb bandwidth, AFM supports 2–32 uplinks.
  - For a 40 Gb bandwidth, AFM supports 2–8 uplinks.
- The IP addresses or VLAN ID for the downlink configuration to connect to the server or ToR.
- The protocol configuration for uplinks and downlinks.

Selecting a Layer 2 and Layer 3 with Resiliency (Routed VLT) Fabric Design

For workload migration over virtualized environments, use a Layer 2 VLT fabric design. To extend equal cost multipathing capabilities, use the Layer 3 with Resiliency (Routed VLT) fabric .

AFM supports the following Layer 2 VLT and Layer with 3 with Resiliency (Routed VLT) fabric designs:

- 1 and 2 Tier 10 Gb for Layer 2 LAN/SAN for iSCSI
- 1 and 2 Tier for 10 Gb Layer 2 LAN/SAN for Fibre Channel
- 1 Tier for 10 Gb and 40 Gb ToR for Layer 2 and Layer 3 Resiliency (Routed VLT)
- 2 Tier and 3 Tier Topologies for 1 Gb ToR VLT Deployment for Layer 2 and Layer 3 with Resiliency (Routed VLT)
- 10 Gb or 40 Gb Top of Rack Deployment (mVLT)
- 2 and 3 Tier 10 Gb ToR (mVLT) Deployment Topologies for Layer 2 or Layer 3 with Resiliency
- 10 Gb Blade Switch (MXL) for Layer 2 and Layer 3 with Resiliency (Routed VLT)

  For information about tiers, refer to Deployment Topology and Deployment Topology Use Cases.

For more information about VLT, refer to the following sections:

- Overview of VLT
- Key Core Design Considerations
- Getting Started

One and Two-Tier ToR 10 Gb for Layer 2 LAN/SAN for iSCSI Topologies

Table 2. One-Tier ToR Layer LAN/SAN for iSCSI Topologies

						Possible Topologies	
DL BW	**UL BW**	**UL Port Range**	**iSCSI Port Range**	**DL Port Range**	**AVC**	**Aggregation**	**Access**
10G	10G	2–32	2–8	1–108	2 * 40G	S4810	NA
10G	40G	2–4	2–8	1–102	2 * 40G	S4810	NA

DL = Downlink

DL BW = Down Link Bandwidth

UL BW = Uplink Bandwidth

UL

AVC = Aggregation VLTi Capacity

Table 3. Two-Tier ToR Layer 2 LAN/SAN for iSCSI Topologies

						Possible Topologies	
Uplink Port Range	**iSCSI Port Range**	**Downlink Port Range**	**Aggregation VLTi Capacity**	**Access VLTi Capacity**	**FL BW AA**	**Aggregation**	**Access**
2–32	2–8	71–3410	2 * 40G	NA	20G	S4810	S4810
2–4	2–8	101–3224	2 * 40G	NA	20G	S4810	S4810
2–32	2–8	71–2916	2 * 40G	2 * 40G	20G	S4810	S4810
2–4	2–8	101–2808	2 * 40G	2 * 40G	20G	S4810	S4810
2–32	2–8	71–2970	2 * 40G	2 * 40G	20G	S4810	S4810
2–4	2–8	101–2808	2 * 40G	2 * 40G	20G	S4810	S4810

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

Table 4. Two-Tier MXL for Layer 2 LAN/SAN for iSCSI Topologies

						Possible Topologies	
Uplink Port Range	**Uplink Bandwidth**	**Deployment Type**	**iSCSI Port Range**	**MXL Blade Pairs Range**	**FL BW AA**	**Aggregation**	**Access**
2–32	10G	Basic	2–8	2–27	20G	S4810	MXL
2–4	40G	Basic	2–8	2 - 26	20G	S4810	MXL
2–32	10G	Stacking	2 –8	2–27	40G	S4810	MXL
2 –4	40G	Stacking	2–8	2–26	40G	S4810	MXL
2–32	10G	MXL - intraChassis resiliency	2– 8	2–27	20G	S4810	MXL
2–4	40G	MXL - intraChassis resiliency	2–8	2–26	20G	S4810	MXL

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

One and Two-Tier ToR 10 Gb for Layer 2 LAN/SAN for Fibre Channel Topologies

Table 5. One-Tier LAN/SAN Layer 2 for Fibre Channel — 10 Gb Downlinks

Downlink Bandwidth	Uplink Bandwidth	Downlink Port Range	Aggregation VLTi Capacity	Possible Aggregation Topologies
10 Gb	10 Gb	1–86	2 * 40G	S5000
10 Gb	40 Gb	1–80	2 * 40G	S5000

Table 6. Two-Tier LAN/SAN Layer 2 for Fibre Channel — 10 Gb Downlinks

DL BW	UL BW	Deployment Type	Downlink Port Range	AVC	Access VLTi Capacity	FL BW AA	Possible Aggregation Topologies	
							Aggregation	Access
10 Gb	10G	Basic	87–2268	2 * 40G	NA	20G	S4810	S5000
10 Gb	40G	Basic	81–2184	2 * 40G	NA	20G	S4810	S5000
10 Gb	10G	Resiliency	87–2750	2 * 40G	2 * 40G	20G	S4810	S5000
10 Gb	40G	Resiliency	81–2600	2 * 40G	2 * 40G	20G	S4810	S5000

DL BW = Downlink Bandwidth

UL BW = Uplink Bandwidth

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

One-Tier for 10 Gb and 40 Gb ToR for Layer 2 and Layer 3 Resiliency (Routed VLT)

Table 7. One-Tier for 10 Gb and 40 Gb ToR for Layer 2 and Layer 3 Resiliency (Routed VLT)

DL BW	UL BW	Downlink Port Range	Aggregation VLTi Capacity	Possible Aggregation Topologies
10 Gb	10 Gb	1–110	2 * 40 Gb	S4810 or S4820T
10 Gb	40 Gb	1–104	2 * 40 Gb	S4810 or S4820T
40 Gb	10 Gb	1–59	2 * 40 Gb	Z9000 or S6000
40 Gb	40 Gb	1–58	2 * 40 Gb	Z9000 or S6000

DL = Downlink

DL BW = Downlink Bandwidth

UL BW = Uplink Bandwidth

Two-Tier and Three-Tier Topologies for 1 Gb ToR VLT Deployment for Layer 2 and Layer 3 with Resiliency (Routed VLT)

In a 1 Gb ToR VLT Deployment fabric design, the S4810 aggregation switches connect to access switches at 10 Gb. The maximum number of VLT aggregations is two switches and the maximum number of VLT

access switches is based on the number of uplinks and downlinks in the fabric. With this topology, the downlinks connect to access S55 or S60 switches using a 1 Gb bandwidth.

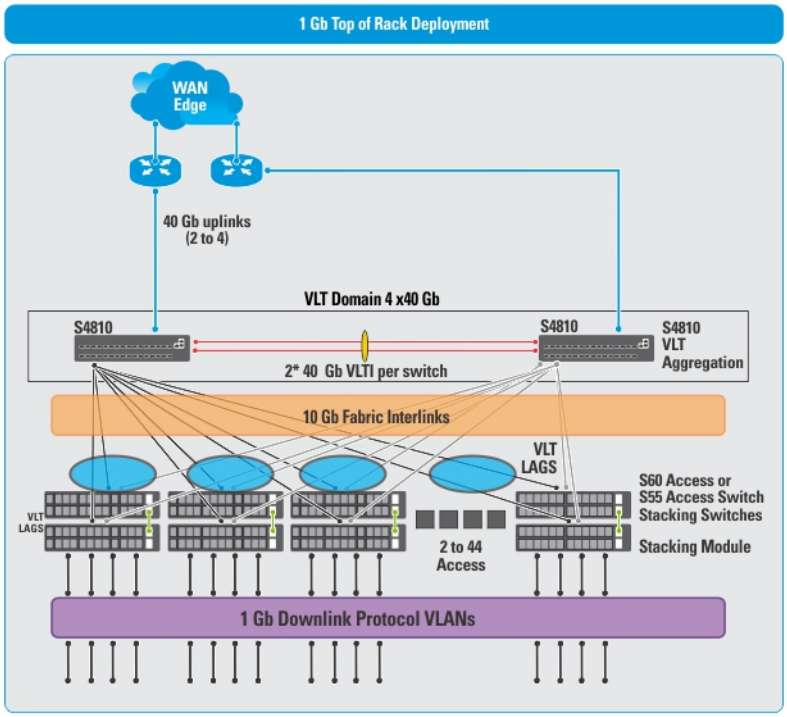


Figure 8. 1 Gb ToR VLT Deployment

NOTE: All the VLT aggregation switches must be same mode type for aggregation (for example, S4810). On the VLT access, configure the same model type.

AVG = Aggregation VLTi Capacity

DL = Downlink

DL BW = Down Link Bandwidth

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

UL BW = Uplink Bandwidth

BW = Bandwidth

Use the following table as guideline for selecting the appropriate two-tier Layer 2 VLT or Layer 3 with Resiliency (Routed VLT) fabric design for a 1 Gb ToR VLT deployment.

NOTE: With a Layer 2 VLT fabric, the uplinks come from the first two switches on the aggregation side. For information about tiers, refer to Deployment Topology.

Table 8. Two-Tier (1 Gb Downlinks)

DL BW	UL BW	Type	DL Port Range	AVG	Access VLTi Capacity	FL BW A & A	Possible Topologies	
							Aggregation	Access
1 Gb	10 Gb	Stacking	1–2640	2 * 40 Gb	NA	40 Gb	S4810	S60 (12G or 24G)
1 Gb	10 Gb	Stacking	1–2640	2 * 40 Gb	NA	40 Gb	S4810	S55 (12G)
1 Gb	40 Gb	Stacking	1–2496	2 * 40 Gb	NA	40 Gb	S4810	S60 (12G or 24G)
1 Gb	40 Gb	Stacking	1–2496	2 * 40 Gb	NA	40 Gb	S4810	S55 (12G)
1 Gb	10 Gb	Basic	1–2640	2 * 40 Gb	NA	20 Gb	S4810	S60
1 Gb	10 Gb	Basic	1–2640	2 * 40 Gb	NA	20 Gb	S4810	S55
1 Gb	40 Gb	Basic	1–2496	2 * 40 Gb	NA	20 Gb	S4810	S60
1 Gb	40 Gb	Basic	1–2496	2 * 40 Gb	NA	20 Gb	S4810	S55

Use the following table as a guideline for selecting the appropriate three-tier Layer 2 VLT or Layer 3 with Additional Resiliency (Routed VLT) fabric design for a 1 Gb ToR VLT deployment.

AVG = Aggregation VLTi Capacity

AVC = Access VLTi Capacity

CVG = Core VLTi Capacity

DL = Downlink

DL BW = Downlink Bandwidth

FL BW C A = Fabric Link Bandwidth between Core & Aggregation

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

FL BW = Fabric Link Bandwidth

UL BW = Uplink Bandwidth

BW = Bandwidth

Table 9. Three-Tier ToR (1 Gb Downlinks) for Layer 2 and Layer 3 with Resiliency (Routed VLT)

DL BW	UL BW	Type	DL Port Range	CVG	AVG	AVC	FL BW CA	FL BW AA	Possible Topologies		
									Core	Aggregation	Access
1 Gb	10 Gb	Stacking	2641–32256	2 * 40 Gb	2 * 40 Gb	NA	80G	40 Gb	Z9000 or S6000	S4810	S55 (12G)
1 Gb	10 Gb	Stacking	2641–32256	2 * 40 Gb	2 * 40 Gb	NA	80G	40 Gb	Z9000 or S6000	S4810	S60 (12G or 24G)
1 Gb	40 Gb	Stacking	2497 – 32256	2 * 40 Gb	2 * 40 Gb	NA	80G	40 Gb	Z9000 or S6000	S4810	S55 (12G)
1 Gb	40 Gb	Stacking	2497 – 32256	2 * 40 Gb	2 * 40 Gb	NA	80G	40 Gb	Z9000 or S6000	S4810	S60 (12G or 24G)
1 Gb	10 Gb	Basic	2641–32256	2 * 40 Gb	2 * 40 Gb	NA	80G	20 Gb	Z9000 or S6000	S4810	S60
1 Gb	10 Gb	Basic	2641–32256	2 * 40 Gb	2 * 40 Gb	NA	80G	20 Gb	Z9000 or S6000	S4810	S55
1 Gb	40 Gb	Basic	2497 – 32256	2 * 40 Gb	2 * 40 Gb	NA	80G	20 Gb	Z9000 or S6000	S4810	S60
1 Gb	40 Gb	Basic	2497 – 32256	2 * 40 Gb	2 * 40 Gb	NA	80G	20 Gb	Z9000 or S6000	S4810	S55

10 Gb or 40 Gb ToR (mVLT)

Use the 10 Gb or 40 Gb ToR Deployment (mVLT) fabric when you require 10 Gb or 40 Gb downlinks for a ToR. For information about mVLT, refer to Multi-domain VLT. Refer to the MXL Topologies for MXL Blade Deployment.

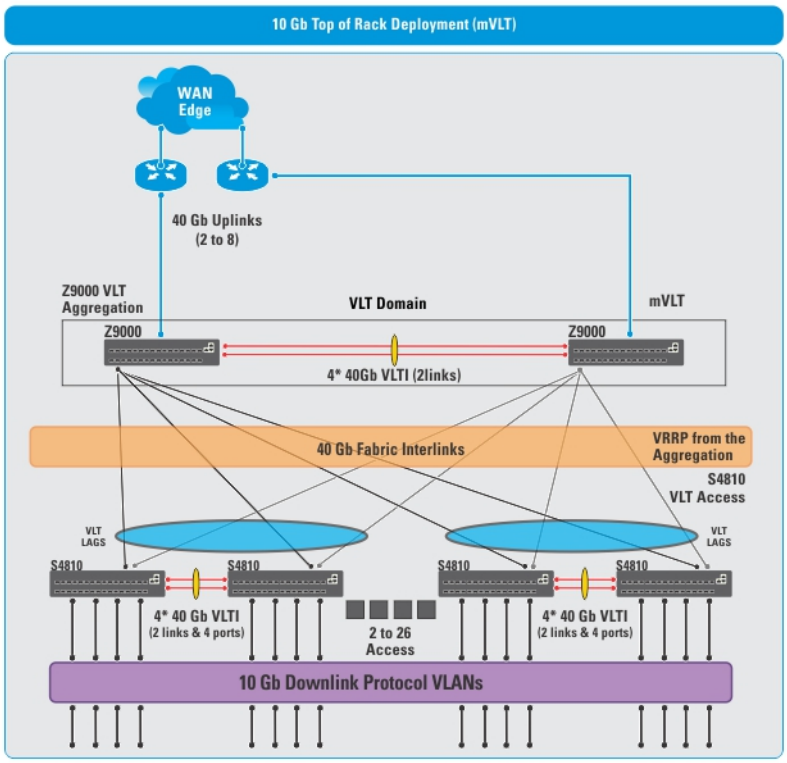


Figure 9. 10 Gb or 40 Gb ToR VLT Deployment (mVLT)

NOTE:
All the VLT aggregation switches must be same model for aggregation (for example, all Z9000 switches). On the VLT access, configure the same switch types or a combination of S4810 and S4820T switches.

Two and Three-Tier 10 Gb ToR (mVLT) Deployment Topologies for Layer 2 or Layer 3 with Resiliency

AVC = Aggregation VLTi Capacity

DL = Downlink

DL BW = Down Link Bandwidth

FL BWB A & A = Fabric Link Bandwidth between Aggregation & Access

UL BW = Uplink Bandwidth

Use the following tables as a guideline for selecting the appropriate two tier Layer 2 VLT or Layer 3 with Resiliency (Routed VLT) fabric design.

NOTE: With a Layer 2 VLT fabric, the uplinks come from the first two switches on the aggregation side. For information about tiers, refer to Deployment Topology.

Table 10. Two-Tier ToR (mVLT) — 10 G Downlinks

DL BW	UL BW	Type	DL Port Range	AVC	Access VLTi Capacity	FL BWB A & A	Possible Topologies		
							Core	Aggregation	Access
10 Gb	10 Gb	Mixed node Stacking	111–2970	2 * 40 Gb	NA	40 Gb	NA	S4810	S4810 or S4820T
10 Gb	10 Gb	Mixed node Stacking	111–1392	2 * 40 Gb	NA	160 Gb	NA	Z9000 or S6000	S4810 or S4820T
10 Gb	10 Gb	Stacking	111–2970	2 * 40 Gb	NA	40 Gb	NA	S4810	S4810
10 Gb	10 Gb	Stacking	111–1392	2 * 40 Gb	NA	160 Gb	NA	Z9000 or S6000	S4810
10 Gb	10 Gb	Basic	111–3410	2 * 40 Gb	NA	20 Gb	NA	S4810	S4810
10 Gb	10 Gb	Basic	111–1624	2 * 40 Gb	NA	80 Gb	NA	Z9000 or S6000	S4810
10 Gb	10 Gb	Mixed node Basic	111–3410	2 * 40 Gb	NA	20 Gb	NA	S4810	S4810 or S4820T
10 Gb	10 Gb	Mixed node Basic	111–1624	2 * 40 Gb	NA	80 Gb	NA	Z9000 or S6000	S4810 or S4820T
10 Gb	10 Gb	Resiliency	111–2916	2 * 40 Gb	2 * 40 Gb	20 Gb	NA	S4810	S4810
10 Gb	10 Gb	Resiliency	111–1344	2 * 40 Gb	2 * 40 Gb	80 Gb	NA	Z9000 or S6000	S4810
10 Gb	10 Gb	Mixed node Resiliency	111–2916	2 * 40 Gb	2 * 40 Gb	20 Gb	NA	S4810	S4810 or S4820T
10 Gb	10 Gb	Mixed node Resiliency	111–1344	2 * 40 Gb	2 * 40 Gb	80 Gb	NA	Z9000 or S6000	S4810 or S4820T
10 Gb	40 Gb	Mixed node Stacking	105–2808	2 * 40 Gb	NA	40 Gb	NA	S4810	S4810 or S4820T
10 Gb	40 Gb	Mixed node Stacking	105–1392	2 * 40 Gb	NA	160 Gb	NA	Z9000 or S6000	S4810 or S4820T
10 Gb	40 Gb	Stacking	105–2808	2 * 40 Gb	NA	40 Gb	NA	S4810	S4810
10 Gb	40 Gb	Stacking	105–1392	2 * 40 Gb	NA	160 Gb	NA	Z9000 or S6000	S4810
10 Gb	40 Gb	Basic	105–3224	2 * 40 Gb	NA	20 Gb	NA	S4810	S4810
10 Gb	40 Gb	Basic	105–1624	2 * 40 Gb	NA	80G	NA	Z9000 or S6000	S4810

DL BW	UL BW	Type	DL Port Range	AVC	Access VLTi Capacity	FL BWB A & A	Possible Topologies		
							Core	Aggregation	Access
10 Gb	40 Gb	Mixed node Basic	105–3224	2 * 40 Gb	NA	20 Gb	NA	S4810	S4810 or S4820T
10 Gb	40 Gb	Mixed node Basic	105–1624	2 * 40 Gb	NA	80G	NA	Z9000 or S6000	S4810 or S4820T
10 Gb	40 Gb	Resiliency	105–2808	2 * 40 Gb	2 * 40 Gb	20 Gb	NA	S4810	S4810
10 Gb	40 Gb	Resiliency	105–1344	2 * 40 Gb	2 * 40 Gb	80G	NA	Z9000 or S6000	S4810
10 Gb	40 Gb	Mixed node Resiliency	105–2808	2 * 40 Gb	2 * 40 Gb	20 Gb	NA	S4810	S4810 or S4820T
10 Gb	40 Gb	Mixed node Resiliency	105–1344	2 * 40 Gb	2 * 40 Gb	80G	NA	Z9000 or S6000	S4810 or S4820T

AVC = Aggregation VLTi Capacity

BW = Bandwidth

DL = Downlink

DL BW = Downlink Bandwidth

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

UL BW = Uplink Bandwidth

Use the following tables as a guideline for selecting the appropriate two-tier Layer 2 VLT or Layer 3 with Resiliency (Routed VLT) fabric design for a 40 Gb ToR (mVLT deployment).

NOTE: With a Layer 2 VLT fabric, the uplinks come from the switches on the aggregation side. For information about tiers, refer to Deployment Topology.

Table 11. Two-Tier ToR (mVLT) — 40 G Downlinks for Layer 2 or Layer 3 with Resiliency (Routed VLT)

DL BW	UL BW	Type	DL Port Range	AVC	Access VLTi Capacity	FL BW AA	Possible Topologies	
							Aggregation	Access
40 Gb	10 Gb	Basic	60–870	2 * 40 Gb	NA	80 Gb	Z9000	Z9000
40 Gb	10 Gb	Basic	60–870	2 * 40 Gb	NA	80 Gb	S6000	S6000
40 Gb	10 Gb	Resiliency	60–784	2 *40 Gb	2 * 40 Gb	80 Gb	Z9000	Z9000
40 Gb	10 Gb	Resiliency	60–784	2 * 40 Gb	2 * 40 Gb	80 Gb	S6000	S6000
40 Gb	40 Gb	Basic	59–870	2 * 40 Gb	NA	80 Gb	Z9000	Z9000
40 Gb	40 Gb	Basic	59–870	2 * 40 Gb	NA	80 Gb	S6000	S6000
40 Gb	40 Gb	Resiliency	59–784	2 *40 Gb	2 * 40 Gb	80 Gb	Z9000	Z9000

DL BW	UL BW	Type	DL Port Range	AVC	Access VLTi Capacity	FL BW AA	Possible Topologies	
							Aggregation	Access
40 Gb	40 Gb	Resiliency	59–784	2 *40 Gb	2 * 40 Gb	80 Gb	S6000	S6000

Three-Tier Topologies for a 10 Gb or 40 Gb ToR (mVLT) Deployment Layer 2 or Layer 3 with Resiliency (Routed VLT)

Use the following tables as a guideline for selecting the appropriate three-tier Layer 2 VLT or Layer 3 with Resiliency (Routed VLT) fabric design for a 40 Gb Tor (mVLT) Deployment.

NOTE: With a Layer 2 VLT fabric, the uplinks come from the switches on the aggregation side. For information about tiers, refer to Deployment Topology.

AVC = Aggregation VLTi Capacity

CVC = Core VLTi Capacity

BW = Bandwidth

DL = Downlink

DL BW = Downlink Bandwidth

FL BW CA = Fabric Link Bandwidth between Core & Aggregation

FL BW AA = Fabric Link Bandwidth between Aggregation & Access

UL BW = Uplink Bandwidth

Table 12. 3 Tier ToR (mVLT) — 10 Gb Downlinks

DL BW	UL BW	Type	DL Port Range	CVC	AVC	AVC	FL BW CA	FL BW AA	Possible Topologies		
									Core	Aggregation	Access
10 Gb	10 Gb	Stacking	2971–36288	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	40 Gb	Z9000 or S6000	S4810	S4810
10 Gb	10 Gb	Stacking	2971–36288	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	40 Gb	Z9000 or S6000	S4810	S4820
10 Gb	10 Gb	Stacking	2971–18816	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	160 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	10 Gb	Stacking	2971–18816	2 *40 Gb	2 *40 Gb	NA	80 Gb	160 Gb	Z9000 or S6000	Z9000 or S6000	S4820
10 Gb	10 Gb	Basic	3411–41664	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	20 Gb	Z9000 or S6000	S4810	S4810

DL BW	UL BW	Type	DL Port Range	CVC	AVC	AVC	FL BW CA	FL BW AA	Possible Topologies		
									Core	Aggregation	Access
10 Gb	10 Gb	Basic	3411–41664	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	20 Gb	Z9000 or S6000	S4810	S4820
10 Gb	10 Gb	Basic	1625–21952	2 *40 Gb	2 *40 Gb	NA	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	10 Gb	Basic	1625–21952	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4820
10 Gb	10 Gb	Resiliency	2917–36288	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	20 Gb	Z9000 or S6000	S4810	S4810
10 Gb	10 Gb	Resiliency	2917–36288	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	20 Gb	Z9000 or S6000	S4810	S4820
10 Gb	10 Gb	Resiliency	1355–18816	2 *40 Gb	2 *40 Gb	2 * 40 Gb	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	10 Gb	Resiliency	1355–18816	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4820
10 Gb	40 Gb	Stacking	2809–36288	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	40 Gb	Z9000 or S6000	S4810	S4810
10 Gb	40 Gb	Stacking	2809–36288	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	40 Gb	Z9000 or S6000	S4810	S4820
10 Gb	40 Gb	Stacking	1393–18816	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	160 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	40 Gb	Stacking	1393–18816	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	160 Gb	Z9000 or S6000	Z9000 or S6000	S4820
10 Gb	40 Gb	Basic	3225–41664	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	20 Gb	Z9000 or S6000	S4810	S4810
10 Gb	40 Gb	Basic	3225–41664	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	20 Gb	Z9000 or S6000	S4810	S4820

DL BW	UL BW	Type	DL Port Range	CVC	AVC	AVC	FL BW CA	FL BW AA	Possible Topologies		
									Core	Aggregation	Access
10 Gb	40 Gb	Basic	1225–21952	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	40 Gb	Basic	1225–21952	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4820
10 Gb	40 Gb	Resiliency	2809–36288	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	20 Gb	Z9000 or S6000	S4810	S4810
10 Gb	40 Gb	Resiliency	2809–36288	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	20 Gb	Z9000 or S6000	S4810	S4820
10 Gb	40 Gb	Resiliency	1345–18816	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4810
10 Gb	40 Gb	Resiliency	1345–18816	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	80 Gb	Z9000 or S6000	Z9000 or S6000	S4820

AVC = Aggregation VLTi Capacity

CVC = Core VLTi Capacity

BW = Bandwidth

DL = Downlink

DL BW = Downlink Bandwidth

FL BWB C & A = Fabric Link Bandwidth between Core and Aggregation Switches

FL BWB A & A = Fabric Link Bandwidth between Aggregation and Access Switches

UL BW = Uplink Bandwidth

Table 13. Three-Tier ToR (mVLT) — 40 Gb Downlinks

DL BW	UL BW	Type	DL Port Range	CVC	AVC	Access VLTi Capacity	FL BWBC & A	FL BWBA & A	Possible Topologies		
									Core	Aggregation	Access
40 Gb	10 Gb	Basic	871–11760	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	Z9000	Z9000	Z9000
40 Gb	10 Gb	Basic	871–11760	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	S6000	S6000	S6000
40 Gb	10 Gb	Resiliency	785–10976	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	80 Gb	Z9000	Z9000	Z9000
40 Gb	10 Gb	Resiliency	785–10976	2 * 40 Gb	2 * 40 Gb	2 * 40 Gb	80 Gb	80 Gb	S6000	S6000	S6000
40 Gb	40 Gb	Basic	871–11760	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	Z9000	Z9000	Z9000
40 Gb	40 Gb	Basic	871–11760	2 * 40 Gb	2 * 40 Gb	NA	80 Gb	80 Gb	S6000	S6000	S6000

Two and Three-Tier MXL Blade Topologies for Layer 2 and Layer 3 with Resiliency (Routed VLT)

Create a fabric using MXL blades by selecting the **MXL blade** option and **10 Gb** downlinks. For information about MXL fabric deployments, refer to MXL Topologies for MXL Blade Deployment.

NOTE: All VLT aggregation switches must be same type (for example, all S4810 switches). On the VLT access, all the switches must be MXL blades. Refer to the previous tables in this section for more information.

10 Gb blade switch (MXL) VLT Deployment

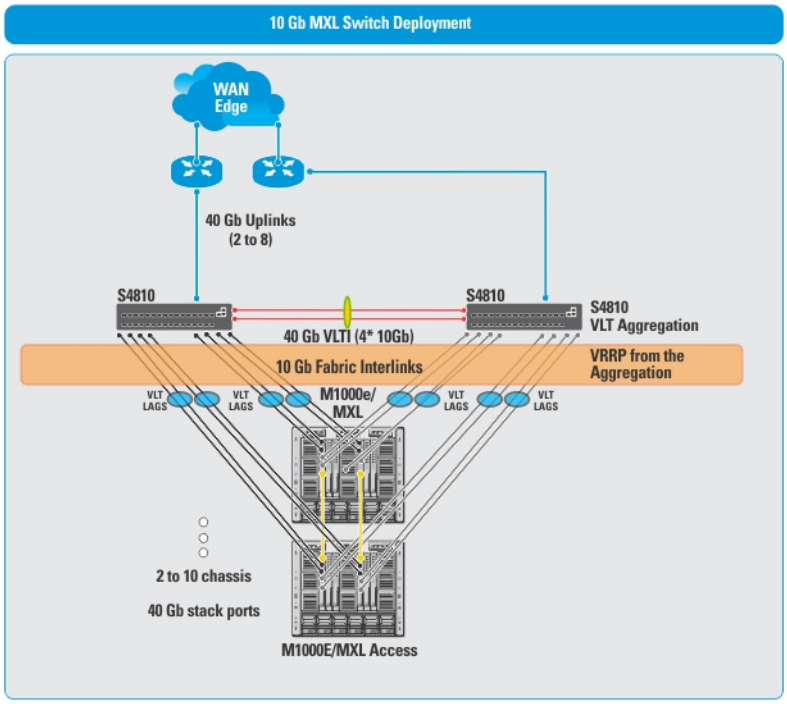


Figure 10. 10 Gb blade switch (MXL) VLT Deployment

BW = Bandwidth

DL = Downlink

FL BWB A & A = Fabric Link Bandwidth between Aggregation and Access

UL BW = Uplink Bandwidth

VLTi A BW = VLTi Aggregation Bandwidth

Table 14. MXL Blade Two-Tier Topologies for 10 GB MXL blade switch For Layer 2 and Layer 3 with Resiliency (Routed VLT)

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BWBA & A	VLTi A BW	VLTi Access BW	MXL Inter-chassis BW	Possible Topologies	
								Aggregation	Access
2–27	10 Gb	Basic	Layer 2/ Layer 3 with Resiliency	20 Gb	2 * 40 Gb	NA	NA	S4810 or S4820T	MXL

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BWBA & A	VLTi A BW	VLTi Access BW	MXL Inter-chassis BW	Possible Topologies	
								Aggregation	Access
			(Routed VLT)						
2–14	10 Gb	Basic	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80 Gb	2 * 40 Gb	NA	NA	Z9000 or S6000	MXL
2–14	40 Gb	Basic	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80 Gb	2 * 40 Gb	NA	NA	Z9000 or S6000	MXL
2–26	40 Gb	Basic	Layer 2/ Layer 3 with Resiliency (Routed VLT)	20 Gb	2 * 40 Gb	NA	NA	S4810 or S4820T	MXL
2– 27	10 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	40 Gb	2 * 40 Gb	NA	NA	S4810 or S4820T	MXL
2–14	10 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	160G	2 * 40 Gb	NA	NA	Z9000 or S6000	MXL
2–14	40 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	160G	2 * 40 Gb	NA	NA	Z9000/ S6000	MXL
2–26	40 Gb	Stacking	Layer 2/ Layer 3 with Resiliency	40 Gb	2 * 40 Gb	NA	NA	S4810 or S4820T	MXL

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BWBA & A	VLTi A BW	VLTi Access BW	MXL Inter-chassis BW	Possible Topologies	
								Aggregation	Access
			(Routed VLT)						
2–27	10 Gb	MXL - intra-Chassis resiliency	Layer 2/ Layer 3 with Resiliency (Routed VLT)	20 Gb	2 * 40 Gb	2 * 40 Gb	NA	S4810 or S4820T	MXL
2–14	10 Gb	MXL - intra-Chassis resiliency	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80 Gb	2 * 40 Gb	2 * 40 Gb	NA	Z9000/ S6000	MXL
2–14	40 Gb	MXL - intra-Chassis resiliency	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80 Gb	2 * 40 Gb	2 * 40 Gb	NA	Z9000/ S6000	MXL
2–26	40 Gb	MXL - intra-Chassis resiliency	Layer 2/ Layer 3 with Resiliency (Routed VLT)	20 Gb	2 * 40 Gb	2 * 40 Gb	NA	S4810 or S4820T	MXL
2–30 (for all even numbers only)	10 Gb	MXL - inter-Chassis resiliency	Layer 3 with Resiliency (Routed VLT)	20 Gb	2 * 40 Gb	2 * 40 Gb	40 Gb	S4810 or S4820T	MXL
2–14 (for all even numbers only)	10 Gb	MXL - inter-Chassis resiliency	Layer 3 with Resiliency (Routed VLT)	80 Gb	2 * 40 Gb	2 * 40 Gb	40 Gb	Z9000 or S6000	MXL
2–30 (for all even numbers only)	40 Gb	MXL - inter-Chassis resiliency	Layer 3 with Resiliency (Routed VLT)	20 Gb	2 * 40 Gb	2 * 40 Gb	40 Gb	S4810 or S4820T	MXL

BW = Bandwidth

DL = Downlink

FL BWB A & A = Fabric Link Bandwidth between Aggregation and Access

FL BWB C & A = Fabric Link Bandwidth between Core and Access

UL BW = Uplink Bandwidth

VCBW = VLTi Core Bandwidth

Table 15. Three-Tier Deployment Topologies for MXL Blade Switch for Layer 2 and Layer 3 with Resiliency (Routed VLT)

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BW B C & A	FL BWB A & A	VCBW	VLTi Aggregation BW	Possible Topologies		
								Core	Aggregation	Access
28–336	10 Gb	Basic	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	20 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
28–336	40 Gb	Basic	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	20 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
15–196	10 Gb	Basic	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL
15–196	10 Gb	Basic	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL
15–196	40 Gb	Basic	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BW B C & A	FL BWB A & A	VCBW	VLTi Aggregation BW	Possible Topologies		
								Core	Aggregation	Access
15–196	40 Gb	Basic	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL
28–336	10 Gb	Stacking	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	40 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
28–336	40 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80G	40 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
15–196	10 Gb	Stacking	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	160 G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL
15–196	10 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80G	160 G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL
15–196	40 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80G	160 G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL
15–196	40 Gb	Stacking	Layer 2/ Layer 3 with Resiliency (Routed VLT)	80G	160 G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL

MXL Blade Pairs Range	UL BW	Type	Fabric Type	FL BW B C & A	FL BWB A & A	VCBW	VLTi Aggregation BW	Possible Topologies		
								Core	Aggregation	Access
28–336	10 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	20 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
27–336	40 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	20 Gb	2 * 40 Gb	2 * 40 Gb	Z9000 or S6000	S4810 or S4820T	MXL
15–196	10 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL
15–196	10 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL
15–196	40 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	Z9000	Z9000	MXL
15–196	40 Gb	MXL - intra-Chassis resiliency	Layer 2 or Layer 3 with Resiliency (Routed VLT)	80G	80G	2 * 40 Gb	2 * 40 Gb	S6000	S6000	MXL

5

Designing the Fabric

To design a Layer 3 two-tier distributed core fabric or Layer 2 VLT fabric based on your current or future needs, use the **Fabric Design Wizard** on the **Network > Design Fabric > New Fabric** screen. The design consists of a wiring plan, network topology information, summary of the inventory requirement, and a design specification. See also Network Deployment Summary.

NOTE: If you are designing a fabric using an IOA blade switch, refer to IOA Fabric Design Wizard.

The **Fabric Design Wizard** allows you to perform the following tasks:

- Create a fabric
- Edit and Expand an Existing Fabric
- Delete the Fabric
- Import an Existing Fabric Design
- View the Wiring Diagram
- Display the status of the fabric design (if the design, pre-deployment, deployment, and validation phases have been successfully completed)
- Display detailed information about the fabric

Before you begin, review the Getting Started section.

To design a fabric, complete the following tasks using the **Fabric Design Wizard**.

1. Fabric Design – Fabric Name and Type
   Choose a fabric design type:
   a. Standard Fabric Design:
      1. Standard Fabric Design — Bandwidth and Port Count
      2. Standard Fabric Design — Deployment Topology
      3. Standard Fabric Design — Fabric Customization
   b. Advanced Fabric Design:
      1. Advanced Fabric Design — Aggregation Configuration
      2. Advanced Fabric Design — Access Configuration
      3. Advanced Fabric Design — Port Configuration
2. Fabric Design – Output
3. Fabric Design – Summary

NOTE: After designing the fabric, prepare it for deployment. For more information, refer to Pre-deployment Wizard.

Network Deployment Summary

Use AFM to design a fabric, make changes to the pre-deployment configuration, deploy the fabric, and validate the fabric designed by comparing it to a discovered fabric. AFM provides up-to-date status during each phase of the fabric from design to validate. AFM displays any pending steps required to ensure the fabric is fully functional for each fabric design.

Fabric Configuration Phases and States

The following table describes the four fabric phases displayed on the **Network** > *Fabric Name* > **Configure and Deploy** > **Deploy** screen. To correct the fabric design and pre-deployment configuration before or after deploying the fabric, refer to the following table for phases, states, and descriptions.

Table 16. Fabric Configuration Phases and States

Phase	State	State Description
Design	Incomplete	Required information to complete the design is necessary.
	Complete	All required input to complete the design is available.
Pre-deployment Configuration	Required	Required Pre-deployment Configuration information for the switches is necessary. NOTE: The Pre-deployment Configuration state for all switches is Required.
	Error	Deployment errors exist for one or more switches.
	Partial Complete	Pre-deployment is successful for one or more switches but not for all switches; provides information about the count of switches successfully deployed versus the count of total switches in the fabric design. NOTE: In this state, the information provided is sufficient to proceed with deployment of the subset of switches.
	Complete	Pre-deployment Configuration information is complete for all switches.
Deployment	Required	Deployment state for all switches is required.
	In-progress	Deployment is in progress on one or more switches; displays a progress bar and provides information about the count of switches successfully deployed versus the count of total switches per design (based on the based current port count — future port count is not included).
	Error	Deployment errors exist for one or more switches.
	Partial Complete	Deployment is successful for one or more switches but not for all switches per design; provides information about number of switches

Phase	State	State Description
		successfully deployed versus the number of total switches in the design. NOTE: Deployment on any of the switches is not In-progress while in this state.
	Complete	Deployment is successful for the switch.
Validation	Required	Validation state for all switches is required.
	In-progress	Validation is in progress for one or more switches; displays a progress bar and provides information about count of switches successfully validated vs. count of total switches per design (based on current port count — future port count is not included).
	Error	Validation errors exist for one or more switches.
	Partial Complete	Validation is successful for one or more switches but not all switches per design; provides information about the count of switches successfully validated versus the count of total switches per design. NOTE: Validation of any of the switches is not in progress during this state.
	Complete	Validation is successful for all switches.

Switch Configuration Phases and States

This section describes the phases and possible states for a switch.

Table 17. Switch Level States

Phase	State	State Description
Design	Complete	Fabric design is complete for the switch. NOTE: At the switch level, Partial Complete designs are not tracked. Partial Complete designs are only tracked at the fabric level.
Pre-deployment Configuration	Required	Required Pre-deployment Configuration information is necessary.
	Error	An error occurred during file transfer (transfer of minimum configuration file) to FTP/TFTP server or an error occurred during automatic DHCP integration for local DHCP server. NOTE: In case of a remote DHCP server, AFM does not report errors for the DHCP integration step as it is not an automated step from AFM. If a DHCP error occurs, manually integrate DHCP.
	Complete	Pre-deployment Configuration information is complete for the switch.

Phase	State	State Description
Deployment	Required	Deployment has not been initiated for the switch or the Deployment state was reset due to a Design/Pre-deployment Configuration change. NOTE: Deployment can be initiated/re-initiated only if Pre-deployment Configuration is Complete.
	In-progress	Deployment is in progress; provides the percentage of completion.
	Error	Deployment errors exist.
	Complete	Deployment is successful for the switch.
Validation	Required	Validation has not been initiated for the switch or the validation state was reset due to a Design/Pre-deployment Configuration/Deployment change. NOTE: Validation can be initiated only if Deployment is Complete.
	In-progress	Deployment is in progress; provides the percentage of completion.
	Error	One or more validation errors exist.
	Complete	Validation is successful for the switch.

Operations Allowed in Each Fabric State

To determine which operations are allowed during the design, pre-deployment configuration, deployment, and validation states, use the following table. Switch groups can be added or deleted at any time. If none of the switches in the fabric are pre-deployed or deployed, all fabric properties can be edited.

Table 18. Operations Allowed in Each Fabric State

Design State	Pre-Deploy Configuration State	Deployment State	Validation State	Operation Allowed
Incomplete	Not Started	Not Started	Not Started	• Edit Fabric (All fabric attributes) • Switch model, type, & name • Delete Fabric
Complete	Not Started	Not Started	Not Started	• View Wiring Plan • Edit Fabric (All fabric attributes) • Switch model, type, & name • Pre-deployment Configuration • Delete Fabric

Design State	Pre-Deploy Configuration State	Deployment State	Validation State	Operation Allowed
Complete	Incomplete. The system MAC and IP address are not configured for the switches.	Not Started	Not Started	• View Wiring Plan • Edit Fabric (All fabric attributes except fabric name) • Switch model, type, & name • Pre-deployment Configuration • Delete Fabric
Complete	Partial Complete / Complete–Partial complete indicates that at least 1 switch has its system MAC and IP address configured.	Not Started	Not Started	• View Wiring Plan • Edit Fabric Description • Aggregation & Access Config Speed (Advanced fabric) • Number of switches per stack (stack mode) • Pre-deployment Configuration • View DHCP Configuration • Deploy and Validate Fabric • View Deployment and Validation Status • Delete Fabric
Complete	Partial Complete / Complete	In-progress	Not Started / In-progress / Stopped / Error / Complete	• Edit Fabric Description • Aggregation & Access Config Speed (Advanced fabric) • Number of switches per stack (stack mode) • View Wiring Plan • View DHCP Configuration • View Deployment and Validation Status • Delete Fabric
Complete	Partial Complete / Complete	Incomplete / Partial Complete / Complete	Not Started / In-progress / Stopped /	• View Wiring Plan • Edit Fabric Description • Aggregation & Access Config

Design State	Pre-Deploy Configuration State	Deployment State	Validation State	Operation Allowed
		Incomplete indicates that AFM is deploying the switches. Complete indicates all the switches in the distributed fabric are deployed.	Error / Complete	Speed (Advanced fabric) • Number of switches per stack (stack mode) • Pre-deployment Configuration • View DHCP Configuration • Deploy and Validate Fabric — Validation is only allowed when deployment is partial or fully complete • View Deployment and Validation Status • Delete Fabric

Deployment Topology Use Cases

To select a deployment topology, refer to the following use cases as a guide.

Use Case 1: One-Tier Layer 2 Fabric

If you select a one-tier Layer 2 fabric:

- The uplinks between the two aggregation switches and external switch support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the two aggregation switches support the Layer 2 protocol (VLAN or VLAN/VRRP). The default setting on the pre-deployment screen is VLAN configuration, which allows you to configure downlink connections to servers. To support redundancy between the aggregation switches and ToR switches, select **VLAN and VRRP Configuration**.

Use Case 2: One-Tier Layer 3 with Resiliency (Routed VLT)

If you select a one-tier Layer 3 with Resiliency (Routed VLT) fabric:

- The uplinks between the two aggregation switches and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the two aggregation switches support the Layer 2 protocol (VLAN/VRRP or VLAN IP). During the design phase on the **Deployment Topology** screen, select the fabric type and deployment type (topology). Based on the selected deployment type options, different downlink options are configured in the access tier.

Use Case 3: Two-Tier Layer 2

If you select a two-tier Layer 2 VLT fabric:

- The fabric links between aggregation and access switches support the Layer 2 protocol.

- The uplinks between the aggregation switches and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the access switches support the Layer 2 protocol (VLAN or VLAN/VRRP). The default setting on the pre-deployment screen is VLAN configuration, which allows you to configure downlink connections to servers. Select the **VLAN and VRRP Configuration** option to support redundancy between the access switch and ToR switches.

Use Case 3: Two-Tier Layer 3 Distributed Core

If you select a two-tier Layer 3 distributed core fabric:

- The fabric links between the spine and leaf switches support the Layer 3 OSPF routing protocol.
- The uplinks between spine switch and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the access switches support the Layer 2 protocol (**VLAN** or **VLAN** and **LAG**).
  - If the **VLAN** option is selected, the downlinks connecting to server are configured to use the VLAN protocol.
  - If the **VLAN and LAG** option is selected, the downlinks between the leaves and ToR are configured to use VLAN, VRRP, and LAG for redundancy.

Use Case 4: Two-Tier Layer 3 Resiliency (Routed VLT)

If you select a two-tier Layer 3 with Resiliency (Routed VLT) fabric:

- The fabric links between the aggregation and access switches support the Layer 3 protocol with OSPF in the VLAN interfaces.
- The uplinks between the aggregation switch and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the access switches support the Layer 2 protocol (VLAN/VRRP or VLAN IP). During the design phase on the **Deployment Topology** screen, select the fabric type and deployment type (topology). Based on the deployment type option selected, different options are available to configure the downlink at the access tier.

The following section lists the available topology types:

1. **Layer 3 with Resiliency (Routed VLT) with stacking option** — If you select the **Stacking** option, configure the VLAN with the primary and secondary IP addresses for each access switch.
2. **Layer 3 with Resiliency (Routed VLT) with VLT option** — If you select the **VLT** option, enter the VLAN ID, Primary IP address and Secondary address. If you select the **Enable Layer 3 Protocol in Access Switches** option, configure the VLAN ID and the IP Range. When you complete the pre-deployment configuration, the **Advanced VLAN IP Configuration** option is available at the **Configure and Deploy Summary** screen.

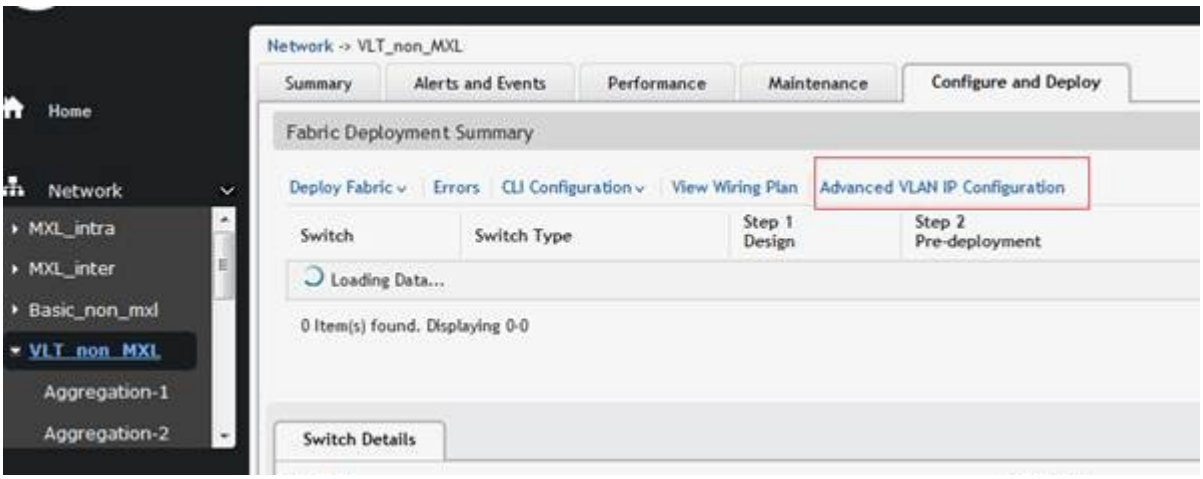


Figure 11. Layer 3 with Resiliency (Routed VLT) with VLT option + Advanced VLAN IP Configuration

3. **Layer 3 with Resiliency (Routed VLT) – Basic option** – If you select the **Basic** option, configure the VLAN with the primary and secondary IP addresses for each access switch.
4. **Layer 3 with Resiliency (Routed VLT) with MXL Blade with interChassis option** – For this topology, select the Deployment Type with an MXL Blade switch with Resiliency (VLT) and Interchassis (across chassis) resiliency. Enter the VLAN ID and the IP range. When you complete the pre-deployment configuration, the **Advanced VLAN IP Configuration** option is available on the **Configure and Deploy Summary** screen.
5. **Layer 3 with Resiliency (Routed VLT) – Blade MXL with IntraChassis option**: With this topology, select the deployment with an MXL Blade switch with Resiliency (VLT) and the **Intrachassis (within the same chassis) resiliency** option. Enter the VLAN ID, primary, and secondary IP addresses.

Use Case 5: Three-Tier Layer 2

If you select a three-tier Layer 2 fabric:

- The fabric links between the core and aggregation switches support the Layer 3 protocol.
- The fabric links between the aggregation and access switches support the Layer 2 protocol.
- The uplinks between the aggregation switches and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the access switches support the Layer 2 protocol (VLAN or VLAN/VRRP). The default setting on the pre-deployment screen is VLAN configuration, which allows you to configure downlink connections to servers. Select the **VLAN and VRRP Configuration** option to support redundancy between the access switch and ToR switches.

Use Case 6: Three-Tier Layer 3 Resiliency (Routed VLT)

If you select a three-tier Layer 3 with Resiliency (Routed VLT) fabric:

- The fabric links between the core and aggregation switches support Layer 3 protocol with OSPF in the VLAN interfaces.
- The fabric links between the aggregation and access switches support the Layer 2 protocol.
- The uplinks between the aggregation switch and external switch (WAN) support the Layer 3 protocol (OSPF, iBGP or eBGP).
- The downlinks from the access switches support the Layer 2 protocol (VLAN/VRRP or VLAN IP). During the design phase on the **Deployment Topology** screen, select the fabric type and deployment

type (topology). Based on the selected deployment type options, different downlinks options are configured at the access tier.

The following section lists the available topology types:

1. **Layer 3 with Resiliency (Routed VLT) with stacking option** – If you select the **Stacking** option, configure the VLAN with the primary and secondary IP addresses for each access switch.
2. **Layer 3 with Resiliency (Routed VLT) with VLT option** – If you select the **VLT** option, enter the VLAN ID, Primary IP address and Secondary address. If you select the **Enable Layer 3 Protocol in Access Switches** option, configure the VLAN ID and the IP Range. When you complete the pre-deployment configuration, the **Advanced VLAN IP Configuration** option is available at the **Configure and Deploy** summary screen.

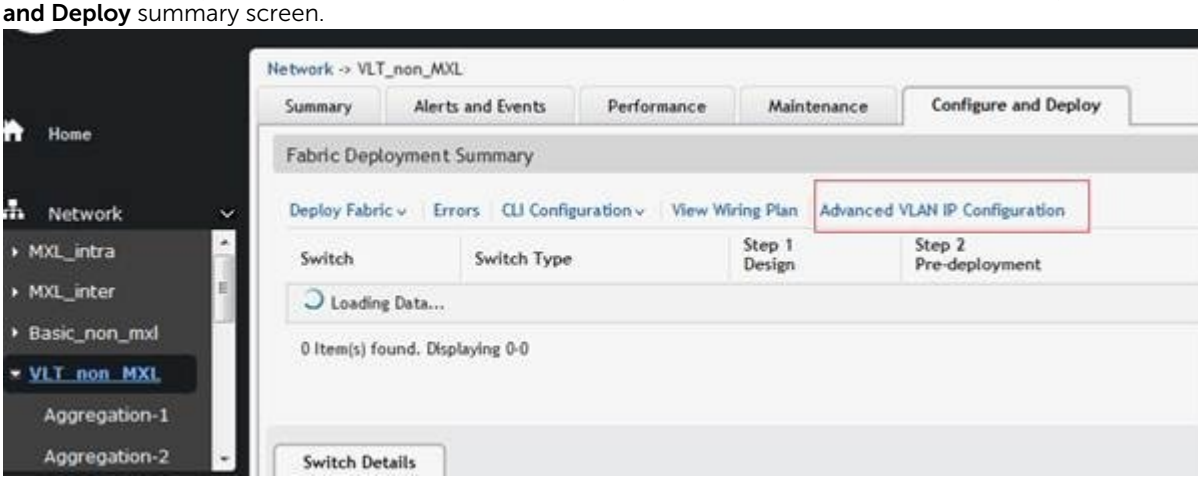


Figure 12. Three-Tier Layer 3 with Resiliency (Routed VLT) with VLT Option + Advanced VLAN IP Configuration

3. **Layer 3 with Resiliency (Routed VLT) – Basic option** – If you select the **Basic** option, configure the VLAN with the primary and secondary IP addresses for each access switch.
4. **Layer 3 with Resiliency (Routed VLT) – Blade MXL with IntraChassis option**: For this topology, select the deployment type with an MXL Blade switch with Resiliency (VLT) and the **Intrachassis (within the same chassis) resiliency** option. Enter the VLAN ID, primary, and secondary IP addresses.

Using the Fabric Design Wizard

To design the following types of customized fabrics based on your workload requirements for your current and future needs, use the Fabric Design Wizard on the **Network > Design Fabric** > **New Fabric** screen. If you are designing a Layer 2 fabric using an IOA blade, refer to Using the IOA Pre-deployment Wizard.

- **Layer 2** — Use the Layer 2 VLT fabric for workload migration over virtualized environments. Refer to VLT and Selecting a Layer 2 and Layer 3 with Resiliency (Routed VLT) fabric.
- **Layer 3 distributed core** — Use the Layer 3 distributed core for large fabric deployments. Refer to Conventional Core Versus Distributed Core
- **Layer 3 with Resiliency (Routed VLT)** — Use the Layer 3 fabric to extend equal cost multipathing capabilities. Refer to Selecting a Layer 2 and Layer 3 with Resiliency (Routed VLT).

This screen allows you to create, edit, delete, and view the fabric.

NOTE: You can also use the Fabric Design Wizard from the **Home > Design New Fabric** screen.

To design a fabric, use the following screens:

1. **Fabric Name and Type** — Select the fabric name, type, and description. Enable OpenStack Neutron Management (Standard fabric only), LAN, LAN/SAN, and blade switch deployments, if required.

    a. To design a Standard Fabric:

        1. **Bandwidth and Port Count** — Configure the number of edge port uplinks to the WAN connection and downlinks required (for example, to servers or ToRs) for deployment as well as for future expansion.
        2. **Deployment Topology** — Select a Layer 2 or Layer 3 solution from a list of all applicable deployment topologies based on the fabric requirements entered on the **Bandwidth and Port Count** and **Fabric Name and Type** screens. To configure VLTi links and fabric links, use the **Advanced options**. For more information, refer to Deployment Topology Use Cases.
        3. **Fabric Customization** — Select the switch names, models, and switch roles (aggregation or access) and modify the fabric link bandwidth for two-tier and three-tier fabrics.

    b. To design an Advanced Fabric:

        1. **Aggregation Configuration** — Select the aggregation switch names and aggregation model (S6000, Z9000, S4810, or S4820T). Allocate the remaining bandwidth to the appropriate link types (40G ⇨10G Split, 40G, or 10G [S4810 only]).
        2. **Access Configuration** — Add, edit, or delete information for access switches.
        3. **Port Configuration** — Configure the proposed port numbers for links.

2. **Output** — View future switches and links and the fabric in the following formats:

    - graphical wiring plan
    - tabular wiring plan
    - graphical network topology
    - tabular network topology

3. **Summary** — View a summary of the fabric design or export the design.

Fabric Design – Step 1: Fabric Name and Type

To simplify and automate the design process, AFM provides a fabric design wizard to design a Layer 2, Layer 3, or Layer 3 with Resiliency (Routed VLT) fabric based on current and future data center capacity requirements. Refer to Designing the Fabric and Using the Fabric Design Wizard.

To generate a physical wiring plan for the fabric during the design phase, enter the data center capacity requirements. The wiring plan is typically given to the network operator, who uses it to build the physical network. For information about designing a fabric, refer to Selecting Distributed Core and Selecting a Layer 2 and Layer 3 with Resiliency (Routed VLT).

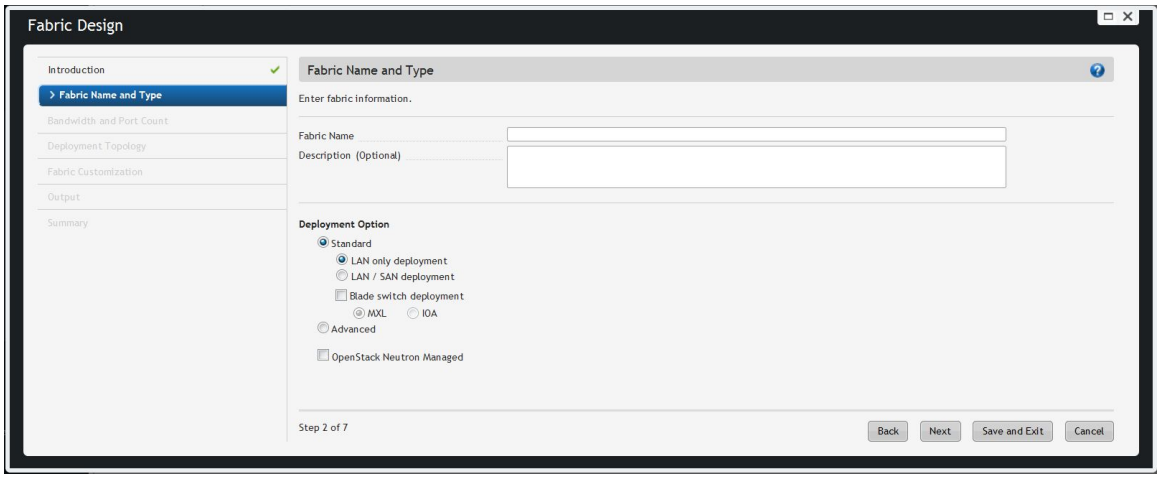


Figure 13. Fabric Design Wizard — Fabric Name and Type

1. Navigate to the **Fabric Design Wizard** on the **Network > Design Fabric** screen.
2. Click **New Fabric** .

   The **Introduction** screen displays.
3. Review the introduction and click **Next**.

   The **Fabric Name** screen displays.
4. Enter the name of the fabric in the **Fabric Name** field.

   The fabric name must be unique. The range is 1–17 characters. AFM supports the following character types:

   - alphanumeric
   - underscore (_)
   - +
5. (Optional) In the **Description** field, enter the description of the fabric.

   There is no character restriction. The range is 1–128 characters.
6. Navigate to the **Deployment Type** area.

   Select one of the following options:

   - **Standard** — View suggested topologies based on available switch types. For more information, refer to the following section.

     – **LAN only deployment**

       * **Blade Switch Deployment** —Create a fabric using blade switches (MXL or IOA). This option is for a Layer 2 fabric or Layer 3 with Resiliency (Routed VLT) fabric LAN deployment. Select a blade switch type:

         - **MXL**: To use an MXL blade switch, select the **MXL** radio button.
         - **IOA**: To use an IOA blade switch, select the **IOA** radio button. Use this option for a Layer 2 fabric.

           NOTE: When you select the IOA blade switch blade deployment and click **Next**, a customized IOA design wizard displays.

     – **LAN/SAN deployment**

       * **Fibre Channel** – Supports fibre channel (FC) interfaces. Uses the S5000 as a N_Port ID Virtualization (NPIV) Proxy Gateway. This option provides a gateway between the fibre

channel switch and server. Configure up to eight VLANs with a VLAN ID range of 2–4094 on the fiber channel and associate these VLANs with any FC port.

  * **iSCSI** – Supports iSCSI interfaces.

- **Advanced** — Create a mixed node or custom topology. For more information, refer to Advanced Fabric Design.

  – In this release, AFM supports only two-tier VLT topologies.

- **OpenStack Neutron Managed**: (Standard fabric only) If you are using AFM Plug-in for OpenStack, select this option.

  NOTE: OpenStack is supported for standard fabric designs only. If you select this option, you cannot enter the VLAN configuration in the AFM Pre-Deployment Wizard. OpenStack, which requires the AFM Neutron Plug-in installation, enters this information automatically to orchestrate the Layer 2 VLAN configuration between OpenStack and AFM. Refer to the *AFM Plug-in for OpenStack Guide*.

7. Click **Next** and review the uplink and downlink bandwidth settings on the **Bandwidth and Port Count** screen.

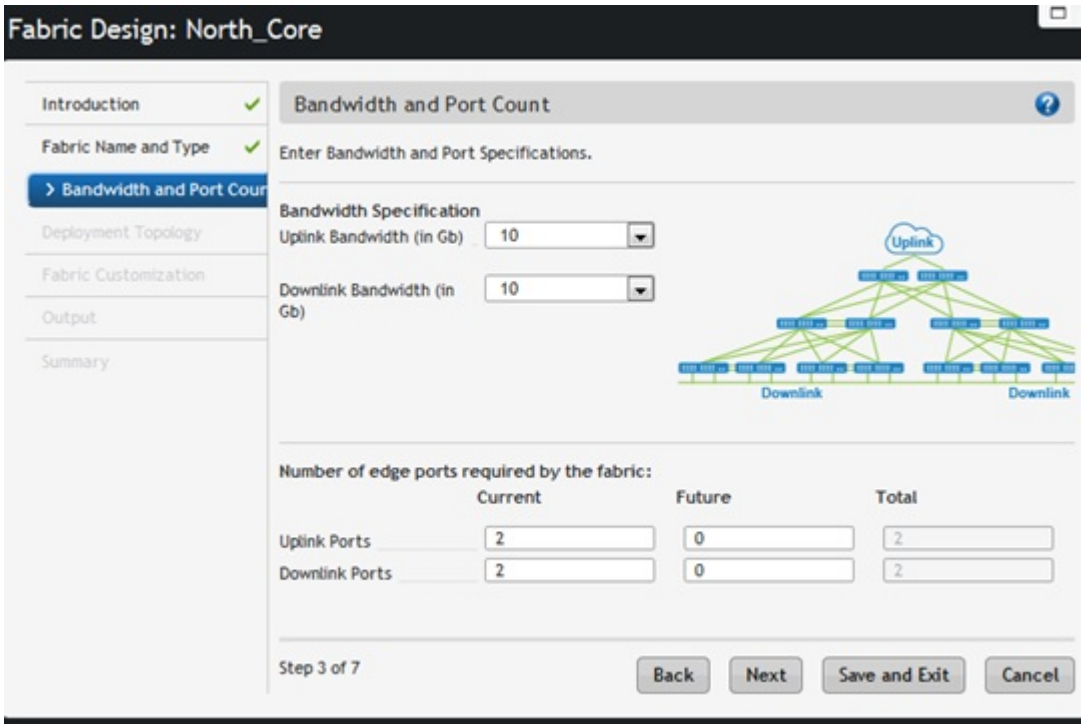
Standard Fabric

Use the following screens to design a standard Layer 2, Layer 3, or Layer 3 with Routed VLT fabric. Specify the available amount and type of bandwidth, then select a topology from the provided options.

1. Standard Fabric Design — Bandwidth and Port Count
2. Standard Fabric Design – Deployment Topology
3. Standard Fabric Design – Fabric Customization

Standard Fabric Design – Bandwidth and Port Count

The **Bandwidth and Port Count** screen displays the default values for the fabric uplinks and downlinks. Uplinks connect from the fabric up to the next upstream tier of devices toward the core of the network. The minimum number of uplinks is two: one uplink is the active link and one uplink is for redundancy. Downlinks connect from the fabric to the next tier down of devices or servers towards the edge of the network. These values (1 Gb, 10 Gb, or 40 Gb) are based on the selected options in the **Fabric Name and Type** screen. The values for the uplink ports, downlink ports, and bandwidth that you enter determine the AFM fabric topology.



1. In the **Bandwidth Specification** section:
   a. Select the uplink bandwidth (10 Gb or 40 Gb) from the **Uplink Bandwidth** drop-down menu.
   b. Select the downlink bandwidth (1 Gb, 10 Gb, or 40 Gb) from the **Downlink Bandwidth** drop-down menu.
   - If you select the **1 Gb Downlink Bandwidth** option, AFM supports deployment topologies using S55 and S60 switches on the access side.
   - If you select the **10 Gb Downlink Bandwidth** option, AFM supports deployment topologies using S4810 and S4820T switches on the access side.
   - If you select the **40 Gb Downlink Bandwidth** option, AFM supports deployment topologies using Z9000 and S6000 switches on the access side.
2. In the **Number of edge ports required by the fabric** section, enter the number of required uplink ports (connections to the WAN) for initial deployment in the **Uplink Ports Current** column.
   - The minimum number of uplinks is two and the number of uplinks must be even. One uplink is for redundancy.
   - For fabric using 10 Gb bandwidth, AFM supports 2–32 uplinks.
   - For fabric using 40 Gb Bandwidth, AFM supports 2–8 uplinks.
   - For a Layer 2 VLT fabric or a Layer 3 with Resiliency (Routed VLT) fabric, an edge port link (uplink) connects to the aggregation or core switches that connect outside the fabric. For a three-tier fabric, edge links connect to the core switches. For a two-tier fabric, edge links connect to aggregation switches.
   - For Layer 3 distributed core, an edge port link (uplink) connects to the first two leaves that connect to the edge WAN, which typically connects to an internet service provider (ISP).
3. In the **Downlink Ports Current** column, enter the required number of downlink ports for initial deployment. The default is two downlink ports and the number of ports must be even.
4. In the **Uplink Ports Future** column, enter the required number of uplink ports (connections to the WAN) for future expansion of the fabric. If the future ports are not reserved, you cannot expand the fabric in the future.

5. In the **Downlink Ports Future** column, enter an even number of downlink ports (connections to the servers, switches, or ToR) required for future expansion of the fabric.

   NOTE: If you select the **Blade switch (MXL) deployment** option in the **Fabric Name and Type** screen, the **Bandwidth and Port Count** screen displays a **Blade Switch Pairs** option instead of a **Downlink Ports** option in the **Number of edge ports required by the fabric** area.

6. If you are connecting to Fibre Channel ports, navigate to the Fibre Channel Ports area and then enter the required number of current and future ports for this interface in the **Current** and **Future** columns.

   The minimum number of Fibre Channel ports is two.

   The maximum number of Fibre Channel ports (current and future) is the number of S5000 access switches multiplied by twelve.

7. If you are connecting to iSCSI ports, navigate to the iSCSI ports section and then enter the required number of current and future ports for this interface in the **Current** and **Future** columns.

   The minimum number of iSCSI ports is two.

   The maximum number of iSCSI ports (current and future) is eight.

8. Review the values and then click **Next** to go to the **Deployment Topology** screen.

Standard Fabric Design – Deployment Topology

AFM displays applicable deployment topologies based on the data center workload requirements specified in the **Fabric Name and Type** and **Bandwidth and Port Count** screens. By default, AFM selects one of the topologies. To display additional deployment topology options, click the deployment topology filter icon on the top right of the screen. The output from these screens and the **Deployment Topology** and **Fabric Customization** screens create the network topology and the detailed wiring plan. For more information, refer to Deployment Topology Use Cases.

Based on your design requirements, create a one, two, or three-tier topology as shown below. To filter the deployment topologies, select the **Layer 2**, **Layer 3**, or **Layer 3 with Resiliency (Routed VLT)** options. You can also filter by device type, cable type, or other information by selecting the filter icon in the upper-right.

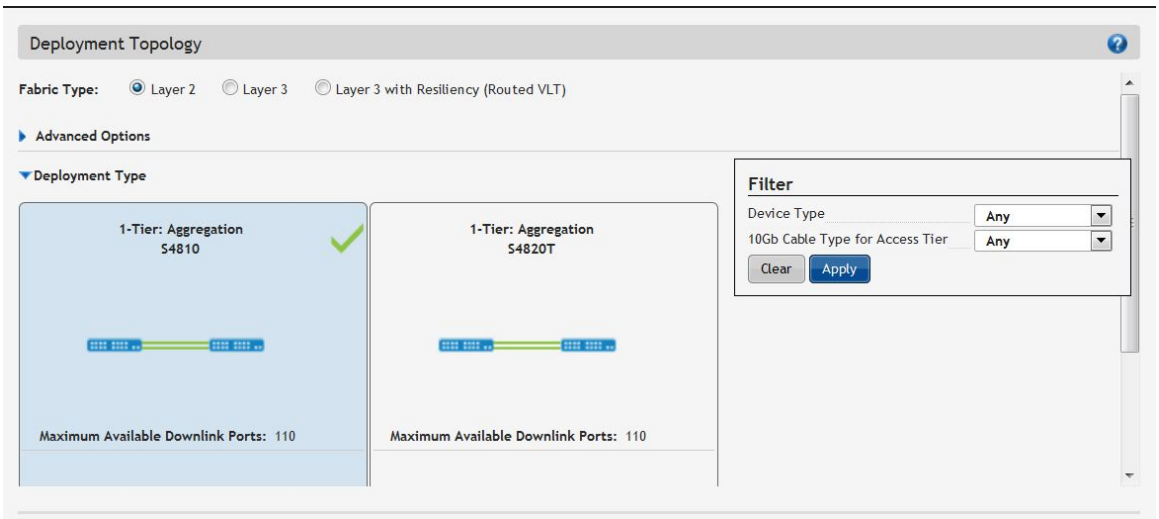


Figure 14. Standard Fabric Design — Deployment Topology

Table 19. Deployment Topology (Filter) Options

Deployment Options	Description
Oversubscription Ratio (Layer 3 distributed core deployment topology only)	For a Layer 3 deployment, the following oversubscription ratios are available: • 1:1 • 3:1 • 4:1 • 5:1
Resiliency in Access Devices	Configures Virtual Router Redundancy Protocol (VRRP) on the downlink.
10 Gb Cable Type for Access Tier	This option is applicable only for topologies where S4810 and S4820T can be swapped. • **SFP+** • **RJ-45**
Stacked/Non-Stacked	Selects stacking for the applicable topologies. If you select stacking, you can enable VLTi.
High Stream Buffering	• **high stream buffering** — For an access layer using S60 switches • **low latency** — For an access layer using S55 switches
Resiliency In MXL (Routed VLT)	• **Intra-chassis** — Within the chassis (mVLT) • **Inter-chassis resiliency** — Across 2 chassis (VLT)

- **One-Tier Topology** — Contains two switches and a downlink and uplink configuration. There are no fabric links.

Figure 15. VLT One-Tier Topology: Aggregation Layer

For more information about one-tier topologies, refer to Designing a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric.

- **Two-Tier Topology** — Contains two layers of switches. Has fabric interlinks, uplinks, and downlinks. Uses Distributed Core (spine and leaf) or VLT (aggregation and access). For more information about two-tier topologies, refer to Designing a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric and Selecting a Layer 3 Distributed Core Fabric Design.

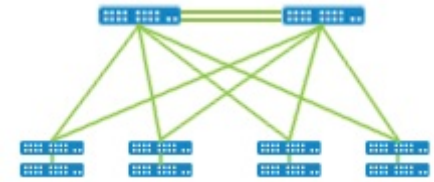


Figure 16. Two-Tier VLT Topology: Aggregation and Access Layer

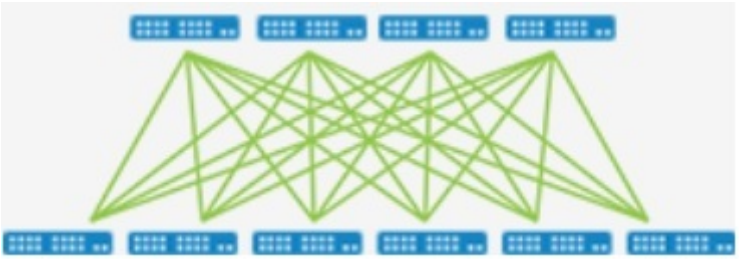


Figure 17. Two-Tier Distributed Core Topology: Spine and Leaf

- **Three-Tier Topology** — Layer 3 with Resiliency (Routed VLT). Has three layers of switches, fabric interlinks, uplinks and downlinks. For more information about three-tier topologies, refer to Designing a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric.

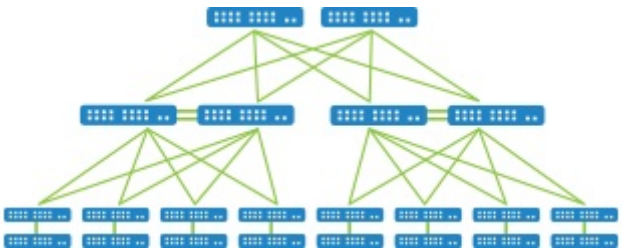


Figure 18. Three-Tier VLT Topology Core: Aggregation - Access Layer

The following illustration and table describe the deployment types for a fabric.

NOTE: For more information about topologies, refer to the Designing a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric and Selecting a Layer 3 Distributed Core Fabric Design.

Selecting a Fabric Deployment Type

1. Navigate to the **Network > Design Fabric > New Fabric > Deployment Topology** screen.
2. In the Fabric Type area, select one of the following fabric types:
   - **Layer 2** — Use the Layer 2 VLT fabric for workload migration over virtualized environments. For more information, refer to VLT and Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design.
   - **Layer 3** — Use the Layer 3 distributed core for large fabric deployments. For more information, refer to Conventional Core Versus Distributed Core.
   - **Layer 3 with Resiliency (Routed VLT)** — Use the Layer 3 fabric to extend equal cost multipathing capabilities. For more information, refer to Selecting a Layer 2 VLT and Layer 3 with Resiliency (Routed VLT) Fabric Design.

If you select LAN/SAN deployment with iSCSI or Fibre Channel storage facing ports using the Fabric Designer wizard, AFM automatically selects a Layer 2 fabric and the Layer 2, Layer 3, and Layer 3 options in the Deployment Topology screen are not displayed.

3. Select the appropriate deployment topology that uses the core switches and aggregation switch types in the fabric.
4. (Optional) Click **Advanced Options** to configure VLTi links and fabric links.
   a. Configure the VLTi and fabric link options:
      - VLTi Link options:
        - Core — Specify the number of links and bandwidth.
        - Aggregation — Specify the number of links and bandwidth
        - Access — Specify the number of links and bandwidth.
      - Fabric Link options:
        - Core and Aggregation — Specify the bandwidth.
        - Aggregation and Access — Specify the bandwidth.
   b. Click **Refresh Deployment Type** to apply the Advanced Options and view the new deployment topologies.
5. Click the deployment topology filter icon on the top right of the screen to display deployment topology options. Only applicable filter options are displayed.
6. Configure the filter options for the deployment topology and click **Apply**.
7. Click **Next** to go to the **Fabric Customization** screen.

Configuring Advanced Options

For a Layer 2 or Layer 3 with Resiliency (Routed VLT) fabric, customize the bandwidth between the aggregation and access switches. If you configure the fabric link bandwidth between the aggregation and access switches from the **Enabled Link Bandwidth Customization** option on the **Deployment Topology** screen, the two redundant links share the selected bandwidth equally. For example, if you select a fabric link bandwidth of 80 Gb between the aggregation and access switches, you can configure 40 Gb for each redundant link on the **Fabric Customization** screen.

NOTE: If you select LAN/SAN deployment with iSCSI or Fibre Channel storage facing ports using the Fabric Designer wizard, AFM automatically selects a Layer 2 fabric and the Layer 2, Layer 3, and Layer 3 options in the **Deployment Topology** screen are not displayed.

1. In the **Deployment Topology** section, select one of the following options:
   - **Layer 2**
   - **Layer 3 with Resiliency (Routed VLT)**
2. Click the blue arrow by **Advanced Options**.
   The **Advanced Options** display.

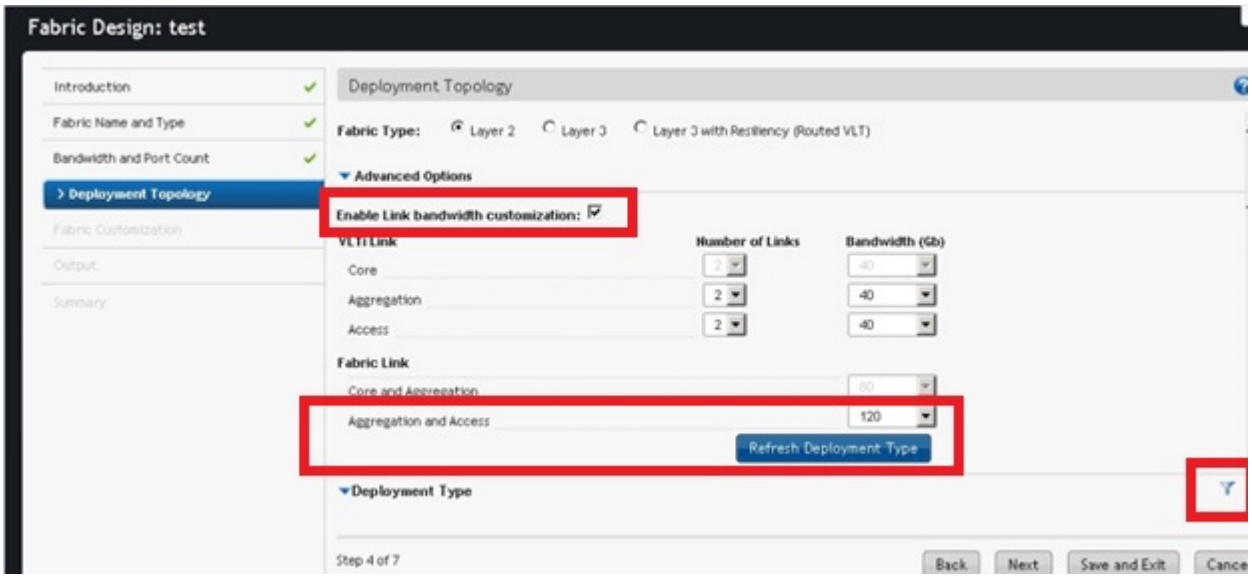


Figure 19. Enabled Link Bandwidth Customization Option

3. Check the **Enable Link Bandwidth Customization** checkbox.
4. Select the number of links and the fabric bandwidth value from the appropriate drop-down menu. Only the applicable options for a select topology are configurable. For example, for a two-tier topology, select the **120 Gb** bandwidth option to customize the bandwidth from 20 to 120 Gb in increments of 20 Gb on the **Fabric Customization** screen.
5. In the **Deployment Type** section, select the appropriate deployment type.
6. (Optional) To display deployment topology filtering options, click the deployment topology filtering icon on the top right of the screen. Only applicable options are displayed. Configure the filter options for the deployment topology and click **Apply**.
7. Select a topology and click **Next**.
8. (Optional) From the **Fabric Link Bandwidth** drop-down menu, select the fabric link bandwidth for each switch that you want to customize.

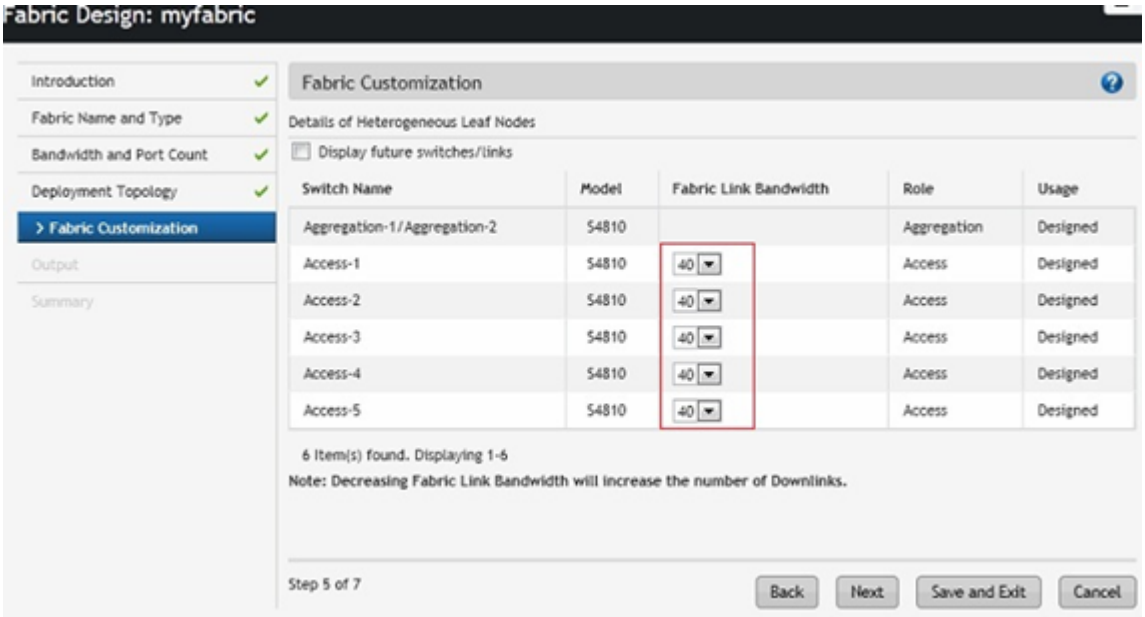


Figure 20. Customizing Fabric Link Bandwidth between Switches

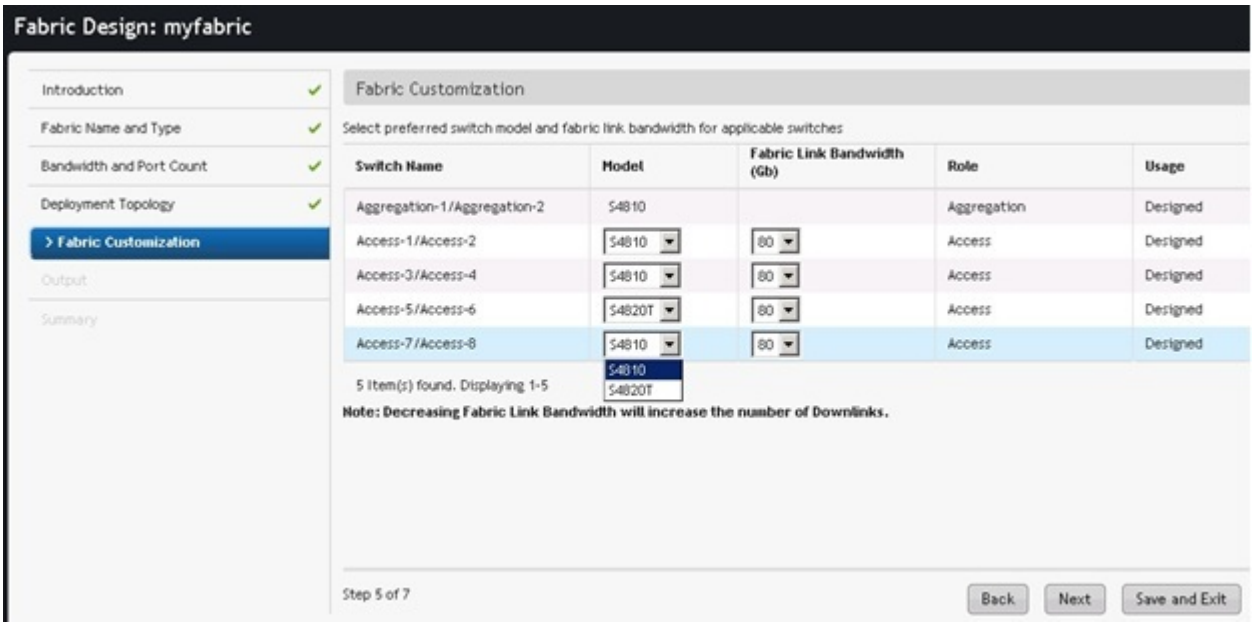
9. Click **Next** to go to the **Output** screen.

Standard Fabric Design — Fabric Customization

To modify the fabric link bandwidth between the aggregation and access switches for two-tier and three-tier fabrics, use the **Fabric Customization** screen, which displays the switch names, models, and switch roles (spine, leaf, aggregation or access). For a Layer 2 or Layer 2 with Resiliency (Routed VLT) deployment topology, select S4810 or S4820T switches (mixed node) on the access side.
To customize the fabric, configure the **Advance Configuration** option for **Fabric Link between Aggregation and Access** to the maximum bandwidth for each access switch. For example, configure the maximum bandwidth as 120 Gb at the **Network** > **Design Fabric** > **New Fabric** > **Deployment Topology** screen. If you do not configure this option, the **Fabric Customization** screen is read-only. For information

about the **Advanced Options**, refer to Configuring Advanced Options. For information about tiers, refer to Deployment Topology and Deployment Topology Use Cases.

1. Navigate to the **Network** > **Design Fabric** > **New Fabric** > **Deployment Topology** > **Fabric Customization** screen.
2. From the **Fabric Link Bandwidth** drop-down menu, select the fabric link maximum bandwidth for each access switch.



3. Click **Next** to go the **Output** screen.

Advanced Fabric Design

Use the following screens to design a custom topology for a two-tier Layer 2 fabric. The access (leaf) switches can be in VLT, stack, or standalone mode and the aggregation (core) switches use VLT.

- Advanced Fabric Design — Aggregation Configuration
- Advanced Fabric Design — Access Configuration
- Advanced Fabric Design — Port Configuration

Advanced Fabric Design – Advanced Aggregation Config

The **Advanced Aggregation Config** screen displays the default values for the fabric uplinks and VLTi links. Uplinks connect the fabric from the next upstream tier of devices to the core of the network. The minimum number of uplinks is two: one uplink is the active link and one uplink is for redundancy.

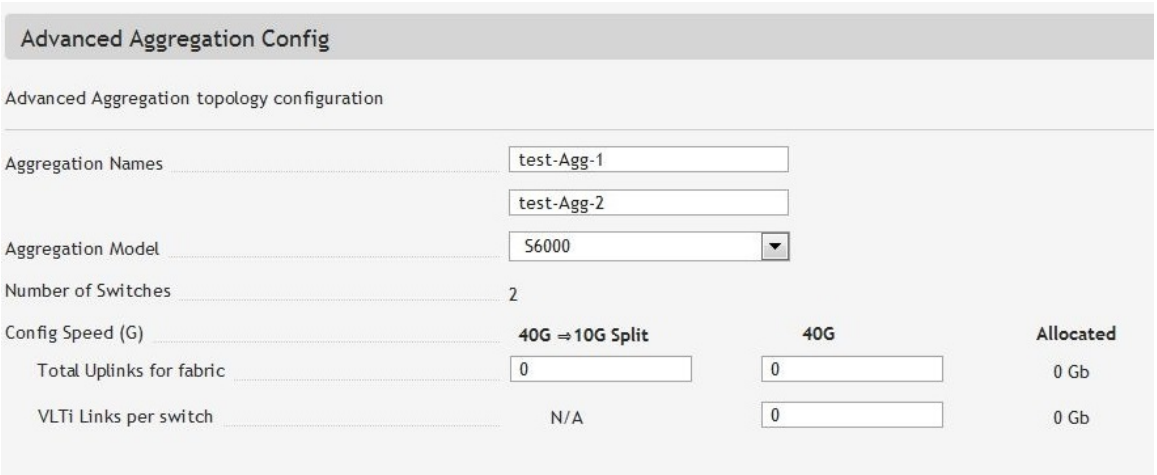


Figure 21. Advanced Aggregation Config

1. (Optional) To customize the switch names, enter a name in each of the **Aggregation Names** fields. The default names are *FabricName*—Agg-1 and *FabricName*—Agg-2.
2. Select a switch type from the drop-down **Aggregation Model** menu:
   - **Z9000**
   - **S6000**
   - **S4810**
   - **S4820T**

   The **Number of switches** field displays the number switches in the VLT pair.
3. In the **Config Speed (Gb)** section, configure the number of ports for uplinks and VLTi in the appropriate entry fields.

   NOTE:
   - Configure at least two VLTi links and two uplinks.
   - All values must be even.
   - The maximum configurable bandwidth is 320 Gb.
   - VLTi does not support **40G ⇒10G Split**.

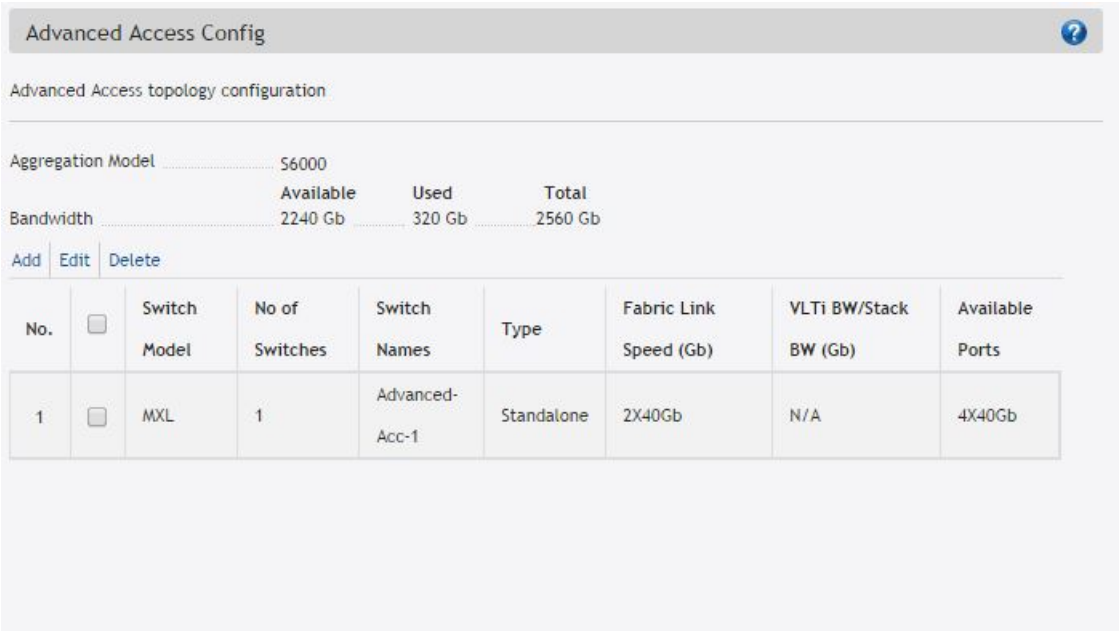
   - The **40G ⇒10G Split** uplink bandwidth range is 2–32.
   - The **40G** uplink bandwidth range is 2–8.
   - The **10G** uplink bandwidth range is 2–32 and is supported on S4810 and S4820T.
   - The **VLTi** link range is 2–16.

   The **Allocated** column displays the total amount of configured uplink bandwidth (in Gb).
4. Review the values and click **Next** to go to the **Advanced Access Config** screen.

Advanced Fabric Design — Advanced Access Config

To add switches to the fabric, edit switch information, or remove switches, use the **Advanced Access Config** screen. The selected aggregation model (Z9000, S4810, S4820T, or S6000) and the available, used, and total bandwidth values display at the top of the screen.

Adding Access Switches



1. In the upper left of the **Advanced Access Config** screen, click **Add**.
   The **Add Switch Unit** window displays.

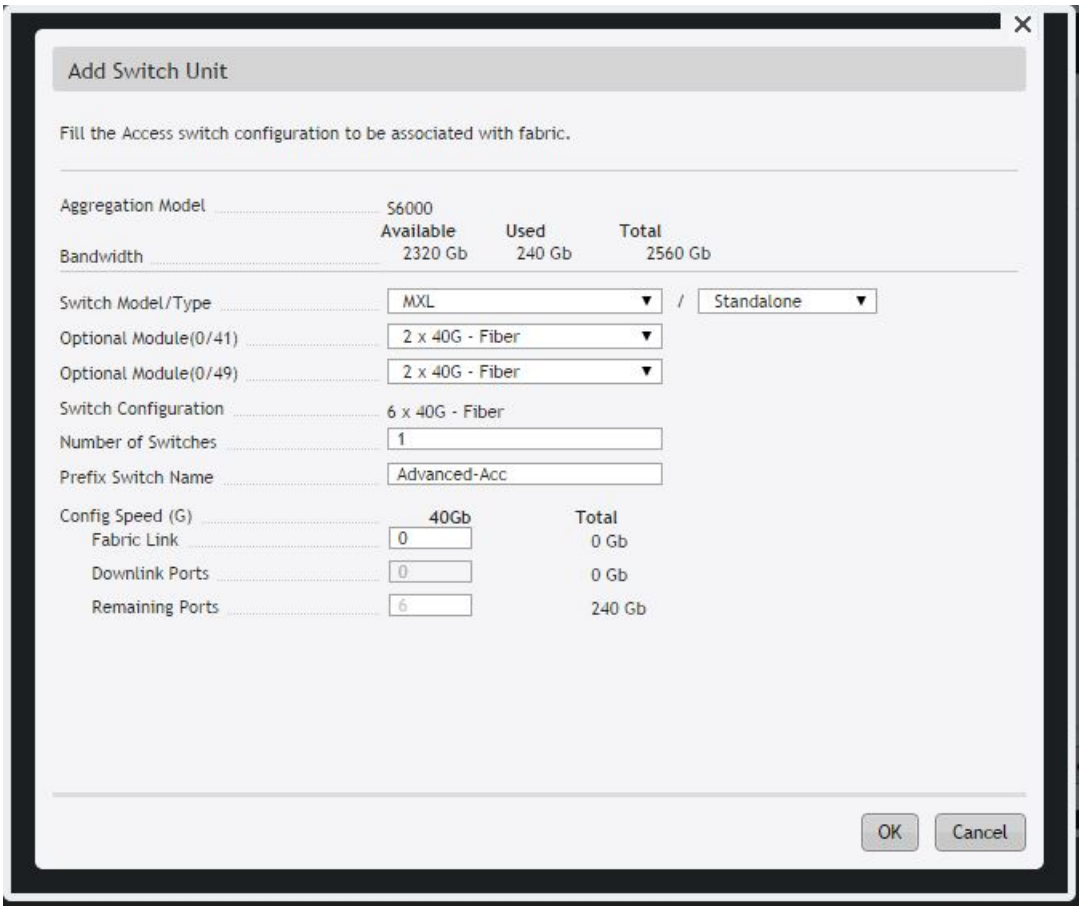


Figure 22. Add Switch Unit Window

NOTE: The information and options in the **Add Switch Unit** window vary based on the selected aggregation switch model.

2. Select a switch type from the **Switch Model** drop-down menu.
   - **S4810**
   - **S4820T**
   - **MXL**
   - **Z9000**
   - **S6000**
   - **S55**
   - **S60**

   NOTE: The switch type options vary depending on the aggregation model.
   - S55 and S60 are only available if S4810 is the aggregation model.
   - Z9000 and S6000 are only available if Z9000 or S6000 is the aggregation model.
3. Select a deployment mode from the **Type** drop-down menu:
   - **Standalone**
   - **Stack**

- **VLT**

NOTE: Z9000 and S6000 do not support stack mode.

4. (VLT mode only) Enter a value in the **Number of VLT pairs** field.

NOTE: Both switches in the VLT pair must be the same model type.

5. (MXL, S55, or S60) Select an optional module type from the first and second **Optional Module** drop-down menus:

NOTE: The first optional module menu name and options vary based on the access switch type and mode (standalone or stack). Refer to the following table for supported options.

Table 20. Access Config Optional Module Options

Switch type & mode	Optional Module	Supported Options
S55 (standalone)	0/48	2 x 10G — Fiber
	0/50	2 x 10G — Fiber
S55 (stack)	0/48	2 x 10G — Fiber
	0/50	2 x 12G — Fiber
S60 (standalone)	0/48	2 x 10G — Fiber
S60 (stack)	0/48	2 x 10G — Fiber
	0/50	2 x 12G — Fiber 1 x 24G — Fiber
MXL	0/41	2 x 40G — Fiber 4 x 10G — Fiber 4 x 10G — Copper
	0/48	2 x 40G — Fiber 4 x 10G — Fiber 4 x 10G — Copper
None		NOTE: Select this option if you don't have any optional modules in this slot.

6. (Stack mode only) Enter a value in the **Number of Stacking Switches** field.

NOTE: All switches in the stack must be the same model type.

7. (Stack mode only) Select a value from the **Number of Switches per Stack** drop-down menu.
   - **1**
   - **2**
8. (Standalone mode only) Enter a value in the **Number of Switches** field.
9. (Optional) Enter a custom prefix switch name. The default switch name is *FabricName*-Access.

NOTE: Only the name of the first switch in a stack can be changed. The other switch is appended (standby).

The name must be unique. The range is 1–16 characters. AFM supports the following character types:

- alphanumeric
- underscore (_)
- +

10. To allocate ports, enter a value in the appropriate field in the **Config Speed** section.
    - **Fabric Link**
    - **VLTi Link**
    - **Stack Ports**

    NOTE: Configure at least two fabric links.

    The **Remaining Ports** field displays the number of available ports. The **Total** column displays the amount of bandwidth in Gb allocated to each link type.

    The **Downlinks Ports** field displays the number of ports configured as downlinks during pre-deployment. The default is 0.
11. To save the current switch information, click **OK**.

    To close the window without saving information, click **Cancel**.
12. To go to the **Advanced Port Config** screen, click **Next**.

Editing Access Switch Information

1. Select a configured switch.
2. In the upper left of the **Advanced Access Config** screen, click **Edit**.

   The **Edit Switch Unit** window displays.

   NOTE: Depending on pre-deployment/deployment status, some options cannot be changed. Refer to Operations Allowed.
3. To save changes, click **OK**.

Removing Access Switches

1. Select a configured switch.
2. In the upper left of the **Advanced Access Config** screen, click **Delete**.
3. To confirm the switch deletion, click **Yes**.

Advanced Fabric Design — Port Configuration

To configure the proposed port numbers for uplinks, stack ports, VLTi links, and fabric links, use the **Advanced Port Config** screen. To export the data, click **Export**.

NOTE: Configure only one source port number per switch.

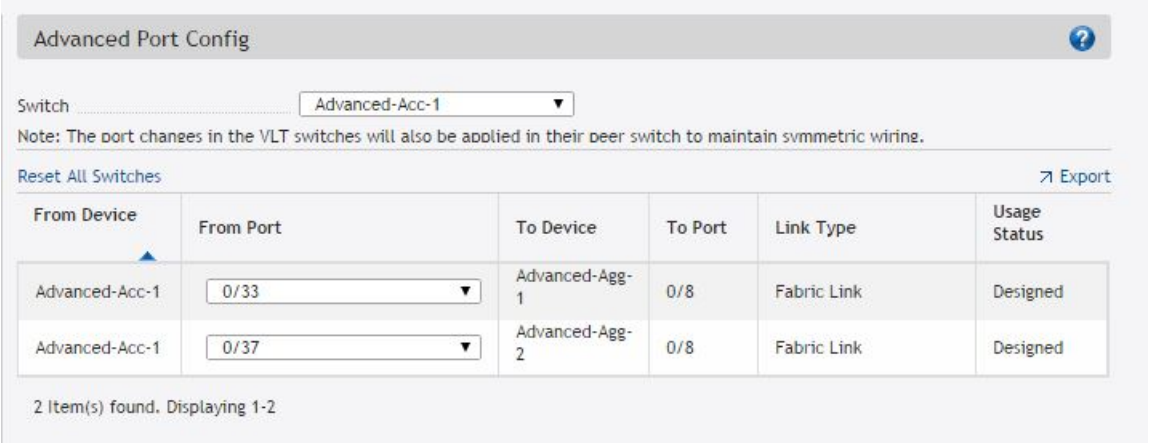


Figure 23. Advanced Port Config

1. Select a switch from the drop-down **Switch** menu.
2. For each device, select a port from the drop-down **From Port** menu.

   NOTE:
   - To reset all switches to original port configurations, click **Reset All Switches**.
   - For switches that are not pre-deployed, the drop-down menus display both used and available ports. For pre-deployed switches, only available ports display.
   - If you change aggregation or access information, AFM resets port configurations.
   - If you change port information for either of the VLT switches, AFM updates the port configuration in the other switch in the pair to maintain symmetry.
3. To validate the port configurations, click **Next**. If AFM finds errors, you must correct them to continue to the **Output** screen.

Fabric Design — Viewing and Exporting Output

To view the graphical wiring, tabular wiring, and network topology wiring plans for your fabric design, use the **Output** screen. Use the wiring plan as a guide for installing your equipment into the fabric. Based on the configuration, AFM calculates the number of switches required for the design and displays a physical wiring plan in PDF or Microsoft Visio® 2010 format that you can export and print. The wiring plans display the switches and links for current and future expansion and the cabling maps (the connections between the switches). Review the wiring plan and then export it to a file.

After the fabric design is approved, provide the wiring plan to the data center operator to build the physical network according to the fabric design.

1. Navigate to the **Network > Design Fabric > New Fabric > Output** screen.
2. Click the type of wiring plan that you want to export: **Wiring** (Graphical or Wiring), or **Network Topology** (Graphical or Tabular format).
3. Use the arrow buttons to view additional pages or enter the page number in the page number entry field to the left of the arrow buttons.
4. Click **Export** .

   The **Generate Wiring Plan** window displays.
5. Specify the following export options.

- **PDF** — Table, Data, Graphical Wiring Plan, or Both.
- **Visio** — Network Topology.

6. Click **Generate**.

   The output displays in the selected format.

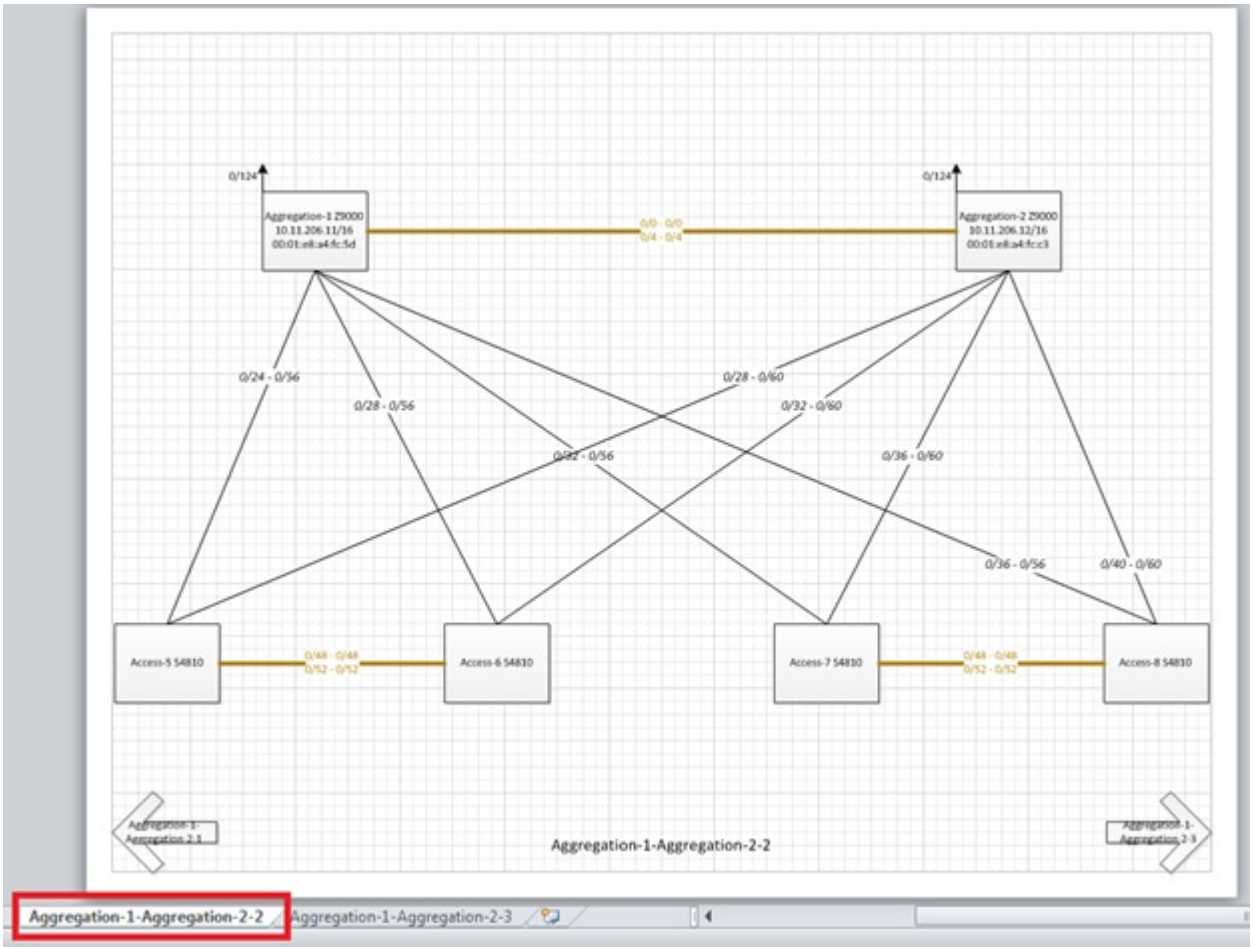


Figure 24. Example: Visio Output

Output Types

Network Topology

- **Graphical Network Topology** — View information about how the switches are connected physically using a topology map. By default, no links are displayed in the fabric. To display the links in the fabric, click a switch.
  - If you select a switch, all the fabric interlinks display.
  - If you select a spine switch, the links to the leaf switches display.
  - If you select an aggregation switch, the links to the access switches display.
  - If you select a leaf switch, the links to the spine switches display.

– If you select the access switches, the links to aggregation switches display.
– If you select the core switches, the links to all the switches in the fabric (aggregation and access) display.

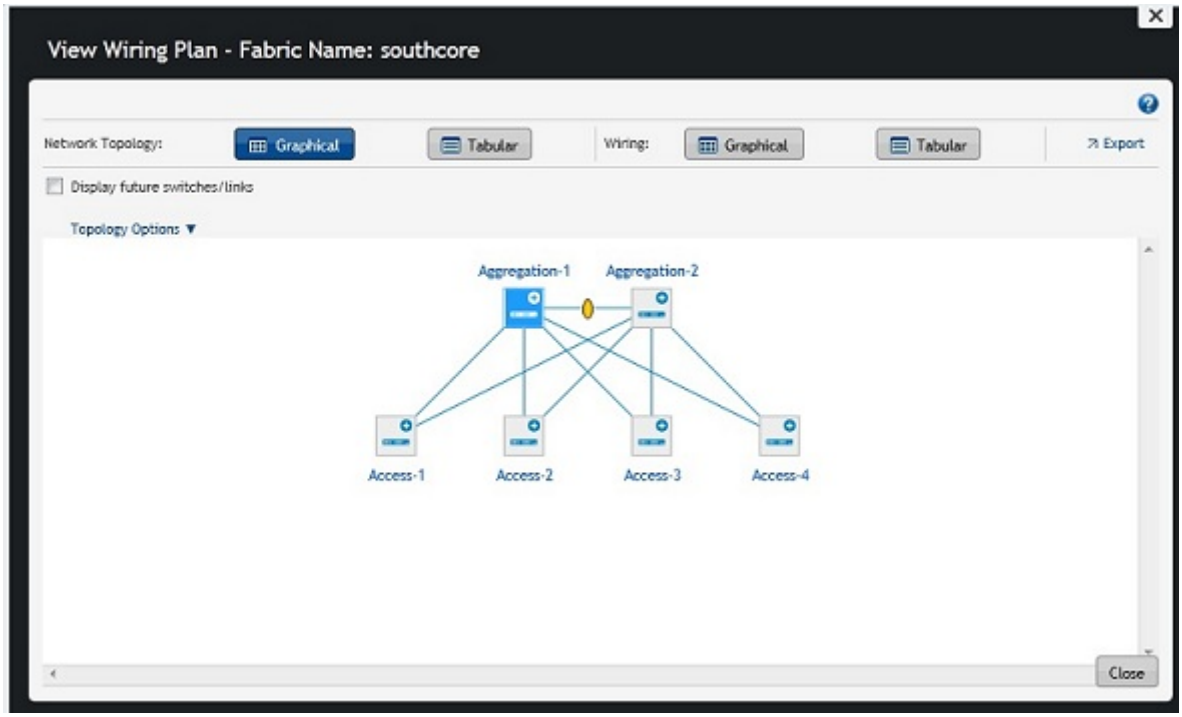


Figure 25. Graphical Network Topology

- **Tabular Network Topology** — View information about the network topology in a tabular format, including switch names, model types, role (aggregation or access), and usage status (designed or deployed).

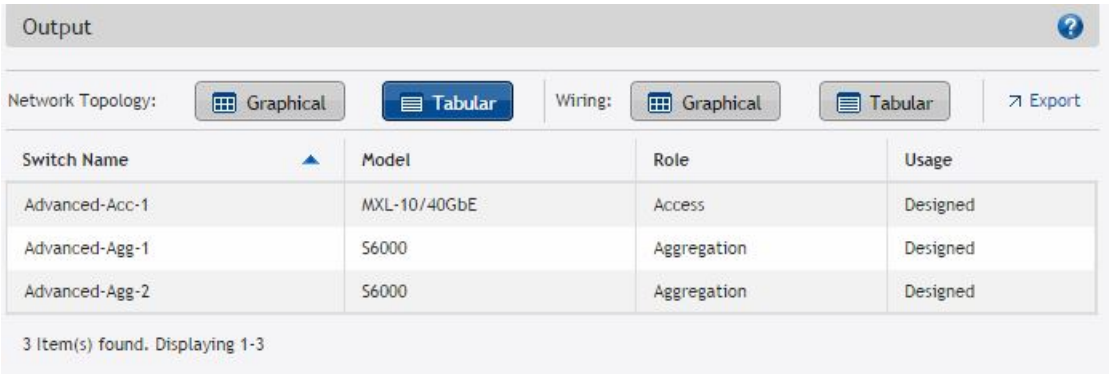


Figure 26. Tabular Network Topology

Wiring

- **Graphical Wiring Plan** — View a diagram of each switch, including uplinks, downlinks, and port numbers, in the fabric. This includes information for designed switches that have not been deployed, deployed switches, and planned capacity.

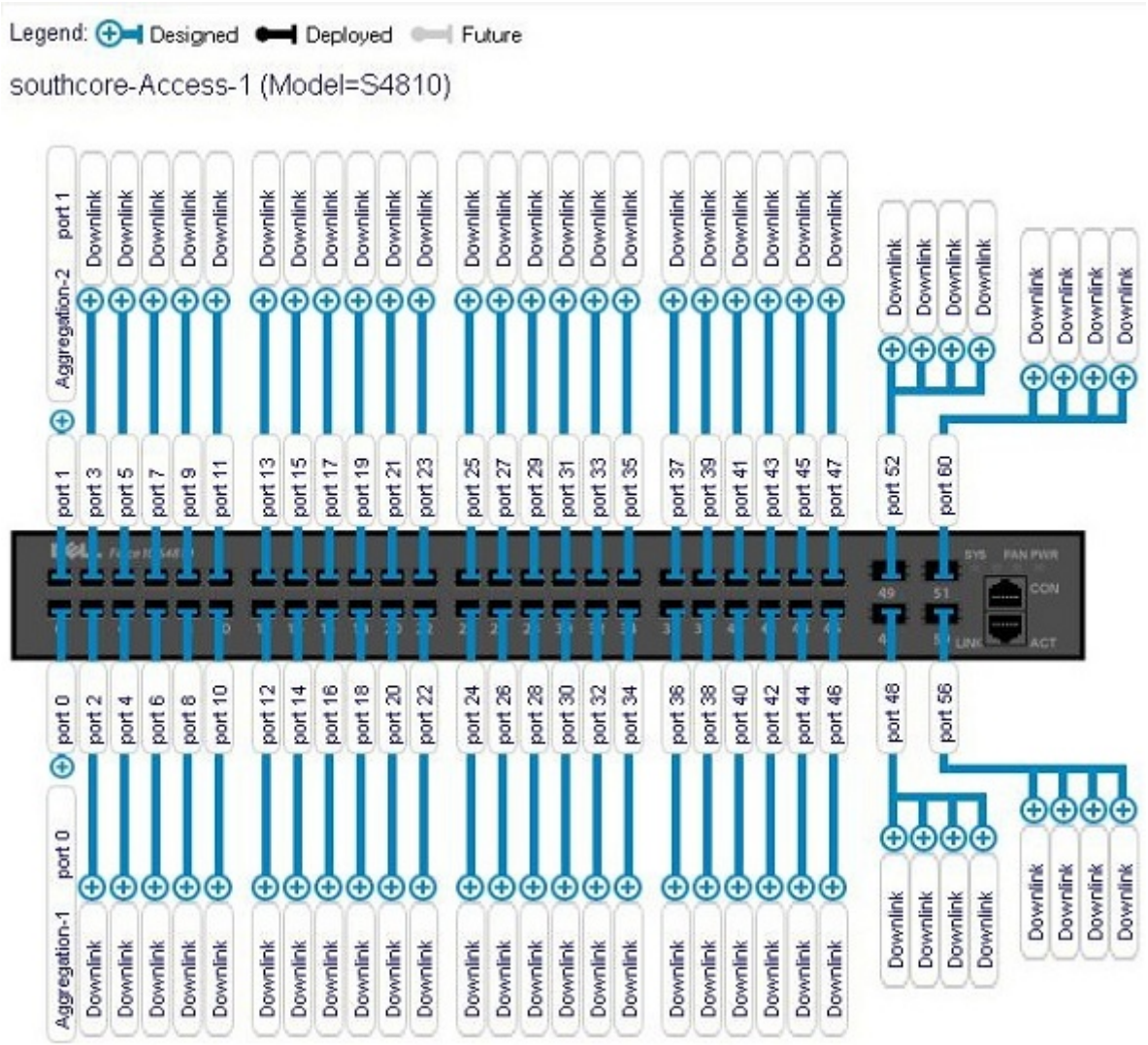


Figure 27. Graphical Wiring Plan

- **Tabular Wiring Plan** — Displays information about how the switches are connected in the fabric in a tabular format, as shown below. The tabular wiring plan contains a list of switches, their names, link types, and the ports that connect to ports of other switches in the fabric.

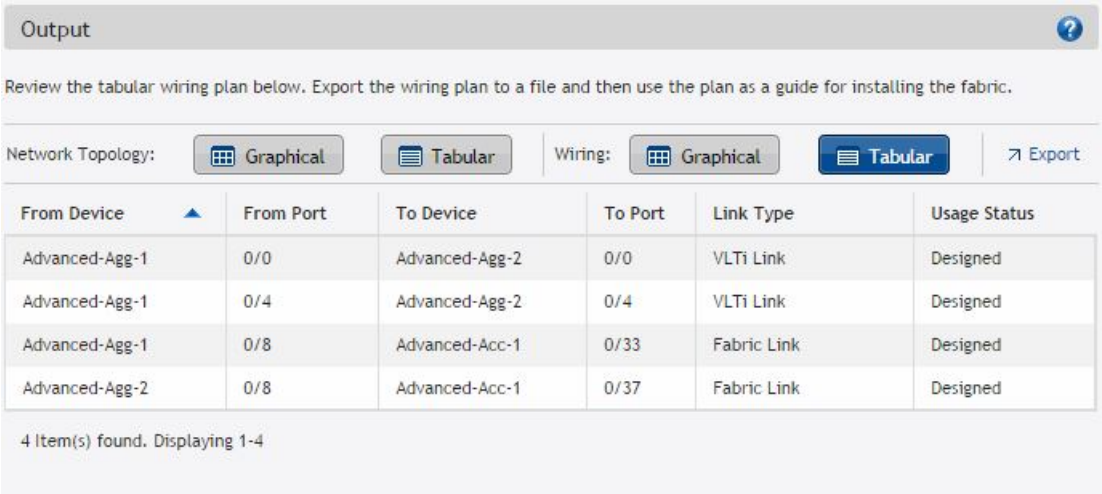


Figure 28. Tabular Wiring Plan

Field Name	Description
From Device (Switch)	Displays the name of the device from the side.
From Port	Displays the port number on the switch from the side.
To Device (Switch)	Displays the name of the device to the side.
To Port	Displays the port number on the device to the side.
Link Type	Displays the type of link (VLTi, Fabric, or Stack link)
Usage Status	– Designed – Deployed

Fabric Design – Summary

The **Summary** screen displays a summary of your fabric design.

1. Click one of the following export options:
   - **Export Wiring Plan**
   - **Export Summary**
   - **Export Design**
2. Select a display format:
   - **PDF** (**Table Data**, **Graphical Wiring Plan**, **Both**)
   - **Visio**
3. Click **Generate**.
4. Review the design carefully before committing the changes.
5. Click **Finish** to commit your changes.

Next Steps

To prepare the fabric for deployment:

1. Check with your system administrator for the TFTP or FTP IP address. To stage the switch software images, use this address. When you prepare the software images:
   - Make sure that the software version is the same for each switch type in the fabric.
   - Download the software image for each type of Dell Networking switch.
   - Stage the software images on the TFTP or FTP site.
2. Obtain a pool of management IP addresses for the switches in the fabric from the lab or system administrator .
3. Prepare the DHCP server so that the switches can be assigned a management IP address.
4. Download the **.csv** file that has the switches' system MAC addresses provided by Dell Networking, if available. If this file is not available, record the system MAC addresses of the switches in the fabric so that you can associate the address to the appropriate switch before you rack the switches.
5. Print the wiring plan and use it to rack and cable the hardware.
6. Document the location of the switches, including the rack and row.
7. Select the fabric for pre-deployment on at the **Network >** *Fabric Name* > **Configure and Deploy** > **Pre-deployment Configuration** screen.

Using Existing Fabric Designs

From the **Home > Getting Started** screen, you can :

- Import an existing design
- Edit an existing design
- Delete a fabric

Importing an Existing Fabric Design

1. Navigate to the **Home** > **Getting Started** screen.
2. Click **Importing Existing Design**.
   The **Import Existing Design** screen displays.
3. In the **Fabric XML file** area, click **Browse** and locate the fabric XML design file that you have exported from the AFM design wizard.
4. Click **Upload**.

Editing and Expanding an Existing Fabric Design

You can edit or expand an existing fabric from the **Getting Started** screen. After you initiate the pre-deployment configuration, you can only update the fabric description and port count for expanding uplinks and downlinks.

1. Navigate to the **Home** > **Getting Started** screen.
2. Click **Edit Existing Fabric**.
   The **Select a Fabric** screen displays.
3. Select a fabric to edit and then click **OK**.
   The **Fabric Designer** wizard displays.
4. Edit the fabric.

Deleting the Fabric

1. Navigate to the **Network** screen.
2. Select the **Design Fabric** tab.
3. Select the fabric to delete.
4. Click **Delete Fabric** .

Viewing the Wiring Plan

1. Navigate to the **Network** > **Design Fabric** screen.
2. Select the fabric and then click **View Wiring Plan**.
3. To display future switches and links, click **Display future switches/links**.
4. Click one of the following options:
   - **Tabular Wiring Plan**
   - **Graphical Wiring Plan**
   - **Network Topology Plan**
   - **Network Topology Tabular Plan**
5. Use the arrow buttons to view additional pages or enter the page number in the page number entry field to the left of the arrow buttons.
6. Click **Export** to export the wiring plan.

6

IOA Fabric Designer Wizard

To design a Layer 2 fabric that has an I/O Aggregator (IOA) blade switch in a M1000e chassis, use the IOA fabric design wizard. AFM supports IOA in standalone mode only.

1. To verify that the IOA blade switch is in standalone mode (default mode), use the following CLI command:

   ```
   show system stack-unit iom-mode
   ```

   For more information about this command, refer to the *Dell PowerEdge Command Line Reference Guide for the M I/O Aggregator*.

2. Navigate to the Fabric Design Wizard on the **Network** > **Design Fabric** screen.

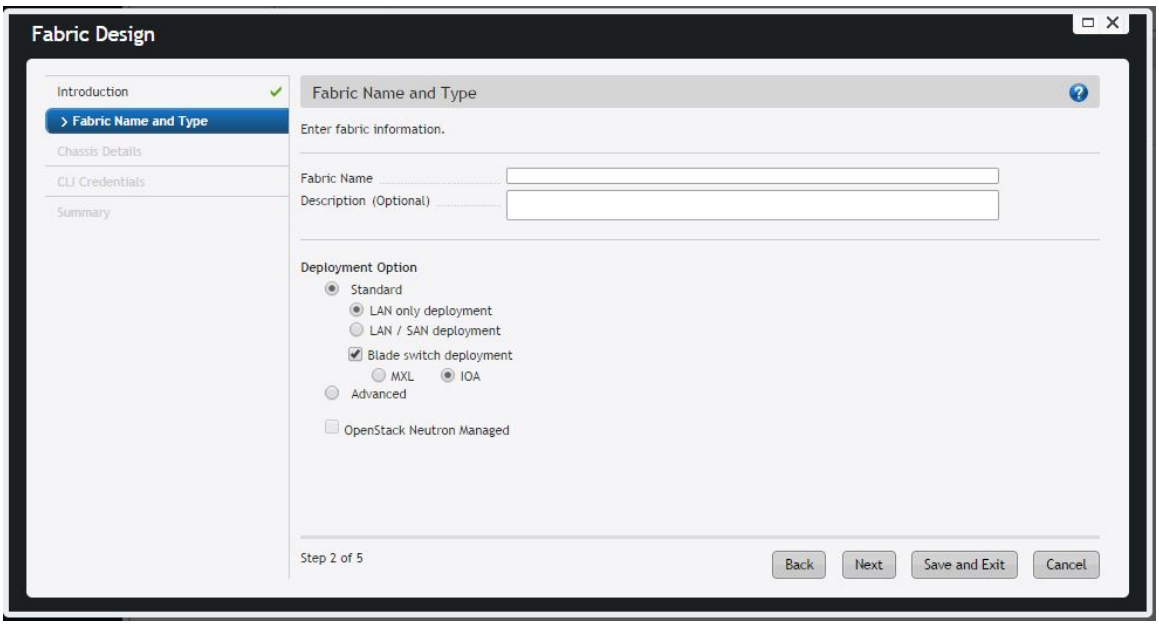


Figure 29. IOA Fabric Design

NOTE: If you are designing a fabric without an IOA blade switch, refer to Using the Fabric Design Wizard..

3. Click **New Fabric**.

   The **Introduction** screen displays.

   NOTE: Click **Save & Exit** to save the current information and exit the wizard or click **Cancel** to exit the wizard without saving the current information.

4. Review the introduction and click **Next**.

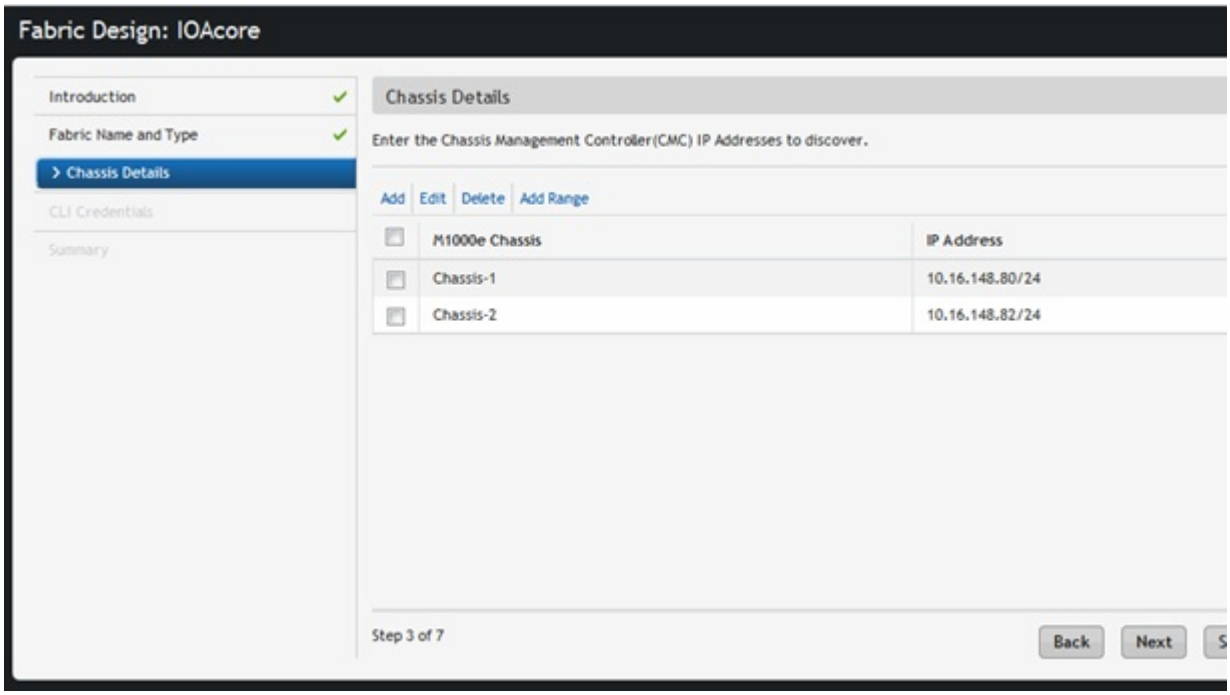
   The **Fabric Name** screen displays.

5. On the **Fabric Name and Type** screen, select the **Blade Switch Deployment** checkbox, then select the **IOA** radio button.
6. Click **Next**.

   The **IOA Fabric Design wizard** displays.
7. Click **Next**.

   The **Chassis Details** screen displays.

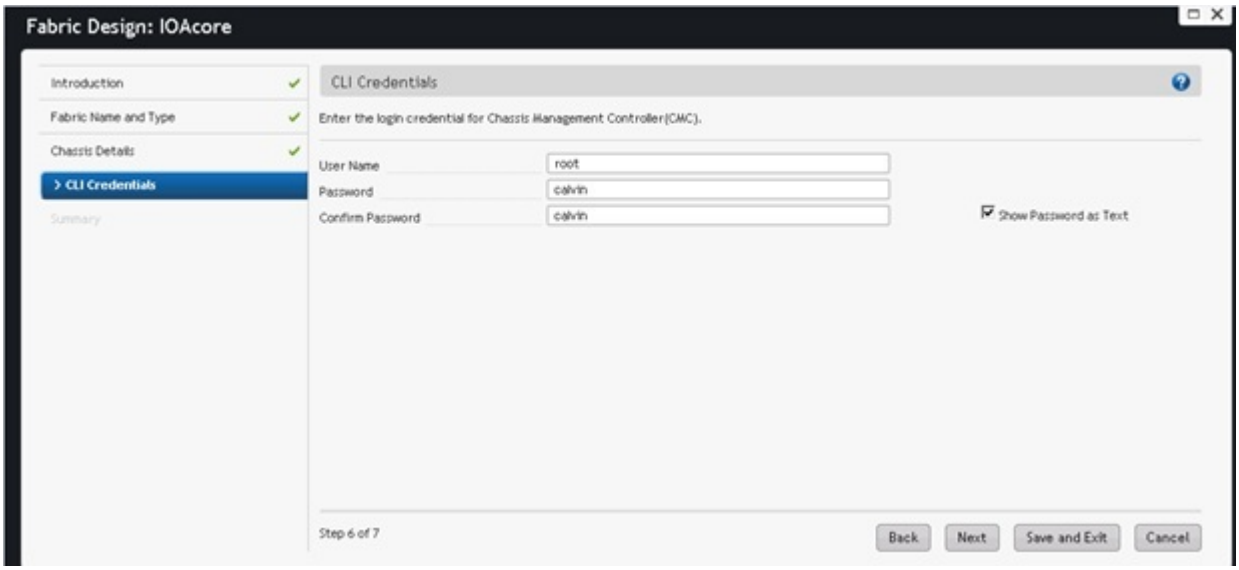
   Figure 30. IOA Fabric Design Wizard — Chassis Details Screen



8. Enter the Chassis Management Controller (CMC) IP addresses to include in the fabric.
   - **Add** — Enter the chassis IP address in the first field and the prefix in the field after the slash and click **OK**. To close the window without adding the IP address, click **Cancel**.
   - **Edit** — Edit information for a specific chassis by selecting the checkbox for that chassis then clicking **Edit**. After changing the IP address, click **OK**. To close the window without saving changes, click **Close**.

     NOTE: You cannot edit information for multiple chassis simultaneously.
   - **Delete:** — Check the checkbox for the chassis that you want to delete, then click **Delete**. To confirm the deletion, click **Yes**. To cancel the deletion, click **No**.
   - **Add Range** — Enter the chassis ID in the **Number of M1000e Chassis** field. Enter the first IP address in the range in the **Start IP Address/Prefix** field. Enter the prefix in the field after the slash. To add the range, click **OK**. To close the window without adding the IP range, click **Cancel**.
9. Click **Next**.

   The **CLI Credentials** screen displays.



10. Enter the user credentials for the CMC.

    This information is used to log in to all CMCs in the fabric. By default, the **CLI Credentials** screen uses the following CLI credentials:

    - username — `root`
    - password — `calvin`

    If you have changed the CLI credentials, update these fields with the new information.

    a. Enter the user name in the **User Name** field.
    b. Enter the password in the **Password** and **Confirm Password** fields.

    NOTE: To unmask the CLI credentials, check the **Show Password as Text** checkbox.

11. Click **Next**.

    The **Summary** screen displays. The design summary screen shows the added chassis number and IP addresses, and CLI credentials.

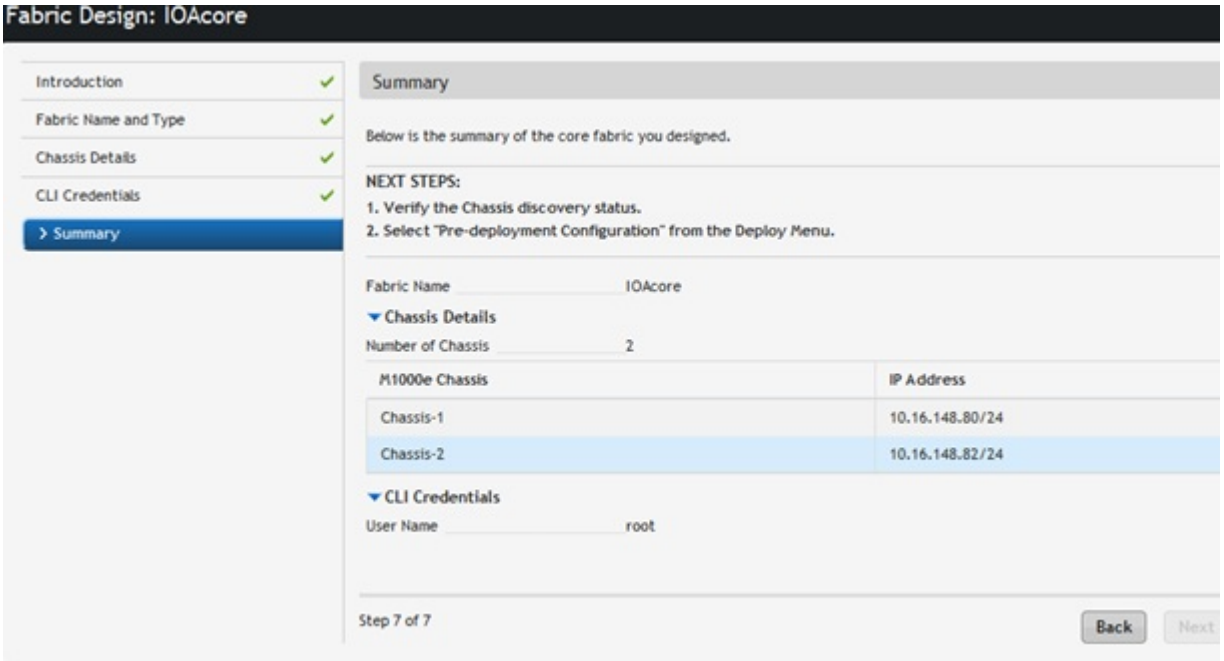


Figure 31. IOA Design Summary Screen

12. Review the fabric design information on the **Summary** screen. To confirm the information, click **Finish** .

    The **Discovery Confirmation** screen displays.

13. Click **Yes** to start the fabric discovery process. The **Discovery Status** screen displays detailed information about the installed IOA blade switches in the M1000e chassis. For information about the Discover Status screen, refer to Discovery Status Screen.

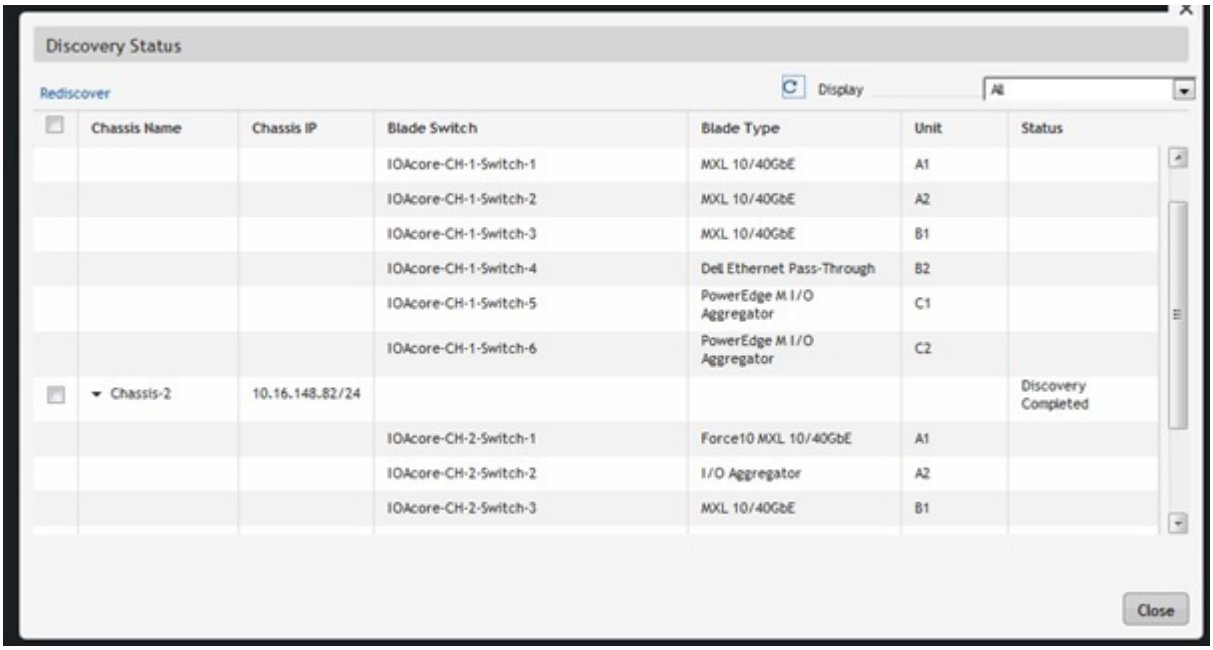


Figure 32. IOA Discover Status Screen

14. After the IOA fabric is successfully discovered, complete the pre-deployment configuration. For information about IOA pre-deployment configuration, refer to IOA Pre-deployment Wizard.

7

Configuring and Deploying the Fabric

After creating a fabric on the **Network** > **Design Fabric** > **New Fabric** screen, configure and deploy the fabric on the **Network** > *Fabric Name* > **Configure and Deploy** screen. This screen deploys the configuration to the switches in the fabric, as well as auto-generated and custom configurations. This screen contains the following options:

- **Deploy Fabric** — Prepares the fabric for deployment and deploys the fabric.
  - Pre-deployment Configuration

    For information about using the pre-deployment wizard for an IOA fabric, see IOA Pre-deployment Wizard
  - Deploying and Validate
  - View DHCP Configuration
- **Errors** — Displays errors in the fabric.

  Related Links:
  - Deployment and Validation Errors
  - Troubleshooting
- **CLI Configuration** — Uses CLI commands for template and custom configuration.
  - Manage Templates
  - Associate Templates
  - Custom Configuration
  - Viewing Custom Configuration History
- **View Wiring Plan** — Displays the wiring plan in tabular, network topology, and graphical formats, which can be exported.

Related Links:

- Pre-deployment Configuration
- Using the Pre-deployment Configuration Wizard. For information about using the pre-deployment wizard for an IOA fabric, refer to IOA Pre-deployment Wizard.

Pre-deployment Configuration

In the **Step 2: Pre-deployment Configuration** section of the **Getting Started** screen:

- To automatically discover MAC addresses and the locations of the devices in the fabric, click **Device MAC Association**, select a fabric, and click **OK**. For more information, refer to Device MAC Association.
- To use the wizard to complete the pre-deployment process, click **Pre-deployment Configuration**, select a fabric, and click **OK**. For more information, refer to the following subsections.

IOA Fabric Pre-deployment

To prepare the IOA fabric for deployment, complete the following tasks using the **Pre-deployment Configuration** wizard.

1. Pre-deployment IOA – Management IP
2. Pre-deployment IOA – VLAN Configuration
3. Pre-deployment IOA – SNMP and CLI Credentials
4. Pre-deployment IOA – Software Images
5. Pre-deployment IOA – Summary

Layer 2 VLT/ Advanced Fabric Pre-deployment

To prepare the Layer 2 VLT or Advanced fabric for deployment, complete the following tasks using the **Pre-deployment Configuration** wizard.

NOTE: The pre-deployment processes for a Layer 2 VLT standard fabric and for an advanced fabric are similar. The exceptions are the **Storage Facing Ports** screen applies only to standard fabric pre-deployment and the **Change Port Status** screen applies only to advanced fabric pre-deployment.

1. Protocol Configuration for a Layer 2 VLT fabric:
    a. Pre-deployment L2 VLT – Uplink Configuration
    b. Pre-deployment L2 VLT – VLAN Configuration
    c. Pre-deployment L2 VLT – Port Channel Configuration
    d. Pre-deployment L2 VLT – Storage Facing Ports (Standard Fabric only)
    e. Pre-deployment L2 VLT – VLAN Mapping
2. Pre-deployment - Change Port Status (Advanced Fabric only)
3. Pre-deployment – Assign Switch Identities
4. Pre-deployment – Management IP
5. Pre-deployment – SNMP and CLI Credentials
6. Pre-deployment – Software Images
7. Pre-deployment – DHCP Integration
8. Pre-deployment – Summary

Layer 3 Distributed Core Fabric Pre-deployment

To prepare the Layer 3 Distributed Core fabric for deployment, complete the following tasks using the **Pre-deployment Configuration** wizard.

1. Protocol Configuration for Layer 3 fabric:
    - Pre-deployment L3 DC – Fabric Link Configuration
    - Pre-deployment L3 DC – Uplink Configuration

- Pre-deployment L3 DC – Downlink Configuration

2. Pre-deployment – Assign Switch Identities
3. Pre-deployment – Management IP
4. Pre-deployment – SNMP and CLI Credentials
5. Pre-deployment – Software Images
6. Pre-deployment – DHCP Integration
7. Pre-deployment – Summary

Layer 3 with Resiliency (Routed VLT) Pre-deployment

To prepare the Layer 3 with Resiliency (Routed VLT) fabric for deployment, complete the following tasks using the **Pre-deployment Configuration** wizard.

1. Protocol Configuration for Layer 3 fabric:
   - Pre-deployment L3 Routed VLT – Fabric Link Configuration
   - Pre-deployment L3 Routed VLT – Uplink Configuration
   - Pre-deployment L3 Routed VLT — VLAN Configuration
   - Pre-deployment L3 Routed VLT – Port Channel Configuration
   - Pre-deployment L3 Routed VLT – VLAN Mapping
2. Pre-deployment – Assign Switch Identities
3. Pre-deployment – Management IP
4. Pre-deployment – SNMP and CLI Credentials
5. Pre-deployment – Software Images
6. Pre-deployment – DHCP Integration
7. Pre-deployment – Summary

Device MAC Association

NOTE: Device MAC association does not support S55 or S60.

To automatically discover MAC addresses for devices, use the **Device MAC Association** screen. In the Pre-deployment wizard, you must manually enter the MAC address of each device. After using Device MAC Association, AFM lists the applicable MAC addresses for each device in the fabric for your selection.

In previous versions of AFM, the MAC address for each device in the fabric had to be loaded manually in the **Pre-Deployment** wizard. If a **.csv** file was used, each MAC address had to be manually matched with the correct device. **Device MAC Association** automatically discovers MAC addresses for devices in the fabric. If you use Device MAC Association, you do not need to upload a **.csv** file or enter the MAC addresses manually.

NOTE:

- Use Device MAC Association on only one fabric at a time. If you select a fabric for Device MAC Association and then try to select a different fabric while Device MAC Association is in progress , the following message displays:

  `MAC discovery already enabled for the fabric "`*`FabricName`*`". Do you want to disable it and enable MAC discovery for the current fabric?`

  To disable Device MAC Association for the first fabric and enable it on the current fabric, click **Yes**. To leave Device MAC Association enabled on the first fabric and cancel it for the current fabric, click **No**.
- Device MAC Association is only available for fabrics that have not been pre-deployed or deployed. After you pre-deploy or deploy a fabric that uses Device MAC Association, AFM disables Device MAC Association for that fabric to help prevent IP address conflicts.

Before using Device MAC Association:

- Complete the fabric design
- Download the wiring diagram
- Complete the wiring according to the wiring diagram

Using Device MAC Association

1. On the **Getting Started** tab, in the **Step 2: Pre-deployment Configuration** section, click **Device MAC Association**.

   The **Select a fabric** window displays.

   NOTE:

   You can also access Device MAC Association by going to the **Network >** *FabricName* > **Configure and Deploy** screen. From the drop-down **Deploy Fabric** menu, select **Device MAC Association**.
2. Select a fabric and click **OK**.

   The **Introduction** screen displays.

   NOTE: You can also access Device MAC Association by going to the **Network >** *FabricName* > **Configure and Deploy** screen. From the drop-down **Deploy Fabric** menu, select **Device MAC Association**.
3. Read the introduction and click **Next**.

   The **IP Configuration** screen displays.

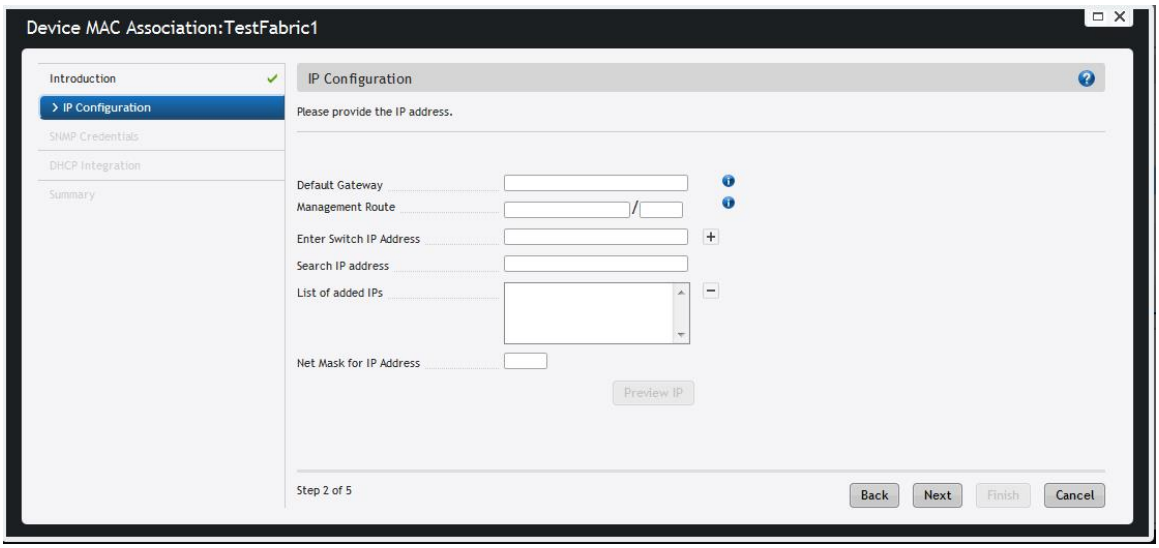


Figure 33. Device MAC Association — IP Configuration

4. Enter the default gateway in the **Default Gateway** field.
5. Enter the management route in the **Management Route** field. Enter the netmask in the **/** field.
6. Enter the switch's IP address in the **Enter Switch IP Address** field and click the **+** button. Repeat for any additional switches.

   NOTE: You can add an individual IP address or IP address with a subnet or a range (for example: `10.16.133.1-150`).

   - To search for a previously entered IP address, enter a portion of or the entire IP address in the **Search IP address list:** field. The software displays all IP addresses that match the search term in the **List of added IPs** field. If you do not enter a search term, all known IP addresses display.
   - To remove an IP address from the displayed list, select the IP address and click the **—** button.
   - To view a list of all IP addresses selected for device MAC association, click **Preview IP**. The **Preview IP** screen displays only the devices participating in the discovery. To view additional pages, use the arrow buttons or enter the page number in the page number entry field to the left of the arrow buttons.

Figure 34. Preview IP Address Window

7. Add at least one IP address to the **List of added IPs:** field.
8. Enter the netmask in the **Net Mask for IP Address** field (for example: `24`). The netmask range is 8–30.
9. To go to the SNMP Credentials screen, click **Next**.

SNMP Credentials

NOTE: AFM populates the CLI and SNMP credentials from the Administration settings.

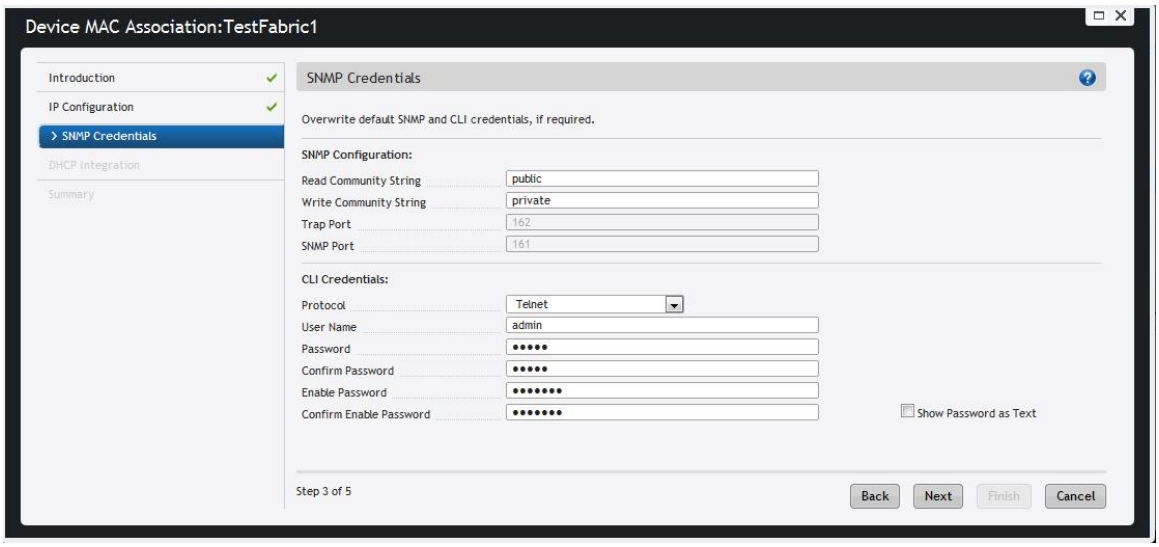


Figure 35. Device MAC Association — SNMP Credentials

1. In the **Read Community String** field, enter the read community string (for example, `public`).
2. In the **Write Community String** field, enter the write community string (for example, `private`).
   The trap port and SNMP port numbers display as read-only fields.
3. From the **Protocol** drop-down menu, select one of the following protocols:
   - **Telnet**
   - **SSHv2**

   NOTE: AFM automatically enters the default credentials for the username, password, and enable password. To unmask the passwords, check the **Show Password as Text** checkbox.
4. Click **Next**.
   The **DHCP Integration** screen displays.

DHCP Integration

NOTE: If you are using a local DHCP server, you do not need to make any changes on this screen. If you are using a remote DHCP server, download the DHCP config file from the AFM server, upload it to the remote DHCP server, and restart the remote server. For more information, refer to DHCP Integration and *DHCP Settings* in Administrative Settings .

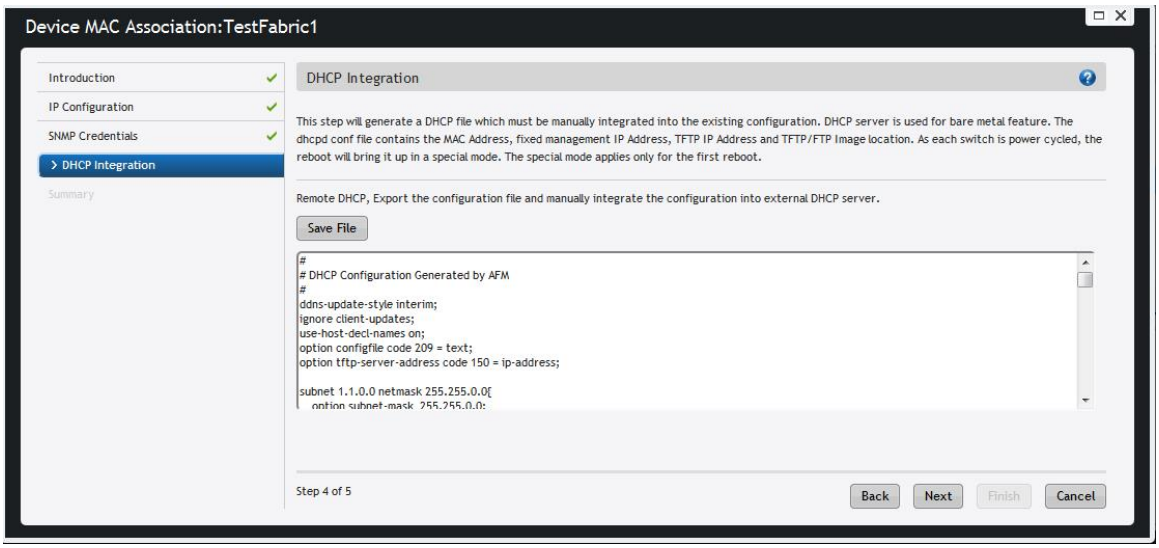


Figure 36. Device MAC Association — DHCP Integration

1. Click **Save to ...** and specify the location for the generated DHCP configuration file or copy and paste the configuration into the DHCP server.
2. Verify the TFTP or FTP file transfer for the DHCP configuration file is successful and verify the CLI and SNMP information on the **Summary** screen, then click **Finish**.

After completing the **Device MAC Association** wizard:

1. Enable BMP on all devices.
2. Go to the **Network >** *FabricName* > **Configure and Deploy** screen. From the drop-down **Deploy Fabric** menu, select **Device MAC Association Status** and verify the Device MAC Association completes successfully.

Viewing Device MAC Association Status
The Device MAC Association Status screen displays detailed information for the IP address list generated by the Device MAC Association wizard, including the following:

- IP address
- Associated Name
- Vendor
- Model
- MAC Address
- Serial Number
- Status & Description
- Reason

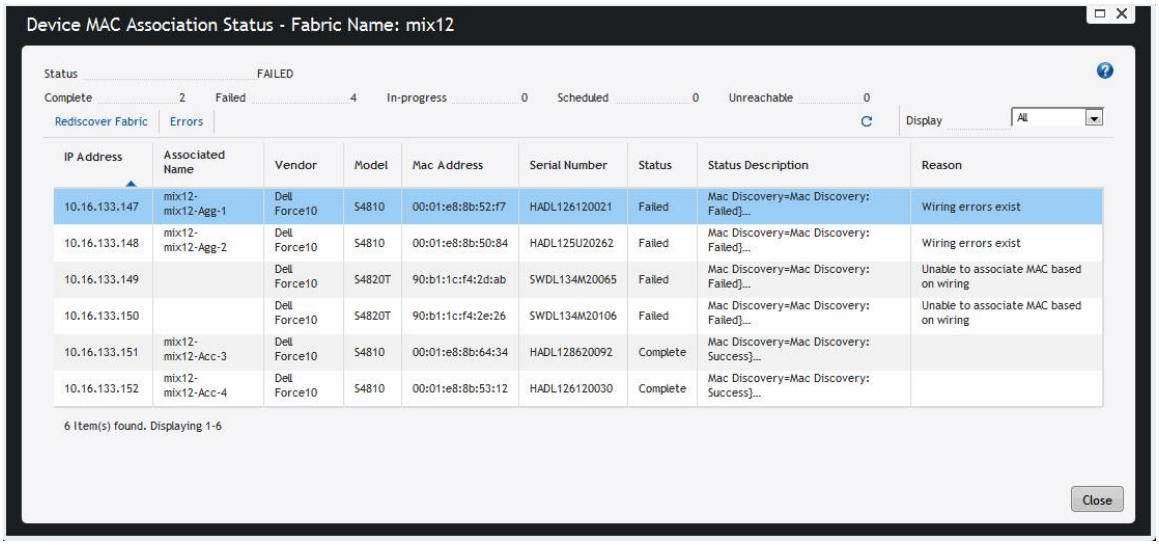


Figure 37. Device MAC Association Status Screen

If the wiring is correct, AFM automatically populates the **Associated Name** column. If the wiring is not correct, this column is blank. If wiring errors exist, AFM displays the cause in the **Reason** column.

IOA Pre-deployment Wizard

IOA Pre-Deployment Screens

To provide the minimum configuration for a IOA fabric, use the following IOA Pre-deployment screens. These screens automate the IOA deployment process. For more information, refer to Using the Pre-deployment Configuration Wizard.

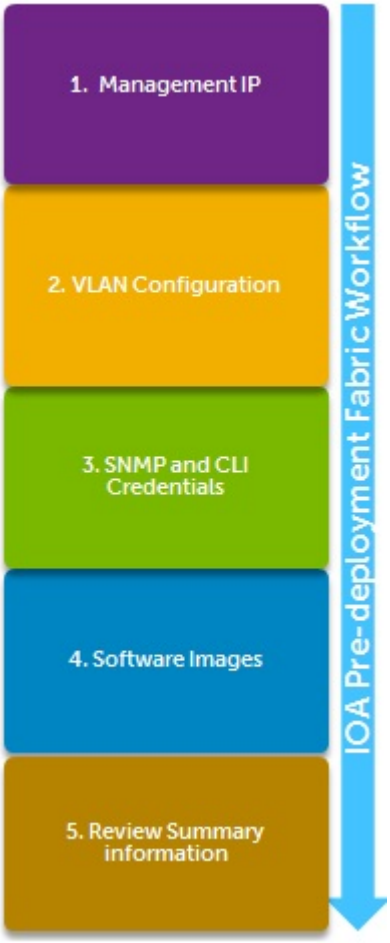


Figure 38. IOA Pre-deployment Workflow

- **Management IP** — Displays all the IOA blades available in the discovered chassis. If the discovered chassis is configured with an IP address, AFM populates with the IP address that you can edit.
- **VLAN Configuration** — Apply a VLAN to the Layer 2 VLT. Include at least one VLAN configuration.
- **Software Images** — Specifies the TFTP or FTP address (local or remote server) and the path of the FTOS software image download to each type of switch. To stage the software, use this address.
- **SNMP and CLI Credentials** — Configures SNMP and CLI credentials at the fabric level. Configure SNMP so that AFM can perform SNMP queries on the switches in the fabric. It is pre-populated with the default IOA credentials (username `root`, password `calvin`).
- **Summary** — Displays the fabric name and location of the software image.

The pre-deployment configuration for IOA consists of the following tasks:

- Pre-deployment IOA - Management IP
- Pre-deployment IOA - VLAN Configuration
- Pre-deployment IOA - SNMP and CLI Credentials
- Pre-deployment IOA - Software Images
- Pre-deployment IOA - Summary

For information about IOA pre-deployment error messages, refer to IOA Pre-deployment Error Messages.

Pre-deployment (IOA) – Management IP

Before you begin:

1. Review the IOA Pre-deployment Wizard information.
2. Insert the IOA blade switch into the M1000e chassis.
3. Make sure that the IOA blade switch is in standalone mode (default mode) using the following FTOS CLI command: `show system stack-unit <unit-number> iom-mode`

   For more information about this command, refer to the *Dell PowerEdge Command Line Reference Guide for the M I/O Aggregator*.
4. Obtain the Chassis Management Controller (CMC) M1000e chassis IP address. Use this address to discover all the IOA switch blades in the CMC chassis.

   NOTE: For a description of each IOA Pre-deployment screen, refer to IOA Pre-deployment Wizard

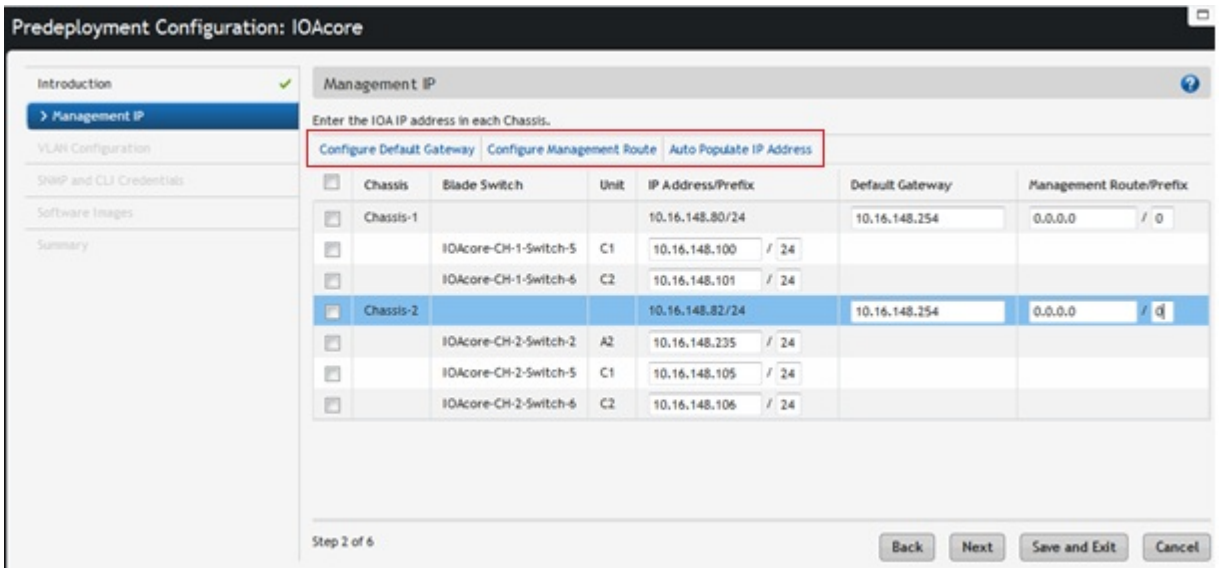


Figure 39. IOA Pre-deployment Management IP Address Screen

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration** .

   The pre-deployment **Introduction** screen displays.
3. On the **Introduction** screen, review the useful information that you need to gather before you begin.
4. Click **Auto Populate IP Address** and enter the starting IP address and prefix in the **Start IP Address/ Prefix** field.
5. Click the **Configure Default Gateway** link and then enter the address of the default gateway for the management interface.
6. Click the **Configure Management Route** link and enter the IP address used by the management route. Enter the gateway prefix in the field after the slash.
7. Click **Next** to go to the **VLAN Configuration** screen.

Pre-deployment (IOA) – VLAN Configuration

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.

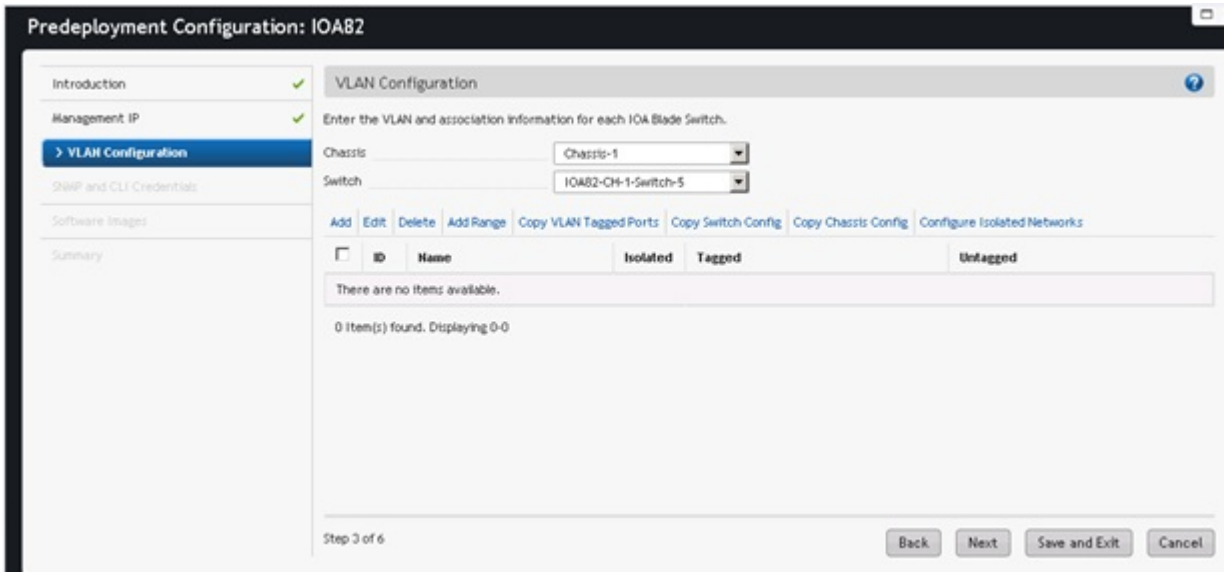


Figure 40. IOA Pre-deployment VLAN Configuration

2. From the **Deploy Fabric** pull-down menu, select **Pre-deployment Configuration**.
   The pre-deployment **Introduction** screen displays.
3. Navigate to the **VLAN Configuration** screen.
4. From the **Chassis** drop-down menu, select a chassis name that you want to configure.
5. From the **Switch** drop-down menu, select the name of the switch that you want to configure.

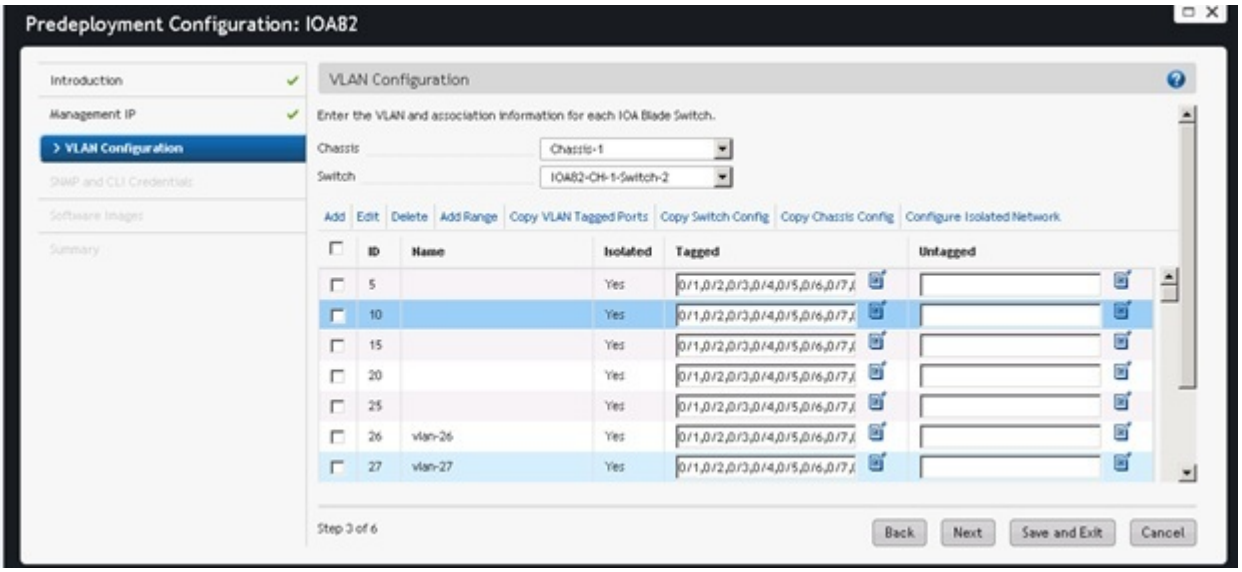
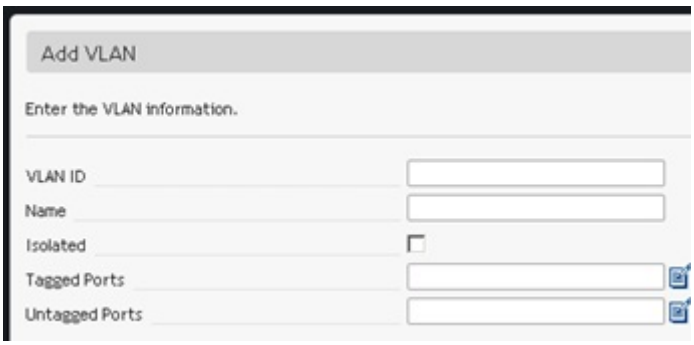
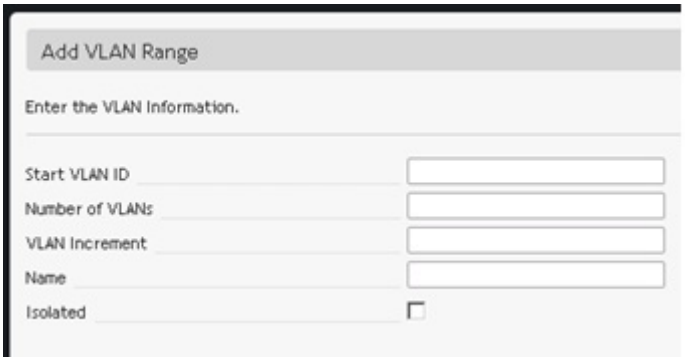
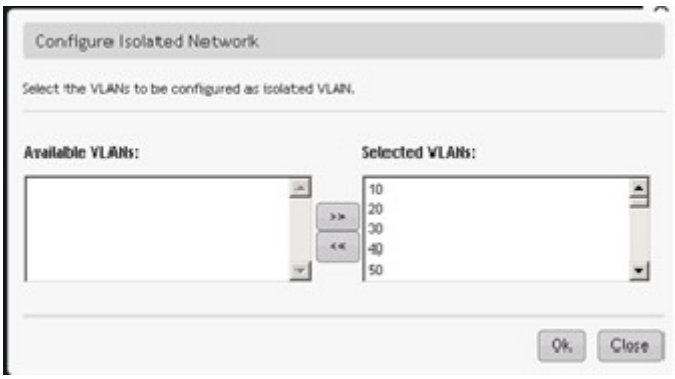
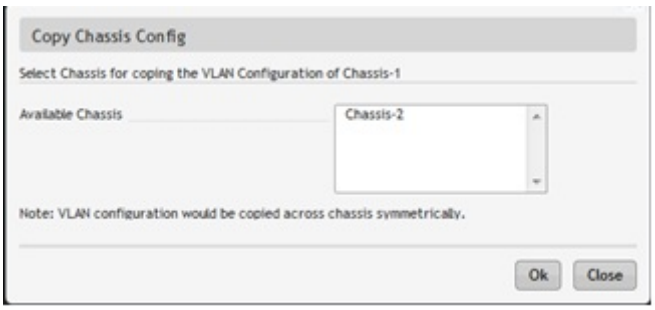


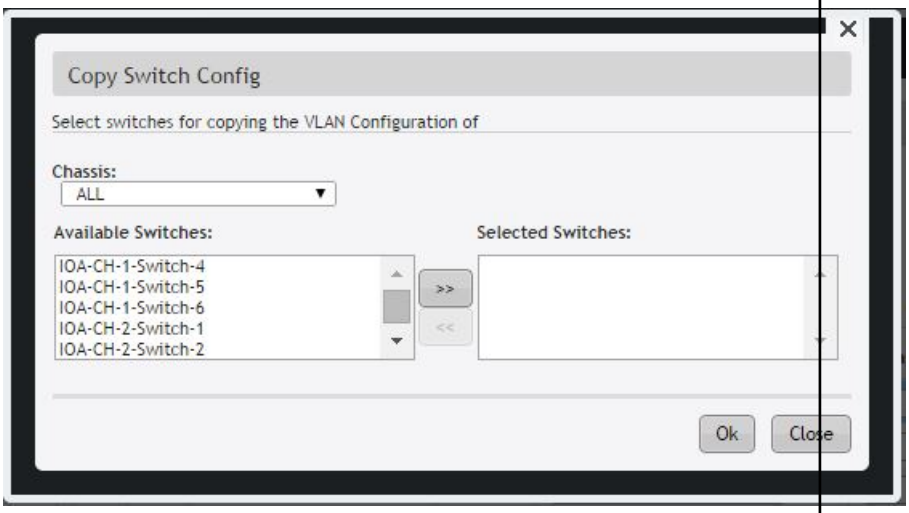
Figure 41. IOA Pre-deployment VLAN Configuration with Populated Data

The following Pre-deployment IOA VLAN configuration options are available:

Table 21. IOA VLAN Pre-deployment Options

VLAN Option	Description
Add VLAN	Create a VLAN. The range is 2–4094.  **NOTE:** VLAN ID 1003 is reserved.
Add VLAN Range	Create a VLAN range.

VLAN Option	Description
	
Configure Isolated Network	Enable the isolated network security feature on a VLAN or a range of VLANs. Only standalone mode is supported. For more information about this option, refer to Isolated Networks. 
Copy Chassis Configuration	Copy the chassis configuration from the current chassis to another chassis in the fabric. **NOTE:** The VLAN configuration is copied symmetrically to the new chassis. For example, the port assigned as Port 1 on the source chassis is also assigned as Port 1 on the destination chassis. 
Copy Switch Config	Copy the IOA VLAN configuration to any IOAs inserted in the same or different M1000e chassis. Copy the VLAN configuration from and to multiple chassis or switches.

VLAN Option	Description
	
Copy VLAN Tagged Ports	Copy the VLAN tagged port configuration from a selected port to other ports within a switch.
Edit	Edit the VLAN configuration.
Delete	Remove the VLAN configuration.

6. Click **Next** to go to the **SNMP and CLI Credentials** screen.

Isolated Networks

The isolated networks security feature can be enabled on a VLAN or a range of VLANs. Only standalone mode is supported, as there is only a single LAG uplink.

When you enable this feature:

- Server-to-server communication is disabled on VLANs where the isolated networks feature is enabled.
- Servers on those VLANs can only communicate through the uplink LAG (core).
- The uplink core (ToR) applies all the required security measures and other services before switching or routing traffic.
- The VLAN is configured only on the server-side interface specified as the isolated network. All traffic arriving on this interface from the server is sent to the associated uplink.
- Multiple servers belonging to the same VLAN cannot communicate with each other over IOA because all traffic is sent to the single uplink LAG and is not switched locally.
- For security, unknown unicast and multicast traffic received at the IOA uplink LAG is blocked towards the server-side interfaces over VLANs that have the isolated network feature enabled.

The following illustration shows multiple servers (server M620A and server M620B) belonging to the same VLAN (VLAN 5). For security, the servers cannot communicate with each other over IOA because all the traffic is sent to the single uplink LAG (ToR) and is not switched locally. There is no switching between the server ports.

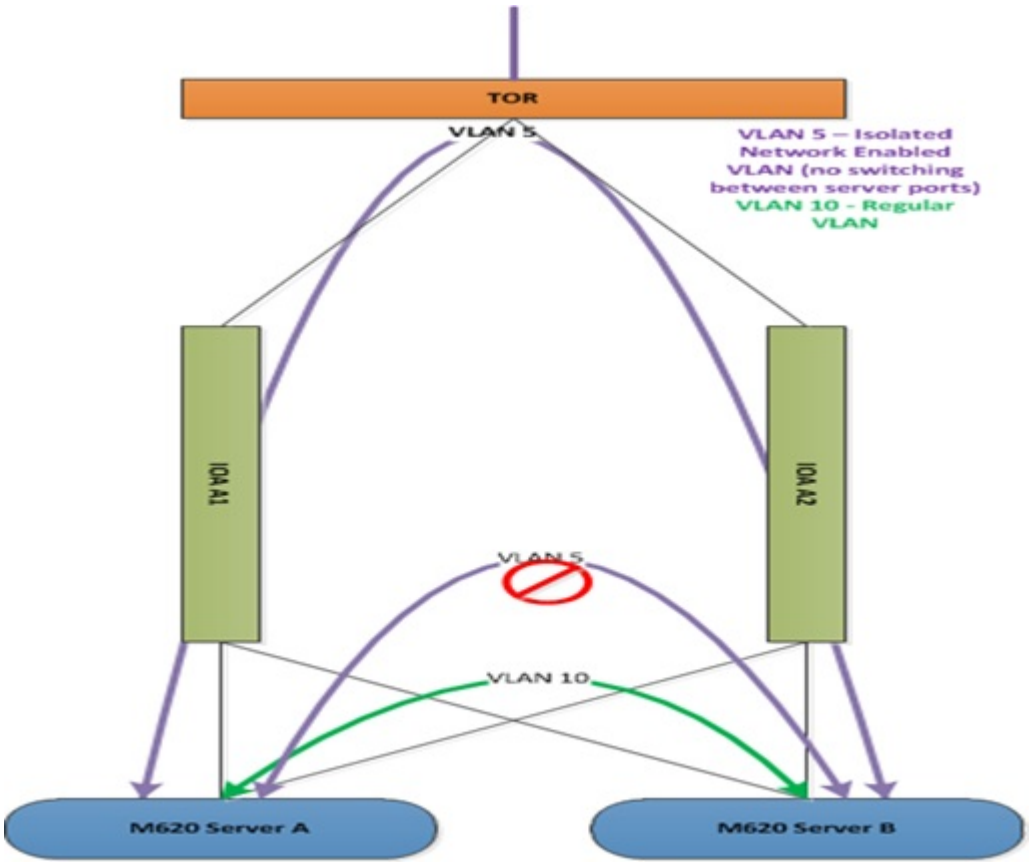


Figure 42. Isolated Networks Enabled on VLAN 5

Pre-deployment (IOA) – SNMP and CLI Credentials

Configure SNMP so that the AFM can perform SNMP queries on the switches in the fabric. Configure SNMP and CLI credentials at the fabric level.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **SNMP and CLI Credentials** screen.

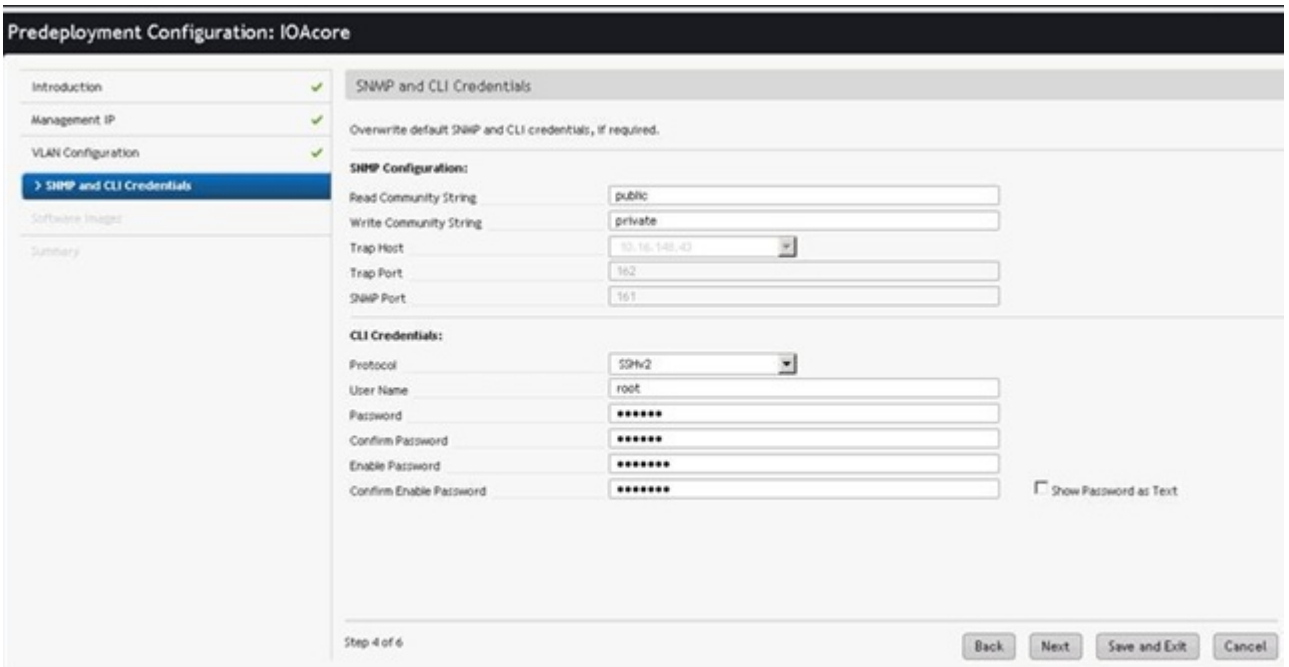


Figure 43. IOA SNMP and CLI Credentials Screen

4. In the **Read Community String** field, enter the read community string (for example, `public`).
5. In the **Write Community String** field, enter the write community string (for example, `private`).
6. From the **Protocol** drop-down menu, select one of the following protocols:
   - **Telnet**
   - **SSHv2**

   NOTE: AFM automatically enters the default IOA credentials (username `root`, password `calvin`).
7. In the **User Name** field, enter the user name.
8. In the **Password** field, enter the password.
9. In the **Confirm Password** field, confirm the password.
10. In the **Enable Password** field, enter the enable password.
11. In the **Confirm Enable Password** field, confirm the enable password
12. Click **Next** to go to the **Summary** screen.

Pre-deployment (IOA) — Software Images

To specify the software images for each type of switch in the fabric, use the Software Images screen. The software image must be the same for each type of platform. Place the software image for the switches on the TFTP or FTP site so that the switches can install the appropriate Dell Networking operating system software image and configuration file from this site. To change the address of the TFTP or FTP site, navigate to the **Administration** > **Settings** > **TFTP/FTP** screen.

NOTE: To download the latest Dell Networking operating system software version for the switch, refer to *Upload Switch Software* in the *AFM Installation Guide*.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select the **Pre-deployment Configuration** option.
3. Navigate to the **Software Images** screen.

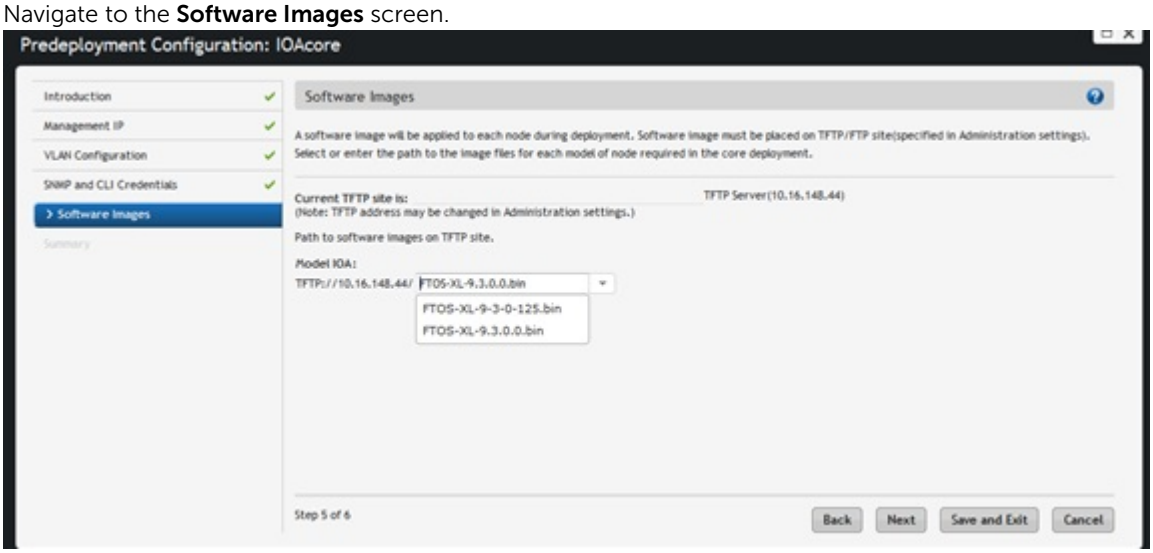


Figure 44. IOA Pre-deployment Software Images Screen

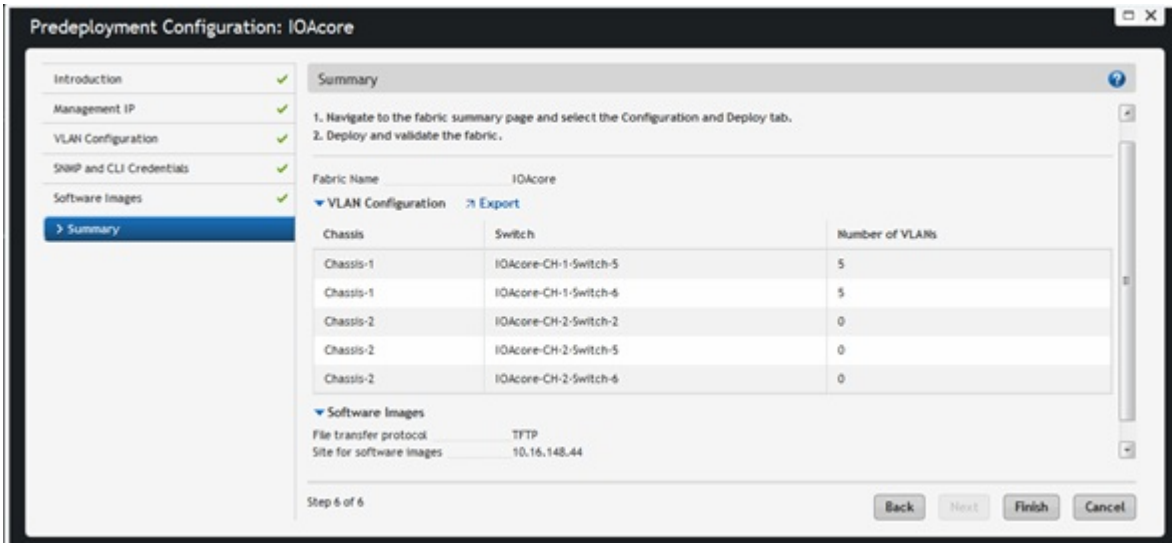
4. Select the TFTP or FTP site option that contains the software image.
5. Enter the path of the software image on the TFTP or FTP site.
6. Click **Next** to go to the **Summary** screen.

Pre-deployment (IOA) – Summary

Use the **Summary** screen to review the IOA pre-deployment configuration. This screen displays the specified IP and protocol settings for the fabric, uplink, and downlink configuration. It also displays the software image information for each type of switch and the configuration file transfer status to the remote or local TFTP or FTP server.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select the **Pre-deployment Configuration** option.
3. Navigate to the **Summary** screen.
4. Review the IOA pre-deployment summary information. To export configure VLAN information, click **Export**.

Figure 45. IOA Pre-deployment Summary Information



5. Click **Finish**.

Next Steps

1. Deploy the IOA switches from the **Network** > *Fabric* > **Configuration and Deploy** > **Deploy and Validate** > **Deploy** screen.

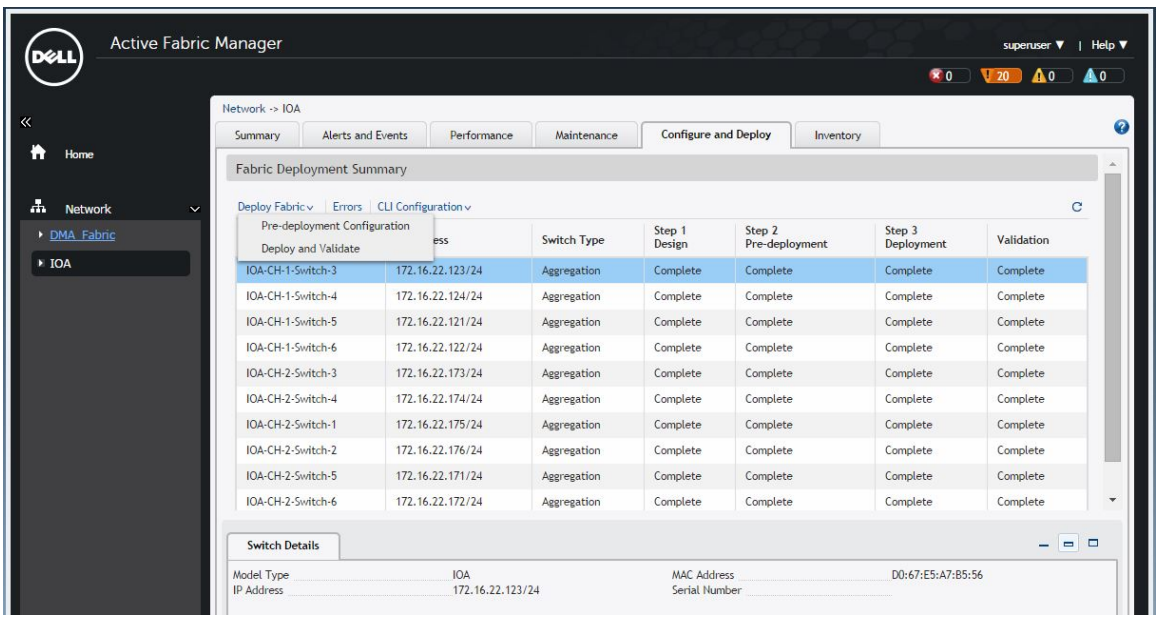


Figure 46. IOA Deploy and Validate

NOTE:

Before deployment, make sure that the IOA switches are in standalone mode using the following CLI command:

```
show system stack-unit <unit-number> iom-mode
```

For more information about this command, refer to the *Dell PowerEdge Command Line Reference Guide for the M I/O Aggregator*.

2. During deployment, check for IOA deployment failures such as **Not being in Standalone Mode** in the **Response Actions** column. To correct this issue, set the IOA to standalone mode and then redeploy it. For information about IOA pre-deployment error messages, see IOA Pre-deployment Error Messages.

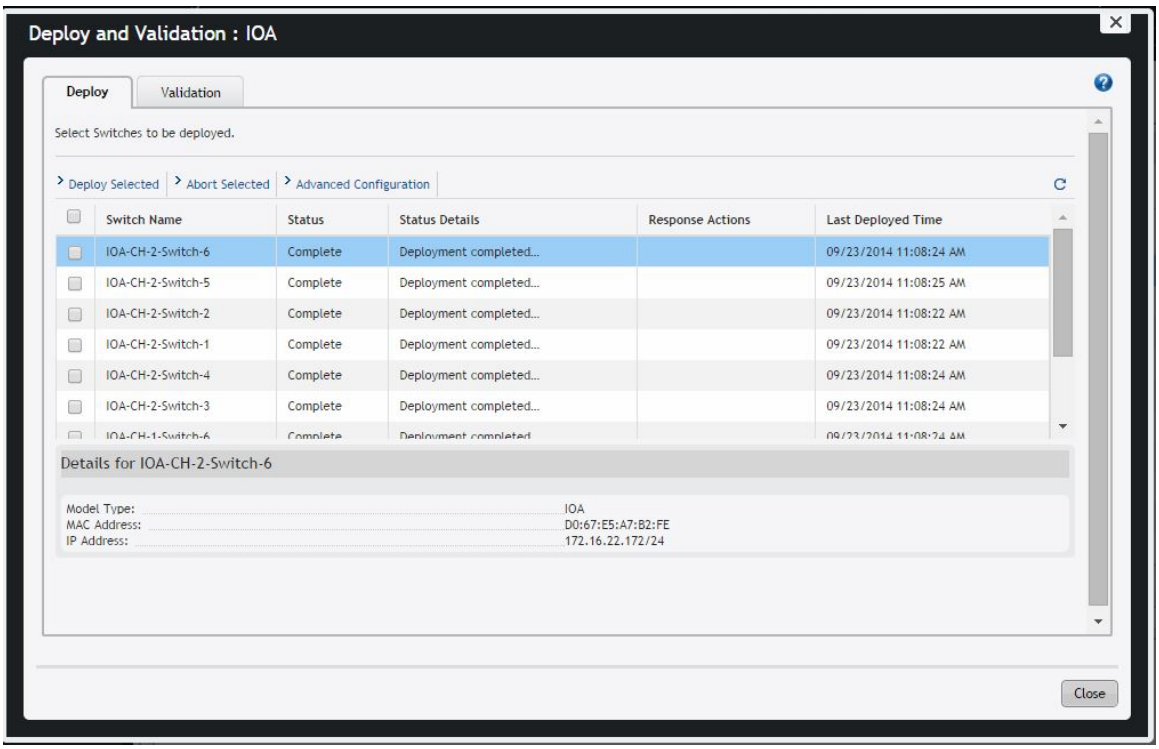


Figure 47. Deploy and Validation Tabs

IOA Pre-deployment Error Messages

Use the following table to troubleshoot the IOA pre-deployment.

Error	Recommended Action
Discovered MAC is different from planned MAC	Make sure the MAC provided for this device is correct.
Discovered model is different from planned model	Make sure the model provided for this device is correct.
IOA is not in standalone mode	Make sure the IOA is in standalone mode.
IOA Software Upgrade task: Failed	1. Power cycle the IOA.

Error	Recommended Action
	2. Make sure the image is present on the TFTP or FTP site. 3. Verify Telnet/SSH connectivity from AFM server and re-deploy.
Ping verification: Failed	From the AFM server, verify connectivity to the IOA device.
Telnet/SSH session verification: Failed	Make sure Telnet/SSH session available from the AFM server has the correct credentials.
Racadm Set IP error - The specified switch operation is not supported by stacked switches	Change the switch mode to standalone mode and then complete pre-deployment.
Unable to get the MAC Address through Racadm	Verify that the chassis/device is reachable and then rediscover it.
Unable to set the Management IP in IOA device	Verify that the chassis/device is reachable or a valid management IP/subnet mask/gateway IP is specified.
Unable to upgrade required software version	Make sure the IOA is using the required software release.

VLT/ Distributed Core Pre-Deployment Wizard

To prepare the VLT or Distributed Core standard or advanced fabric for deployment, use the **Pre-deployment Configuration Wizard**. After you initiate pre-deployment, you can only update the fabric description and port count for expanding uplinks and downlinks.

NOTE: If you are designing a fabric using an IOA blade switch, refer to IOA Pre-deployment Wizard.

Prerequisites

Before you begin:

1. Rack the equipment in the fabric.

   NOTE: Before racking the switches, make sure that you have the **.csv** file that contains the system MAC addresses for each switch in the fabric. If you do not have this file, record the system addresses before you rack the switches.
2. Power off the switches in the fabric.
3. Gather the useful information listed in Gathering Useful Information for a Layer 3 Distributed Core Fabric , Gathering Useful Information for a Layer 2 VLT Fabric, or Gathering Useful Information for a Layer 3 with Resiliency (Routed VLT) Fabric.

Pre-Deployment Screens

To provide the minimum configuration to the switches for the fabric, use the following **Pre-deployment** screens. These screens automate the deployment process.

- **Assign Switch Identities**— Assign a system media access control (MAC) address to each switch in the fabric. You can optionally assign serial numbers and Service Tags to each switch.
- **Change Port Status** — (Advanced fabric only) Enable, disable, or manually select downlinks for Advanced fabric designs.

- **DHCP Integration** — Create a **dhcp.cfg** file that loads the correct software image and the configuration file for each switch type. The DHCP server also uses this file to assign a management IP address to each switch.

  NOTE: Install the DHCP configuration file on the DHCP server before you deploy the fabric.
- **Downlink Configuration** — For a Layer 3 Distributed Core or Layer 3 with Resiliency (Routed VLT) fabric. Configure an EdgePort that connects to the access layer, such as servers or a ToR.
- **Fabric link Configuration** — For a Layer 3 or Layer 3 with Resiliency (Routed VLT) fabric. For a Layer 3 fabric, configure options for the communication between the spine and leaf. For a Layer 3 with Resiliency (Routed VLT) fabric, configure the links that connect the core, access, and aggregation switches in the fabric.
- **Management IP** — Specify a management IP address to each switch.
- **Output** — View the uplink and downlink configuration on the leaf or access switches. Verify that this information is correct before deployment.
- **Port Channel Configuration** — Add, edit, delete, and automatically populate the port channel configuration or copy a switch port channel configuration to another port.
- **SNMP and CLI Credentials** — Configure SNMP and CLI credentials at the fabric level. Configure SNMP so that AFM can perform SNMP queries on the switches in the fabric.
- **Software Images** — Specify the TFTP or FTP address (local or remote server) and the path of the Dell Networking operating system software image to download to each type of switch. To stage the software, use this address.
- **Storage Facing Ports** — (LAN/SAN with iSCSI or fibre channel only) Establish storage connectivity to iSCSI or fibre channel port.
- **Summary** — View the fabric name, location of the software image, and DHCP configuration file.
- **Uplink Configuration** — Specify an even number of uplinks. The minimum number of uplinks is two. One uplink is reserved for redundancy.
  - For a Layer 3 distributed core fabric, configure an EdgePort link on the first two leaves that connect to the edge WAN, which typically connects to an internet service provider (ISP).
  - For a Layer 2 VLT fabric or Layer 3 with Resiliency (Routed VLT) fabric, configure an EdgePort link (uplinks) on the first two aggregation devices that connect outside the fabric.
- **VLAN Configuration** — Specify a VLT VLAN to apply to the Layer 2 VLT or Layer 3 with Resiliency (Routed VLT) fabric. Include at least one VLAN configuration.
- **VLAN Mapping** — For a Layer 2 VLT fabric or Layer 3 fabric with Resiliency (Routed VLT). Associate each of the ports of an access switch to one or more VLANs. You can associate one or more tagged VLANs. Untagged VLANs support only one association.

Protocol Configuration — Layer 2 VLT Fabric Designs

Complete the following pre-deployment protocol configuration tasks for Layer 2 fabric designs.

1. Review the pre-deployment workflow for a Layer 2 fabric at Using the Pre-deployment Configuration Wizard.
2. Pre-deployment – Uplink Configuration
3. Pre-deployment – VLAN Configuration
4. Pre-deployment – Port Channel Configuration
5. Pre-deployment – Storage Facing Ports (For LAN\SAN deployments only)
6. Pre-deployment – VLAN Mapping

L2 VLT Pre-deployment – Uplink Configuration

The **Uplink Configuration** page displays the port bandwidth and the number of specified ports as read-only fields on the **Fabric Name and Type** and **Port Specification** screens. To configure the uplink protocol for the EdgePort uplinks to the WAN, use the **Uplink Configuration** screen.

NOTE: If you enable OSPF, the uplinks or interlinks must be in area 0.

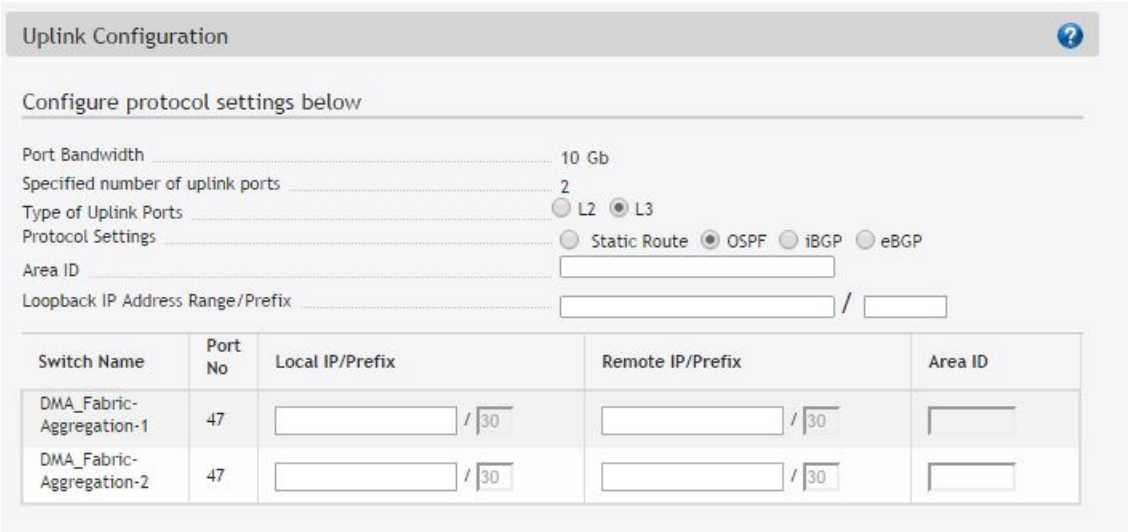


Figure 48. Uplink Configuration Screen

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration** .
3. Navigate to the **Uplink Configuration** screen.
4. In the **Type of Uplink Ports** area, select one of the following options:
   - **Static routes** — If you select the static routes option, AFM displays the **Adds Static Route** window. Configure up to 10 static routes for each aggregation device. If you check the **Default Route** option, AFM automatically populates the destination network field to 0.0.0.0/0. For static routes, enter the destination network and the next hop.
   - **L2** — Configure Layer 2 uplinks for a Layer 2 fabric.
   - **L3** — Configure uplinks for a Layer 2 VLT or Layer 3 Distributed Core fabric. If you select the L3 option, the **Uplink Configuration** screen displays additional options to configure the Layer 3 protocol settings.
5. (For Layer 3 uplinks only) In the **Protocol Settings** area, select a routing protocol (OSPF, IBGP, or eBGP) or static route for the EdgePort uplinks. Specify the number of uplinks on the **Bandwidth and Port Count** screen.

   AFM automatically populates the range of IP addresses in the /30 subnet.
   - If you enable OSPF, enter the local IP address, remote neighbor IP address, and area ID for each specified uplink. The area ID range is 0–65535.
   - If you enable iBGP, enter the local IP address, remote neighbor IP address, and local AS number for each specified uplink. The AS number range is 1–4294967295.
   - If you enable eBGP, enter the local IP, remote neighbor IP address, local AS number, and remote AS number for each specified uplink. The AS number range is 1–4294967295.
6. In the **Loopback IP Address Range/Prefix** area, enter the loopback IP address and prefix.

7. Click **Next** to go the **VLAN Configuration** screen.

L2 VLT Pre-deployment - VLAN Configuration

Specify at least one VLAN for the Layer 2 fabric manually or automatically using this screen.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select the **Pre-deployment Configuration** option.
3. Navigate to the **VLAN Configuration** screen.

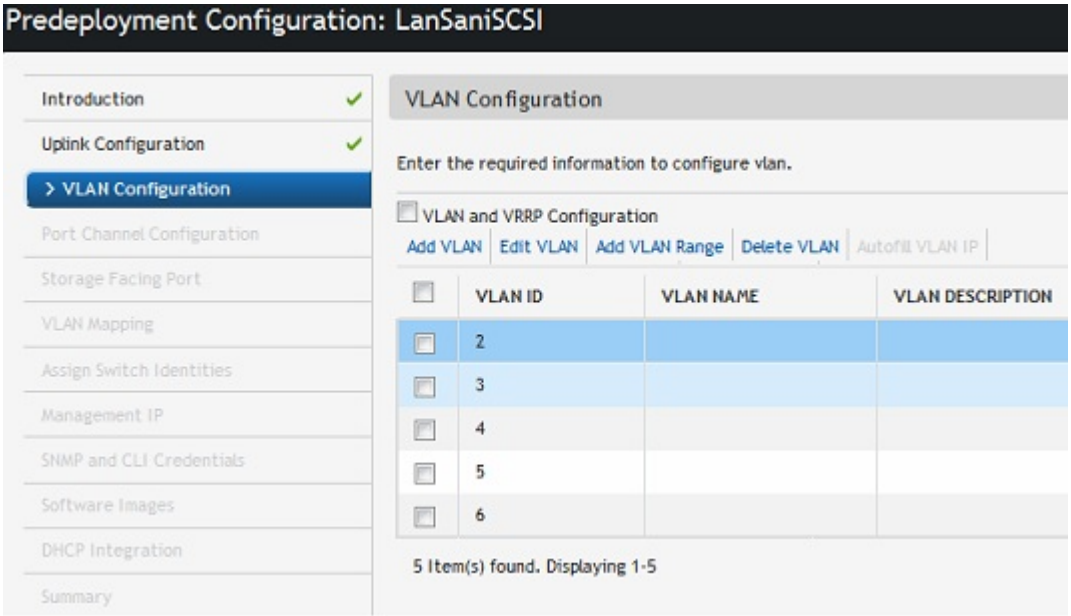


Figure 49. VLAN Configuration without VLAN and VRRP Configuration

4. Check the **VLAN and VRRP Configuration** option to configure the VLAN ID, primary IP address, secondary IP address, and virtual address.
5. Click the **Add VLAN** link.
   The **Add VLAN Window** displays.

   NOTE: If you add a VLAN and do not enable the **VLAN and VRRP Configuration** option, you can only enter the VLAN ID and IP address range.
6. In the **VLAN ID** field, enter the VLAN ID. The range is 2–4094. There is no default value.
7. In the **Primary IP address** field, enter the primary IP address. AFM automatically enters the default prefix (24), but there is no default IP address. The range is 8–29.
8. In the **Secondary IP** address field, enter the secondary IP address. AFM automatically enters the default prefix (24), but there is no default secondary IP address. The range is 8–29.
9. In the **Virtual IP** address field, enter the virtual IP address. AFM automatically enters the default prefix (24), but there is no default virtual IP address. The range is 8–29.
10. Click **Next** to view the **Port Channel Configuration** screen.

Table 22. VLAN Configuration Options

VLAN Option	Description
Add VLAN	Enter the VLAN ID.
Edit VLAN	Change the VLAN ID or VLAN ID, primary IP address, secondary IP address.
Add VLAN Range	Automates VLAN creation and automatically populates IP addresses. Enter the following VLAN information: • **Starting VLAN ID** — Specify the starting VLAN ID. The range is 2–4094. • **Number of VLANs** — Specify the number of VLANs. • **VLAN Increment** — Specify the increment of the VLAN. If you do not specify an increment, the default VLAN increment is one. • **Start Subnet IP Address/Prefix** — Specify the IP range to automatically populate VLAN IP addresses. Valid IP addresses include primary, secondary peer VLAN, and VRRP IP. NOTE: Check the **VLAN and VRRP Configuration** option to view this option.
Delete VLAN	Remove the selected VLAN row.
Autofill VLAN IP (For VLAN and VRRP Configuration only)	Enter the starting subnet IP address/prefix for the range of selected VLAN. AFM automatically populates the IP addresses.
VLAN and VRRP Configuration	Configure an IP address using VRRP. If you select **VLAN and VRRP Configuration**, the following fields display: • Primary IP • Secondary IP • Virtual IP

L2 VLT Pre-deployment – Port Channel Configuration

To add, edit, delete, and automatically populate the port channel information, use this screen. Once you add a port channel configuration, you can copy it for use in another fabric. You can also configure uplink LAGs on the Port Channel Configuration screen.

Table 23. Layer 2 Port Channel Configuration Options

Field Name	Description
Add	Enter port channel information and enable LACP.
Auto Populate	Enter port channel information to automatically assign port channels to switches in the fabric and enable LACP. • Number of Ports per Port Channel • Start Port Channel ID • Number of Port Channel • Port Channel Increment • Enable LACP (optional)
Copy Switch Port Channel Configuration	Copy switch port channel configuration from another switch. Create a port channel configuration and copy the configuration to another switch.

Field Name	Description
Delete	Delete the selected port channel configuration.
Edit	Enter the port channel configuration.

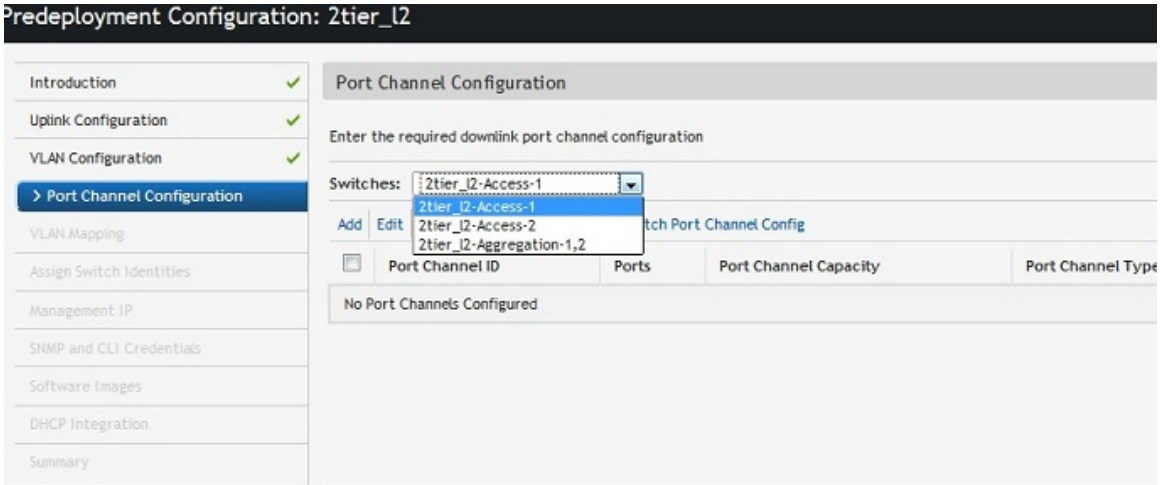


Figure 50. Port Channel Configuration Screen

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Port Channel Configuration** screen.
4. From the **Switch** drop-down menu, select the switch for the port channel configuration.
5. Click **Add** to add a port channel manually or click **Auto populate** to automatically populate the port channels. For more port channel configuration options, refer to the Port Channel Configuration Options table.
6. Click **Next** to go to the **VLAN Mapping** screen.

L2 VLT Pre-deployment — Storage Facing Port

To establish storage connectivity to iSCSI or fibre channel port, use the **Storage Facing Port** screen. The **Storage Facing Port** pre-deployment screen is available only for LAN/SAN deployments using iSCSI or fibre channel ports.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Storage Facing Port** screen.

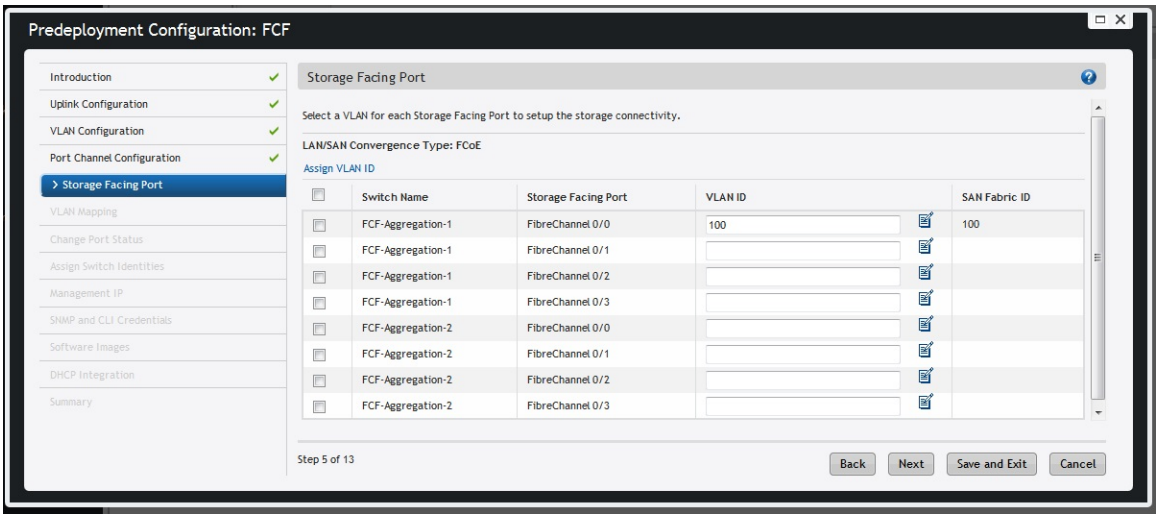


Figure 51. Storage Facing Port Screen

4. Navigate to the **VLAN ID** column.
5. Click the VLAN ID icon to the right of the VLAN ID field, select a VLAN ID, and associate it with the storage-facing port.
   a. If you connect to fibre channel storage-facing ports, AFM automatically populates the SAN Fabric ID when you select the VLAN ID.
   b. If you connect to iSCSI storage-facing ports, select a VLAN ID and associate it with a vendor. Navigate to the **Vendor** drop-down menu and select one of the following options:
      - Compellent
      - EqualLogic
      - Other

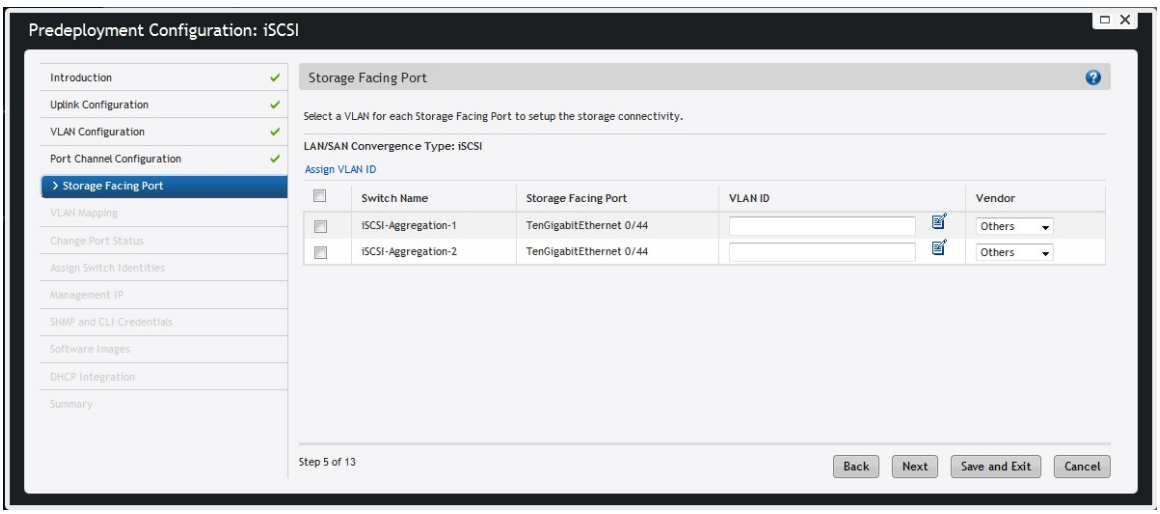


Figure 52. Selecting a Vendor

NOTE: Associate only one vendor for each VLAN. If you associate a VLAN to multiple storage-facing ports, AFM automatically sets the vendor as the same across for all associated entries.

6. Click **Next** to configure the VLAN Mapping configuration.

L2 VLT/L3 Routed VLT Pre-deployment – VLAN Mapping

To add VLANs and associate ports on the different switches for a Layer 2 fabric, use the **Downlink Port Configuration** screen. After you add a VLAN and associate it, you can copy switch VLAN or port VLAN configurations. You can associate one or more tagged VLANs with a port. You can only associate one VLAN per port.

Table 24. VLAN Mapping Field Descriptions

Field Name	Description
Configured VLANs	View a list of VLANs specified in the VLT VLAN Configuration screen.
Port Name	View the port name (read-only).
Tagged VLANs	Enter one or more VLANs to associate with the port. The VLANs must be in the Configured VLANs list and the Untagged VLAN field must be empty. There is no default value. 1. Click on the icon next to the field entry and select a VLAN from the list. 2. Select one or more VLANs to associate with the port. NOTE: VLANs previously associated with storage-facing ports are included in the selection list.
Untagged VLANs	Select a VLAN to associate with the port. The Tagged VLAN field must be empty. There is no default value. NOTE: VLANs previously associated with storage-facing ports are included in the selection list.

Table 25. Layer 2 VLAN Mapping Options

Option	Description
Auto-fill Tagged Port	For selected VLANs, apply sequential tagging to the available ports and the number of ports specified on a VLAN.
Auto-fill Untagged Port	For selected VLANs, apply untagged ports. Based on available ports, associate only one port per VLAN. NOTE: **The number of Port/VLAN Ports** option is disabled on the **Autofill Tagged/Untagged Port** screen.
Copy Switch VLAN Config	Copy the VLAN association from the current switch to other switches in the fabric.
Copy VLAN Port Config	Copy the VLAN association from a selected port to other ports in a switch.
Port-VLAN Association	Map the physical port to the VLAN ID. For example, map one port to multiple VLANs.
VLAN-Port Association	Map the VLAN ID to physical port interfaces. For example, map one VLAN to multiple ports.

Option	Description
Copy VLAN Tagged Port Config	Copy the VLAN tagged port configuration from a selected port to other ports in a switch.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **VLAN Mapping** screen.

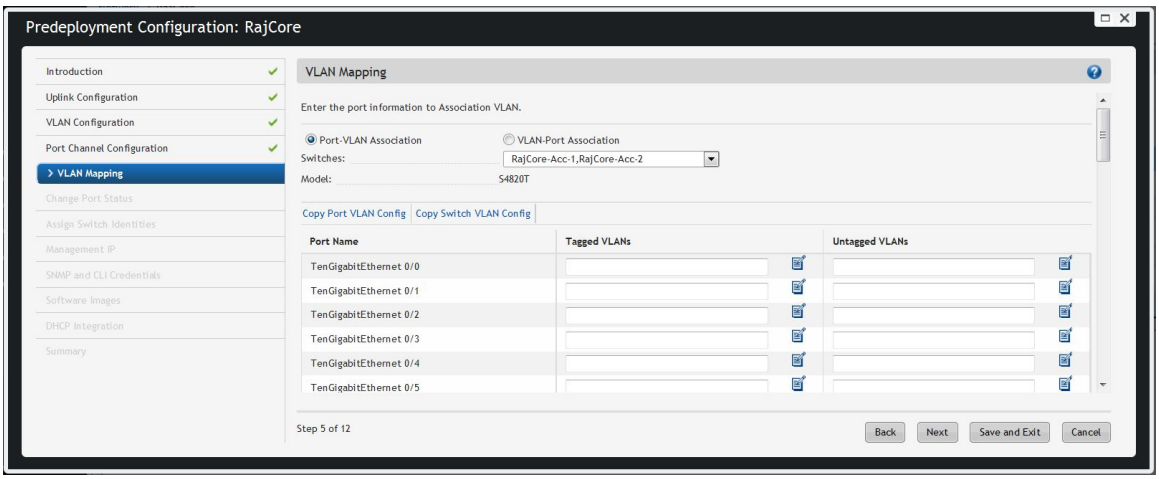


Figure 53. Pre-deployment Configuration — VLAN Mapping

4. From the **Switches** drop-down menu, select an access or aggregation switch.
   The selected switch for the VLAN mapping displays in the read-only **Model** field.
5. In the **Tagged VLANs** field, click the icon to the right and enter one or more VLANs to associate with the port.
6. Click **Next** to go to the **Assign Network Identities** screen.

Protocol Configuration — Layer 3 Distributed Core Fabric

To configure the pre-deployment protocol configuration for a Layer 3 distributed core fabric, complete the following tasks:

1. Review the pre-deployment workflow for a Layer 3 distributed core fabric at Using the Pre-deployment Configuration Wizard
2. Pre-deployment — fabric link configuration
3. Pre-deployment — uplink configuration
4. Pre-deployment — downlink configuration

L3 DC/Routed VLT Pre-deployment – Fabric link Configuration

Before you begin, review Using the Pre-deployment Configuration Wizard and Pre-deployment Wizard: Introduction.

To configure links connecting the leaves and spines for a Layer 3 distributed core fabric or links connecting the core, access, and aggregation switches for a Layer 3 with Resiliency (Routed VLT) fabric using the OSPF routing protocol, use the **Fabric link Configuration** screen. The selected fabric type and fabric oversubscription ratio determines the value that AFM automatically assigns to the **Port Bandwidth** read-only field . To automate the pre-deployment process, AFM automatically:

- populates the starting IP address range and prefix
- populate the loop IP address and prefix based on the fabric design
- sets the area ID for OSPF to 0

Review these settings before deployment. You can modify the IP address range and loopback address. The range for the starting prefix for both types of addresses is 8–29 and the range for the loopback prefix is 8–26.

NOTE: The area ID for the interconnect link must not be the same as the area ID for the uplink.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select **Pre-Deployment Configuration**.
   The **Introduction** screen displays.
3. Review the **Introduction** screen and gather the useful information for deployment.
4. Click **Next**.
   The **Fabric Link Configuration screen** displays.
5. In the **Start IP Address Range/Prefix** area, enter the starting IP address and prefix.
   The prefix range is 8–29.
6. In the **Loopback IP Address Range/Prefix** area, enter the loopback address range and prefix.
   The prefix range is 8–26.
7. In the **Area ID** field, use the default setting (zero) or enter the area ID.
   The area ID range is 0–65535. The uplinks or interlinks must be in area 0 for OSPF.

L3 DC/Routed VLT Pre-deployment – Uplink Configuration

The **Uplink Configuration** screen for a Layer 3 and Layer 3 with Resiliency (Routed VLT) fabric displays the port bandwidth and the number of specified ports as read-only fields on the **Bandwidth and Port Count** screen. To configure the uplink protocol for the EdgePort uplinks to the WAN, use the **Uplink Configuration** screen. For more information about uplinks for a Layer 3 distributed core fabric, refer to Distributed Core Terminology.

NOTE: When OSPF is selected for both uplinks and interlinks, one of uplinks or interlinks must be in area 0.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration** .
3. Navigate to the **Uplink Configuration** screen.
4. In the **Type of Uplink Ports** area, select one of the following options:
   - **Static routes** — When you select the static routes option, AFM displays the **Add Static Route** window.

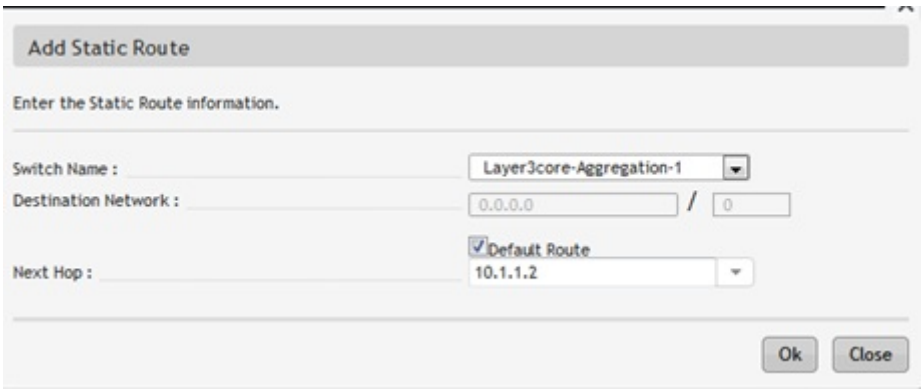


Figure 54. Add Static Route Window

Configure up to 10 static routes for each aggregation device. When you check the Default Route option, AFM automatically populates the destination network field as 0.0.0.0/0. For static routes, enter the destination network and the next hop.

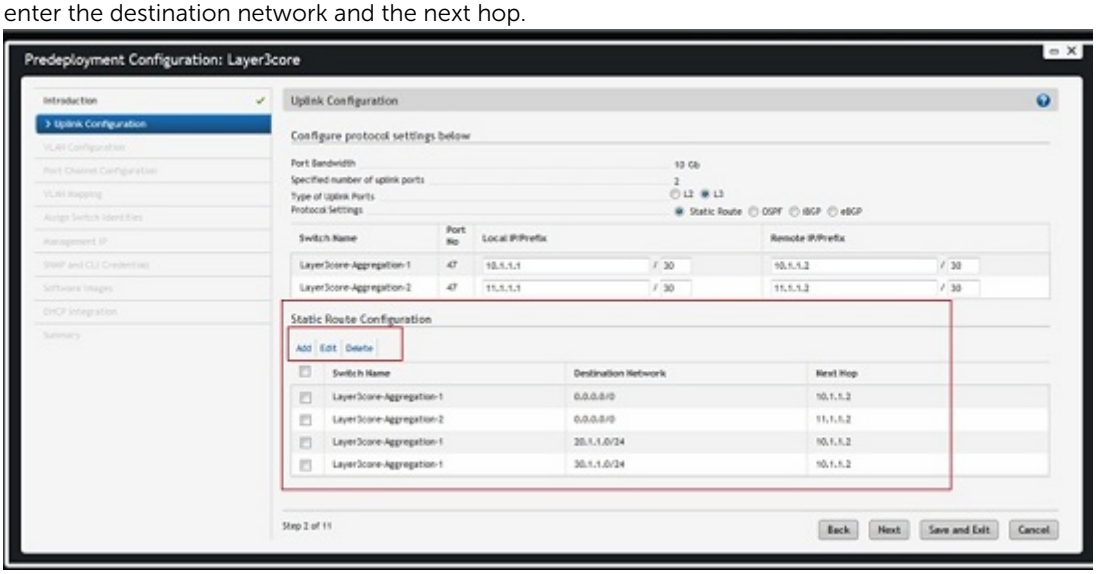


Figure 55. Uplink Configuration Screen

- **L2** — Configures Layer 2 uplinks for a Layer 2 fabric. This option is disabled by default on a Layer 3 Distributed Core fabric.
- **L3** — Configures uplinks for a Layer 2 VLT or Layer 3 Distributed Core fabric. If you select the L3 option, the **Uplink Configuration** screen displays additional options to configure the Layer 3 protocol settings.

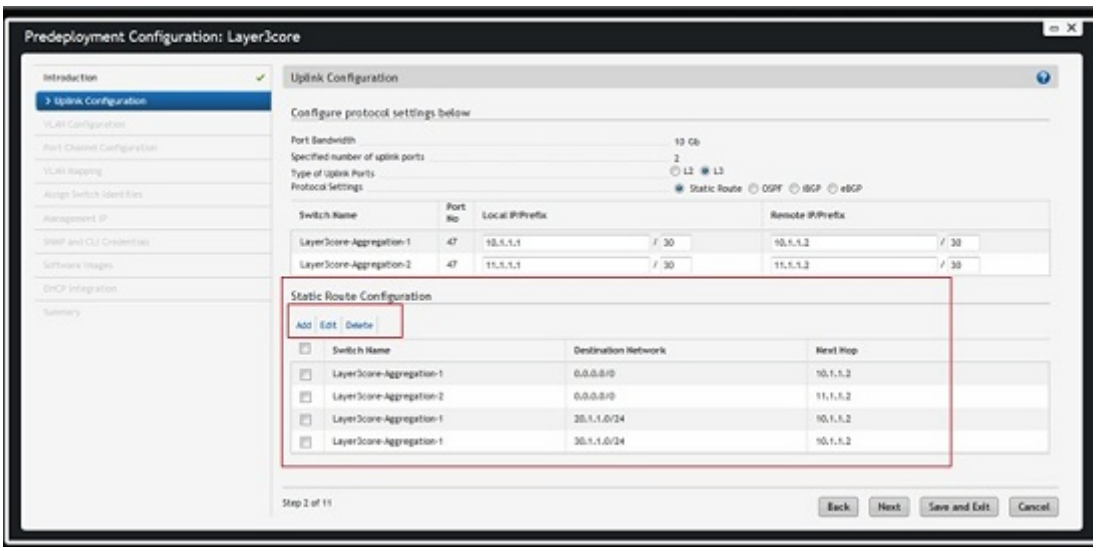


Figure 56. Layer 3 Static Routes

5. In the **Protocol Settings** area, select a routing protocol (OSPF, IBGP, or eBGP) for the EdgePort uplinks. Specify the number of uplinks on the **Bandwidth and Port Count** screen.

   AFM automatically populates the range of IP addresses in the /30 subnet.

   - If you enable OSPF, enter the local IP address, remote neighbor IP address, and area ID for each specified uplink. The area ID area range is 0–65535.
   - If you enable iBGP, enter the local IP address, remote neighbor IP address, local AS number for each specified uplink. The AS number range is 1–4294967295.
   - If you enable eBGP, enter the local IP, remote neighbor IP address, local AS number, and remote AS number for each specified uplink. The AS number range is 1–4294967295.

6. Click **Next** to go the **Downlink Configuration** screen.

L3 DC Pre-deployment – Downlink Configuration

Downlinks are EdgePort links that connect to servers, switches, or ToRs. If you enable the ToR configuration, the leaf switch functions as a ToR. If you disable the ToR configuration, the leaf functions as a switch. The read-only port bandwidth for the downlinks is 1 Gb, 10 Gb, or 40 Gb. For more information about downlinks, refer to Distributed Core Terminology.

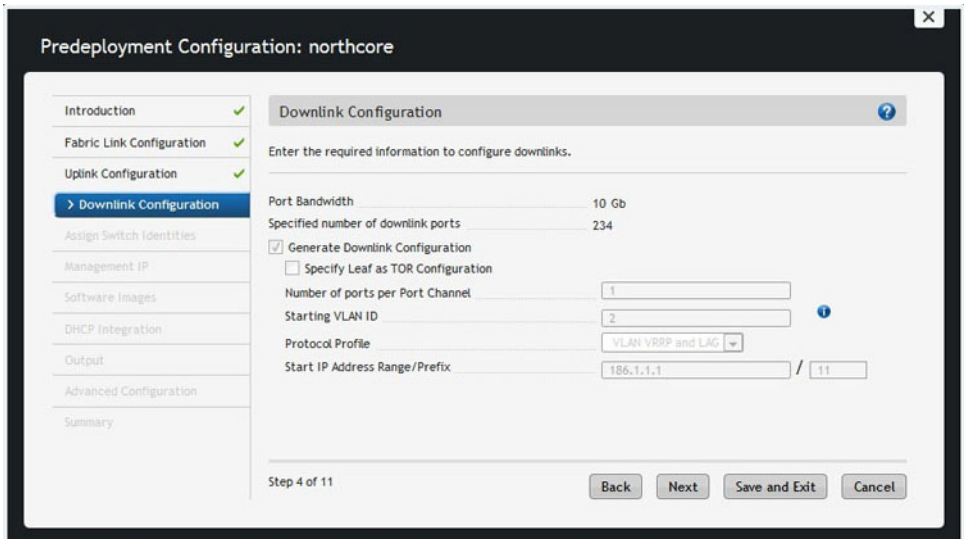


Figure 57. Downlink Configuration for Layer 3 Distributed Core Fabric

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Downlink Configuration** screen.
4. To specify a leaf as a ToR, select **Specify Leaf as ToR**.
5. Manually configure the downlinks or automatically generate the downlink configuration by checking the **Generate Downlink Configuration** option.
6. In the **Start IP Address Range/Prefix** field, enter the starting IP address and prefix. The range is 8–23.
7. In the **Number of ports per port channel** field, enter the number of ports assigned to a port channel for a particular VLAN ID. The range is 1–16.
8. In the **Starting VLAN ID** field, enter a starting VLAN ID. The range is 2–4094.
9. If the leaves are acting as a leaf switch and the switches are directly connected to the server, select the **Downlink VLAN and VRRP and LAG** protocol setting from the **Protocol Profile** drop-down menu. The default setting is **Downlink VLAN**.
10. Click **Next** to go the **Assign Switch Identities** screen.

Protocol Configuration — Layer 3 with Resiliency (Routed VLT)

To configure the pre-deployment protocol configuration for a Layer 3 with Resiliency (Routed VLT) , complete the following tasks:

1. Review the pre-deployment workflow at Using the Pre-deployment Configuration Wizard.
2. Pre-deployment – Step 1a: Fabric Link Configuration
3. Pre-deployment – Step 1b: Uplink Configuration
4. Pre-deployment – Step 1c: VLAN Configuration
5. Pre-deployment – Step 1d: Port Channel Configuration
6. Pre-deployment – Step 1e: VLAN Mapping

L3 DC/Routed VLT Pre-deployment – Fabric link Configuration

Before you begin, review Using the Pre-deployment Configuration Wizard and Pre-deployment Wizard: Introduction.

To configure links connecting the leaves and spines for a Layer 3 distributed core fabric or links connecting the core, access, and aggregation switches for a Layer 3 with Resiliency (Routed VLT) fabric using the OSPF routing protocol, use the **Fabric link Configuration** screen. The selected fabric type and fabric oversubscription ratio determines the value that AFM automatically assigns to the **Port Bandwidth** read-only field . To automate the pre-deployment process, AFM automatically:

- populates the starting IP address range and prefix
- populate the loop IP address and prefix based on the fabric design
- sets the area ID for OSPF to 0

Review these settings before deployment. You can modify the IP address range and loopback address. The range for the starting prefix for both types of addresses is 8–29 and the range for the loopback prefix is 8–26.

NOTE: The area ID for the interconnect link must not be the same as the area ID for the uplink.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select **Pre-Deployment Configuration**.
   The **Introduction** screen displays.
3. Review the **Introduction** screen and gather the useful information for deployment.
4. Click **Next**.
   The **Fabric Link Configuration screen** displays.
5. In the **Start IP Address Range/Prefix** area, enter the starting IP address and prefix.
   The prefix range is 8–29.
6. In the **Loopback IP Address Range/Prefix** area, enter the loopback address range and prefix.
   The prefix range is 8–26.
7. In the **Area ID** field, use the default setting (zero) or enter the area ID.
   The area ID range is 0–65535. The uplinks or interlinks must be in area 0 for OSPF.

L3 DC/Routed VLT Pre-deployment – Uplink Configuration

The **Uplink Configuration** screen for a Layer 3 and Layer 3 with Resiliency (Routed VLT) fabric displays the port bandwidth and the number of specified ports as read-only fields on the **Bandwidth and Port Count** screen. To configure the uplink protocol for the EdgePort uplinks to the WAN, use the **Uplink Configuration** screen. For more information about uplinks for a Layer 3 distributed core fabric, refer to Distributed Core Terminology.

NOTE: When OSPF is selected for both uplinks and interlinks, one of uplinks or interlinks must be in area 0.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration** .
3. Navigate to the **Uplink Configuration** screen.
4. In the **Type of Uplink Ports** area, select one of the following options:
   - **Static routes** — When you select the static routes option, AFM displays the **Add Static Route** window.

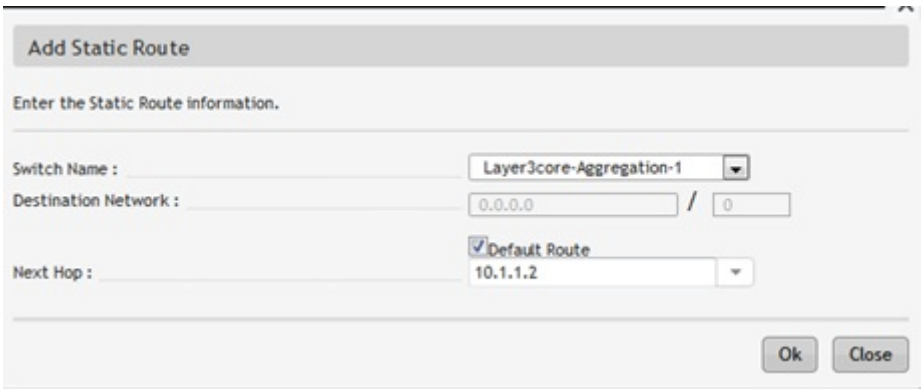


Figure 58. Add Static Route Window

Configure up to 10 static routes for each aggregation device. When you check the Default Route option, AFM automatically populates the destination network field as 0.0.0.0/0. For static routes, enter the destination network and the next hop.

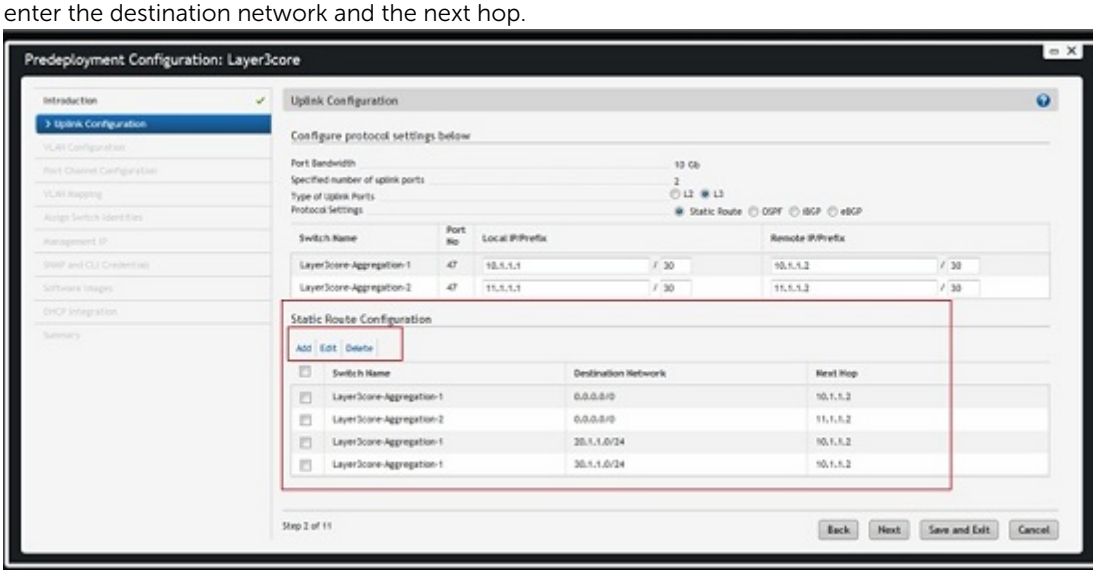


Figure 59. Uplink Configuration Screen

- **L2** — Configures Layer 2 uplinks for a Layer 2 fabric. This option is disabled by default on a Layer 3 Distributed Core fabric.
- **L3** — Configures uplinks for a Layer 2 VLT or Layer 3 Distributed Core fabric. If you select the L3 option, the **Uplink Configuration** screen displays additional options to configure the Layer 3 protocol settings.

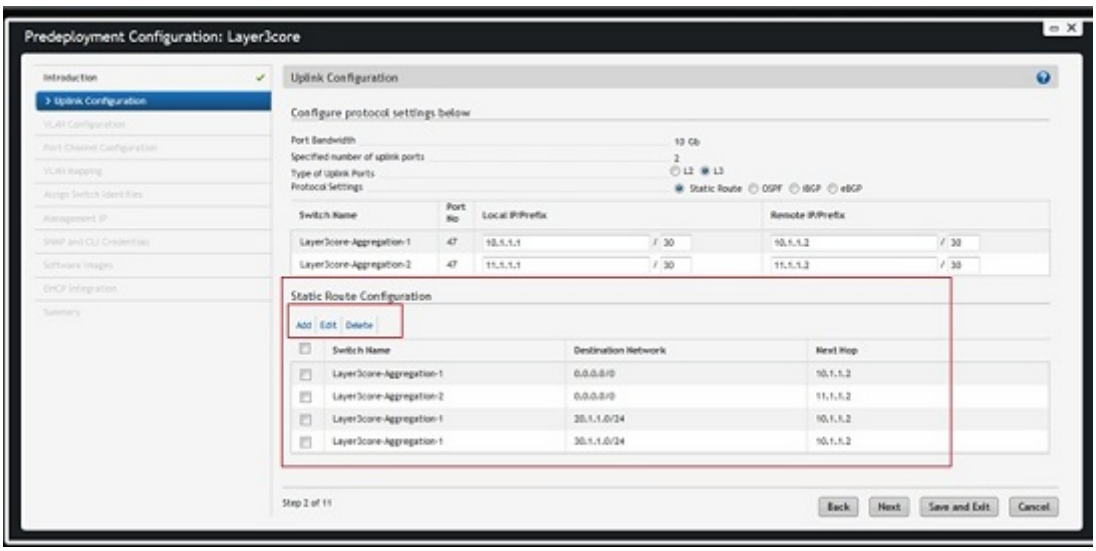


Figure 60. Layer 3 Static Routes

5. In the **Protocol Settings** area, select a routing protocol (OSPF, IBGP, or eBGP) for the EdgePort uplinks. Specify the number of uplinks on the **Bandwidth and Port Count** screen.

   AFM automatically populates the range of IP addresses in the /30 subnet.

   - If you enable OSPF, enter the local IP address, remote neighbor IP address, and area ID for each specified uplink. The area ID area range is 0–65535.
   - If you enable iBGP, enter the local IP address, remote neighbor IP address, local AS number for each specified uplink. The AS number range is 1–4294967295.
   - If you enable eBGP, enter the local IP, remote neighbor IP address, local AS number, and remote AS number for each specified uplink. The AS number range is 1–4294967295.

6. Click **Next** to go the **Downlink Configuration** screen.

L3 Routed VLT Pre-deployment – VLT VLAN Configuration

To configure the VLT VLAN configuration for a Layer 3 with Resiliency (Routed VLT) fabric, use the **VLT VLAN Configuration for Layer 3 with Resiliency (Routed VLT)** screen.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **VLT VLAN Configuration** screen.
4. Check the **Enable Layer 3 Protocol in Access Switches** option.
5. Click the **Add VLAN** link.

   The **Add VLAN Window** is displayed.
6. To assign the IP addresses to the switches for the Layer 3 with Resiliency (Routed VLT) fabric, click **Add VLAN Range** and specify the VLAN range.
7. Click **Next** to view the **Port Channel Configuration** screen.

Table 26. VLT VLAN Configuration Options for Layer 3 with Resiliency (Routed VLT) Fabric

VLAN Option	Description
Add VLAN	Create a VLAN row.
Add VLAN Range	Automate VLAN creation and automatically populate IP addresses. Enter the following VLAN information: • **Starting VLAN ID** — Enter the starting VLAN ID. The range is 2–4094. • **Number of VLANs** — Enter the number of VLANs. • **VLAN Increment** — Enter the increment of the VLANs. If you do not specify an increment, the default value is 1. • **Start Subnet IP Address/Prefix:** — Enter an IP range to automatically populate the VLAN IP addresses. The IP addresses include primary, secondary peer VLAN, and VRRP IP. NOTE: To view this option, check the **VLAN and VRRP Configuration** checkbox.
VLAN and VRRP Configuration (for a Layer 3 fabric for Resiliency (Routed VLT)	Configure an IP address with VRRP. If the **VLAN and VRRP Configuration** option is selected the following fields are displayed. • Primary IP • Secondary IP • Virtual IP
Autofill VLAN IP (For Enable Layer 3 Protocol in Access Switches option only)	Enter the starting subnet IP address/prefix for the range of selected VLANS. The IP addresses are automatically populated.
Delete VLAN	Remove the selected VLAN row.
Edit VLAN	Edit the VLAN ID, primary IP address, and secondary IP address.
VLAN ID	Enter the VLAN ID. The range is 2–4094. There is no default VLAN ID.
Primary IP	Enter the primary IP address. AFM automatically enters the prefix. The prefix range is 8–29 and the default prefix is 24. There is no default primary IP address.
Secondary IP	Enter the secondary IP address. AFM automatically enters the prefix. The prefix range is 8–29 and the default prefix is 24. There is no default secondary IP address.

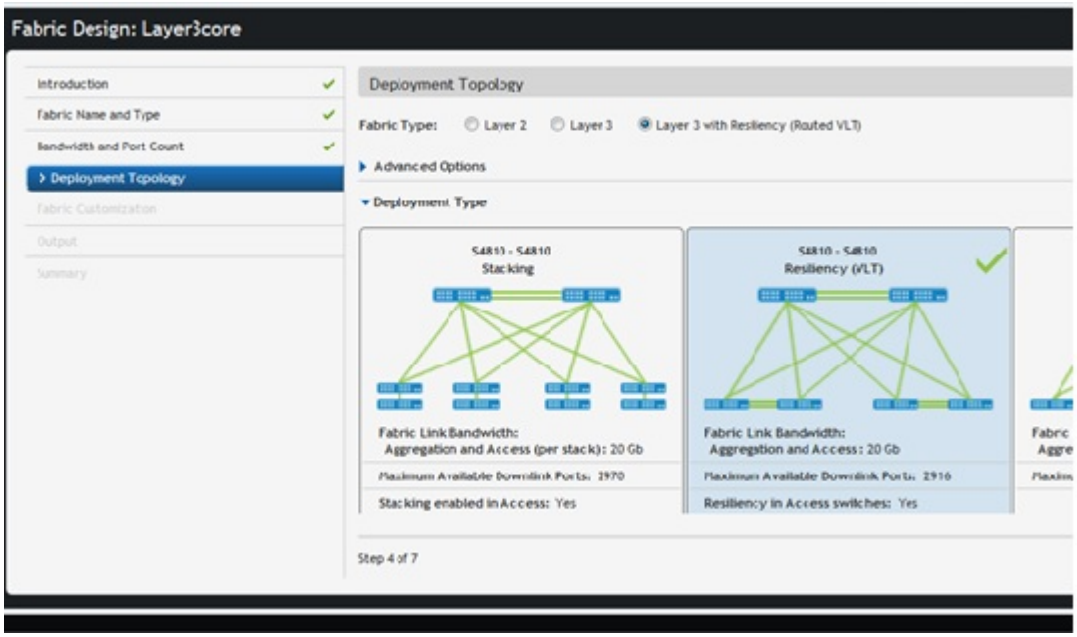


Figure 61. Layer 3 with Resiliency (Routed VLT) Deployment Topology

The following screen shot displays a VLT VLAN Configuration screen without selecting the **Enable Layer 3 protocol in Access Switches** option. By default, the VLT VLAN screen for Layer 3 with Resiliency (Routed VLT) requires the primary and secondary IP address for the VLAN ID.

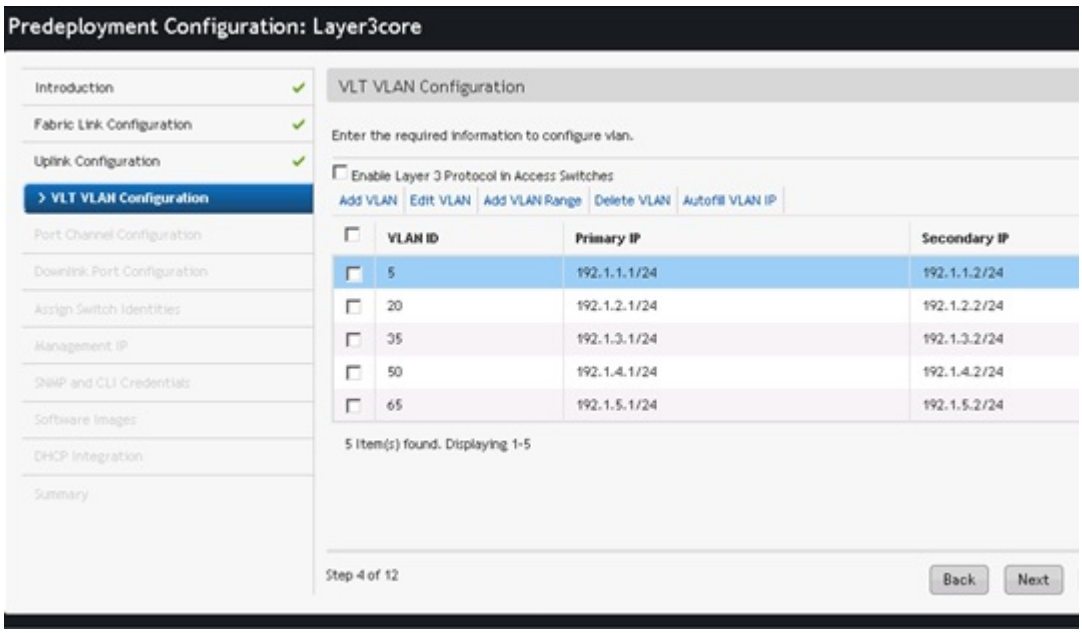


Figure 62. VLT VLAN Configuration Without Using the Enable Layer 3 Protocol in Access Switches Option

The following screen shot displays a VLT VLAN Configuration screen using the **Enable Layer 3 protocol in Access Switches** option. To support both access and aggregation devices in a Layer 3 with Resiliency

(Routed VLT) topology, select the **Enable Layer 3 protocol in Access Switches** option. If you use this option, provide the network IP address range using the **Add VLAN Range** link. AFM assigns IP addresses to all the access and aggregation switches.

The following screen shot displays the results after checking the **Enable Layer Protocol in Access Switches** option and adding VLANs for a Layer 3 with Resiliency (Routed VLT) fabric.

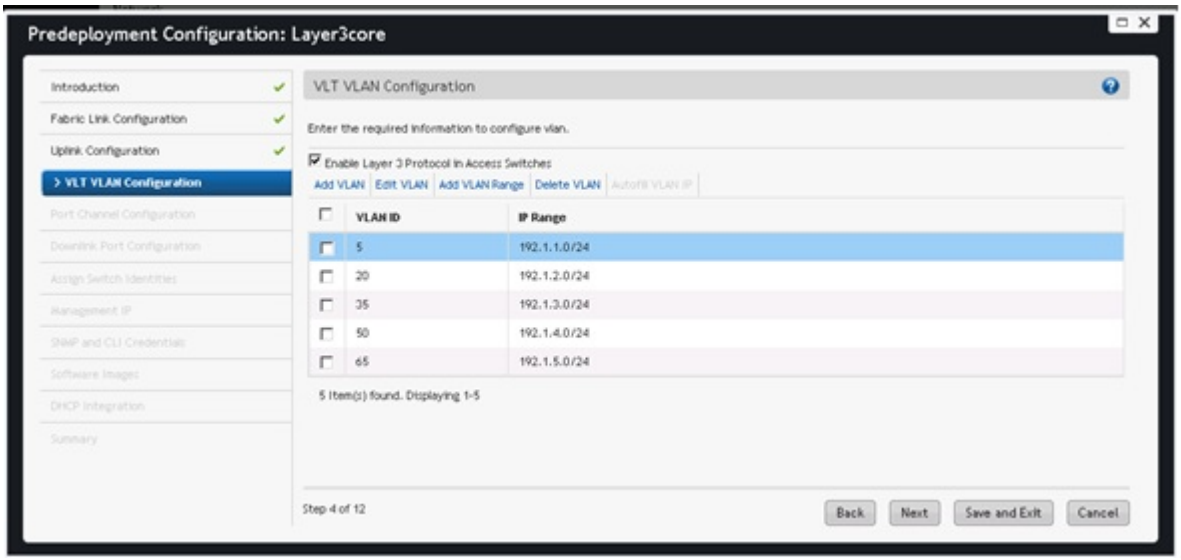


Figure 63. Adding VLANs and Enabling the Layer Protocol in Access Switches Option

Advanced VLAN IP Configuration

After completing pre-deployment, modify the VLT VLAN configuration for Layer 3 with Resiliency (Routed VLT) topology using the **Advanced VLAN IP Configuration** option at the **Network** > *Fabric* > *Switch* > **Configure and Deploy** screen.

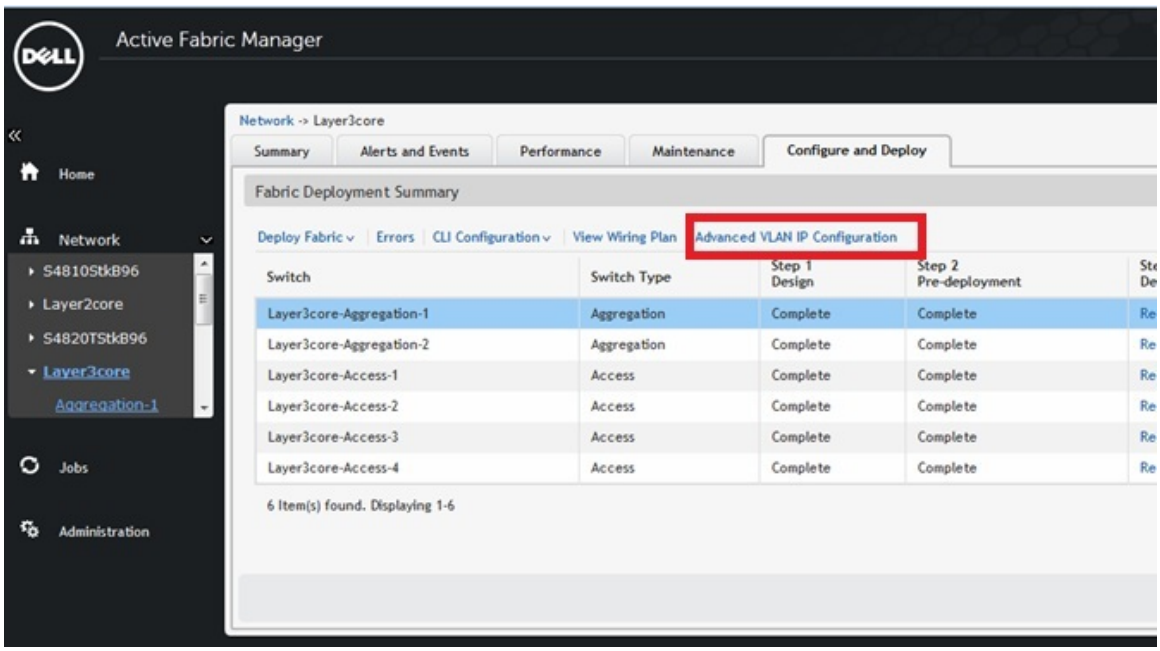


Figure 64. Advanced VLAN IP Configuration Option

L3 Routed VLT Pre-deployment – Port Channel Configuration

To add, edit, delete, and automatically populate the port channel configuration for Layer 3 with Resiliency (Routed VLT) fabric, use the **Port Channel Configuration** screen. After you add a port channel configuration, you can copy it to use on another switch in the fabric.

Table 27. Port Channel Configuration Options

Field Name	Description
Add	Enter the port channel information and enable LACP.
Auto Populate	Enter port channel information to automatically assign port channels to switches in the fabric and enable LACP. • Number of Ports per Port Channel • Start Port Channel ID • Number of Port Channel • Port Channel Increment • Enable LACP (optional)
Copy Switch Port Channel Configuration	Copy the switch port channel configuration from another switch. Create a port channel configuration and then copy the configuration to another switch.
Delete	Delete a selected port channel configuration.
Edit	Enter the port channel configuration.

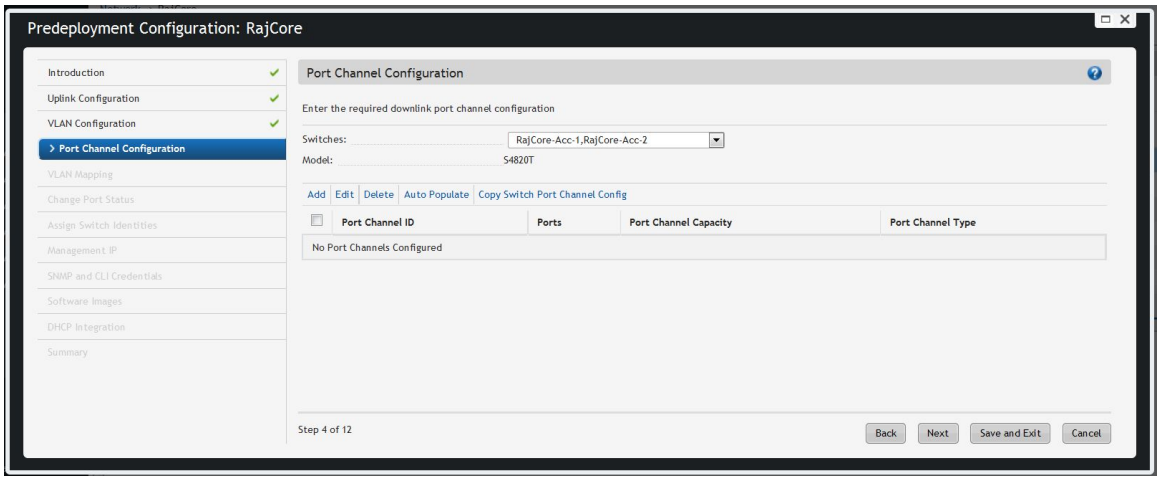


Figure 66. Pre-deployment — Port Channel Configuration

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Port Channel Configuration** screen.
4. From the **Switches** drop-down menu, select a switch for the port channel configuration.
   The selected switch for the port channel configuration displays in the read-only **Model** field.
5. Click **Add** to manually add a port channel or click **Auto populate** to automatically populate the port channels. For more port channel configuration options, refer to the Port Channel Options table.
6. Click **Next** to go to the **Downlink Port Configuration** screen.

L2 VLT/L3 Routed VLT Pre-deployment – VLAN Mapping

To add VLANs and associate ports on the different access switches to which VLAN for a Layer 3 with Resiliency (Routed VLT) fabric, use the **VLAN Mapping** screen. After adding the VLANs and associating them with ports, you can copy switch VLAN or port VLAN configurations. Associate one or more tagged VLANs with a port. For untagged VLANs, only one association is supported.

Table 28. VLAN Mapping Field Descriptions

Field Name	Description
Configured VLANs	View a list of VLANs specified in the VLT VLAN Configuration screen.
Port Name	View the port name (read-only).
Tagged VLANs	Enter one or more VLANs to associate with the port. The VLANs must be in the Configured VLANs list and the Untagged VLAN field must be empty. There is no default value. 1. Click on the icon next to the field entry and select a VLAN from the list. 2. Select one or more VLANs to associate with the port. **NOTE:** VLANs previously associated with storage-facing ports are included in the selection list.
Untagged VLANs	Select a VLAN to associate with the port. The Tagged VLAN field must be empty. There is no default value.

Field Name	Description
	NOTE: VLANs previously associated with storage-facing ports are included in the selection list.

Table 29. Layer 2 VLAN Mapping Options

Option	Description
Auto-fill Tagged Port	For selected VLANs, apply sequential tagging to the available ports and the number of ports specified on a VLAN.
Auto-fill Untagged Port	For selected VLANs, apply untagged ports. Based on available ports, associate only one port per VLAN. NOTE: **The number of Port/VLAN Ports** option is disabled on the **Autofill Tagged/Untagged Port** screen.
Copy Switch VLAN Config	Copy the VLAN association from the current switch to other switches in the fabric.
Copy VLAN Port Config	Copy the VLAN association from a selected port to other ports in a switch.
Port-VLAN Association	Map the physical port to the VLAN ID. For example, map one port to multiple VLANs.
VLAN-Port Association	Map the VLAN ID to physical port interfaces. For example, map one VLAN to multiple ports.
Copy VLAN Tagged Port Config	Copy the VLAN tagged port configuration from a selected port to other ports in a switch.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **VLAN Mapping** screen.

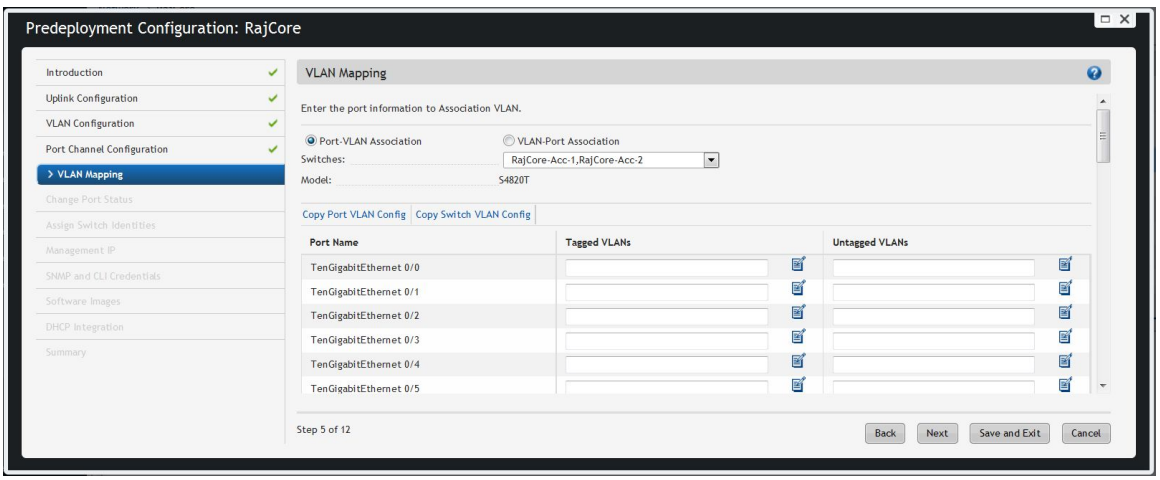


Figure 67. Pre-deployment Configuration — VLAN Mapping

4. From the **Switches** drop-down menu, select an access or aggregation switch.
   The selected switch for the VLAN mapping displays in the read-only **Model** field.

5. In the **Tagged VLANs** field, click the icon to the right and enter one or more VLANs to associate with the port.
6. Click **Next** to go to the **Assign Network Identities** screen.

Pre-deployment – Change Port Status

NOTE: The **Change Port Status** pre-deployment screen applies to advanced fabric only.

To enable or disable a downlink, use the **Change Port Status** screen. If you use an **Advanced** configuration, AFM does not automatically assign any available ports as downlinks. Manually assign the downlink ports by selecting them and clicking **Enable**. To disable a downlink port, select and click **Disable**. VLAN ports and port channels automatically display as enabled downlinks. The remaining amount of bandwidth (in Gb) displays in the **Available Downlink Ports** field. Enabled ports display a green checkmark in the **Port Status** column. Disabled ports display a black box in the **Port Status** column.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Change Port Status** screen.

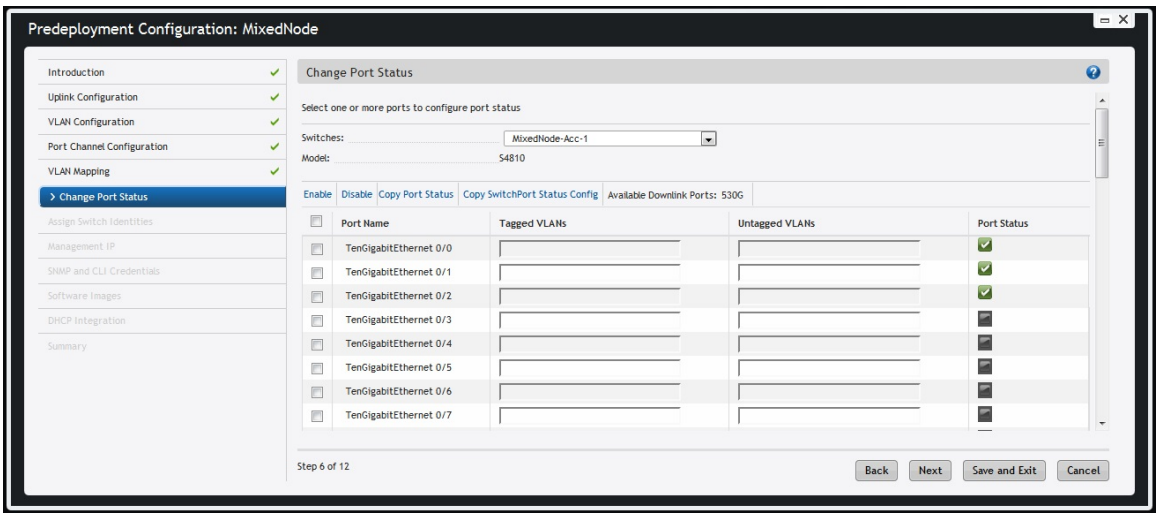


Figure 68. Change Port Status Screen

4. From the **Switches** drop-down menu, select an access switch to enable the downlinks on that switch.

   The selected access switch for the port status displays in the read-only **Model** field. By default, AFM enables the configured port channels and VLANs on the access switch as downlink ports and displays the status details for these ports.
5. Select one or more ports and click **Enable**.

   - To disable one or more ports, select the port or ports and click **Disable**.

     NOTE: You cannot disable port channels or VLANs.
   - To copy a port status to another port on the switch, select the port or ports and click **Copy Port Status**. Select a port from the **Available Ports** list and click **Ok**.
   - To copy a port status configuration to a switch, select the port or ports and click **Copy Switch Port Status Configuration**. Select a switch from the **Available Switches** list and click **Ok**.

NOTE: You can only copy port status configurations to switches that are the same model and access switch type.

6. Click **Next** to go to the **Assign Switch Identities** screen.

Pre-deployment – Assign Switch Identities

To assign the system MAC addresses to the switches in the fabric, use the **Assign Switch Identities** screen.

NOTE: If you use the **Device MAC Association** feature, the MAC addresses, IP addresses, and Service Tags of the switches are automatically entered and no additional configuration is required but you can change any of the pre-populated information. If you change the IP address, manually reload the switch in BMP mode. For more information, refer to Device MAC Association.

If you perform this step manually and do not associate the switches with the correct system MAC address, the wiring plan is inaccurate.

The following is a sample **.csv** file.

Table 30. Sample CSV Format

serial_number	purchase_order	mfg_part_number	mac_address	server_tag
HADL134J20193	163	759-0096-02 REV.F	00:01:E8:8B:15:77	9RGZTS2

NOTE: Before you begin, obtain the **.csv** file with the system MAC addresses, Service Tag, and serial numbers for each Dell switch or enter this information manually.

1. Locate the **.csv** file that contains the system MAC addresses, serial numbers, and Service Tags for the switches in the fabric. Contact your Dell Networking sales representative for this file.
2. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
3. From the **Deploy Fabric** pull-down menu, select **Pre-deployment Configuration**.
4. Navigate to the **Assign Switch Identities** screen.
5. Click **Browse** and specify the path of the **.csv** file. If you do not have this file, enter this information in the **System MAC Address** fields manually.
6. Click **Upload**.
7. Click the **Choose MAC** icon in each row and associate the switch name with the MAC address, (optional) serial number, and (optional) Service Tags using the **.csv** file or enter this information manually.

   NOTE:
   - If you are using a **.csv** file, the **Select MAC Address Selection** screen displays.
   - If you type part of a MAC address, AFM displays any matching configured MAC addresses. If you select a MAC address, AFM automatically enters any associated IP addresses or Service Tags.
8. Associate the system MAC address, serial number, and Service Tag with each switch.
9. Click **Next** to the go to the **Assign Management IP** screen.

Pre-Deployment – Management IP

To assign a management IP address to each switch in the fabric, use the **Management IP** screen.

NOTE: Before you begin, gather the management IP addresses for all the switches in the Layer 2 or Layer 3 fabric for the management port. All management switch IP addresses must be on the same subnet.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Management IP** screen.
4. In the **Default Gateway** field, enter the address of the default gateway for the management interface.
5. In the **Management Route** field, enter the route and prefix of the management interface.
6. In the **Start Management IP Address/Prefix** fields, enter the starting management IP address and prefix.
7. To assign a management IP address, select the switches.
8. Click **Auto-fill Selected Rows** .

   The system automatically assigns a management IP address to all the selected switches in the fabric.
9. Click **Next** to go to the **Software Images** screen.

Pre-Deployment – SNMP and CLI Credentials

To configure SNMP and CLI credentials at the fabric level. Configure SNMP so that the AFM can perform SNMP queries on the switches in the fabric, use the **SNMP and CLI Credentials** screen. The values you enter in the SNMP configuration are also used for configuring the switches during the build phase and for monitoring during the run phase. The write community string is populated from the AFM global setting, which is configured during installation. To provision the fabric, enter the Dell Networking operating system CLI user's credentials and enable the configuration credentials for all the switches in the fabric. This option allows you to remotely make configuration changes to the switches in the fabric.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select **Pre-deployment Configuration** .
3. Navigate to the **SNMP and CLI Credentials** screen.
4. Navigate to the **SNMP Configuration** area.
5. In the **Read Community String** field, enter the read community string (for example, `public`).
6. In the **Write Community String** field, enter the write community string (for example, `private`).
7. Navigate to the **CLI Credentials** area.
8. In the **Protocol** drop-down menu, select one of the following options:
   - **Telnet**
   - **SSHv2**
9. In the **User Name** field, enter the user name.
10. In the **Password** field, enter the password.
11. In the **Confirm Password** field, confirm the password. The privilege level is a read-only field and the default is 15.
12. In the **Enable Password** field, enter a password for the privilege level.
13. In the **Confirm Enable Password** field, confirm the enabled password for the privilege level.
14. Click **Next**.

Pre-Deployment – Software Images

To specify which software images to stage for each type of switch in the fabric from a TFTP or FTP site, use the **Software Images** screen. The software image must be the same for each type of platform. Place

the software image(s) for the switches on the TFTP or FTP site so that the switches can install the appropriate FTOS software image and configuration file from this site.

To change the address of the TFTP or FTP site, navigate to the **Administration > Settings** > **TFTP/FTP** screen.

NOTE: Before you begin, make sure that you have loaded the software image for each type of switch on to the TFTP or FTP site.

NOTE: To download the latest FTOS switch software version, see the "Upload Switch Software" section in the *AFM Installation Guide*.

To specify which software images to load onto each switch in the fabric from the TFTP or FTP site:

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select the **Pre-deployment Configuration** option.
3. Navigate to the **Software Images** screen.
4. Select the **TFTP** or **FTP** site option that contains the software image.
5. Enter the path of the software image(s) to the TFTP or FTP site.
6. Click **Next** to go to the **DHCP Integration** screen.

Pre-Deployment – DHCP Integration

The **DHCP Integration** screen uses the information configured at the **Assign Switch Identities**, **Management IP**, and **Software Images** screens to create a DHCP configuration file named **dhcpd.cfg**, which contains the following information:

- System MAC addresses and fixed management IP addresses for each switch in the fabric
- Location of the software images and configurations for the switches on the TFTP or FTP server

To automatically integrate the file into the AFM local DHCP server, use the default setting **Local (AFM provisioned to be a DHCP server)**. AFM automatically generates a switch configuration file and transfers it to the local DHCP server.

To manually integrate the DHCP configuration into the external DHCP server, select **Remote (External DHCP server)**.

After you power cycle the switches, the switches use BMP. BMP provides the following features:

- Automatic network switch configuration
- Automated configuration updates
- Enforced standard configurations
- Reduced installation time
- Simplified operating system upgrades

Automated BMP reduces operational expenses, accelerates switch installation, simplifies upgrades, and increases network availability by automatically configuring Dell Networking switches. BMP eliminates the need for a network administrator to manually configure a switch, resulting in faster installation, elimination of configuration errors, and enforcing standard configurations.

With BMP, after you install a switch, the switch searches the network for a DHCP server. The DHCP server provides the switch with a management IP address and the location of a TFTP or FTP file server. The file server maintains a configuration file and an approved version of FTOS for the Dell Networking S55, S60,

S4810, S4820T, S6000, Z9000, and MXL blade switches. The switch automatically configures itself by loading and installing an embedded Dell Networking OS image with the startup configuration file.

For more information about BMP, refer to the *Open Automation Guide*.

NOTE: When you enter the system MAC address into the **Assign Switch Identities** screen, AFM generates a port MAC address from the pre-deployment configuration, not a chassis MAC address.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select the **Pre-deployment Configuration** option.
3. Navigate to the **DHCP Integration** screen.
4. Click **Save to ...** and specify the location for the generated DHCP configuration file. You can also copy and paste the configuration into the DHCP server.
5. Install the DHCP file onto the DHCP server before deploying the fabric.
6. Click **Next** to go to the **Summary** screen.

Pre-Deployment – Summary

To review the pre-deployment configuration, use the **Summary** screen, which displays the following information:

- Specified IP and protocol settings for the fabric, uplink, and downlink configuration
- Software image information for each type of switch
- Configuration file transfer status to the remote or local TFTP or FTP server

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**.
3. Navigate to the **Summary** screen.
4. Carefully review the pre-deployment configuration.
5. Click **Finish** to commit your changes.

Next Steps:

1. Verify that the DHCP configuration file for the fabric is integrated into the DHCP server so that the switches are assigned a management IP address before you deploy the fabric.
2. Power on the switches in the fabric when you have completed the pre-deployment process. After you power cycle the switches, the switches use bare metal provisioning (BMP).

   NOTE: If you are using a switch that has already been deployed, reset the switch to factory defaults to use it in the fabric. The switch must be in BMP mode. For more information about BMP, see DHCP Integration and refer to the *Open Automation Guide*.
3. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
4. To deploy and validate the fabric, select **Deploy and Validate** from the **Deploy Fabric** drop-down menu.

Viewing the DHCP Configuration File

NOTE: If you are using Internet Explorer and the Windows 7 OS, change your indexing options by performing the following steps:

1. Navigate to the **Control Panel >Indexing Options** screen.
2. Click **Advanced** and then click the **File Types** tab.
3. In the **Add new extension to list** field, enter `conf` as the extension file type and then click **Add**.
4. Click **OK**.

1. Navigate to the **Network >** *>Fabric Name>* **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **View DHCP Configuration** .
3. From the **Deploy** drop-down menu, select **View DHCP Configuration**. For more information about DHCP, refer to DHCP Integration.

Deploying and Validating the Fabric

Deploying the Fabric

To deploy the fabric, use the **Network >** *Fabric Name>* **Configure and Deploy** > **Deploy Fabric** > **Deploy and Validate** screen. When you deploy a fabric, make sure that the fabric design matches the deployed fabric. AFM prompts you to fix any errors when you deploy the fabric.

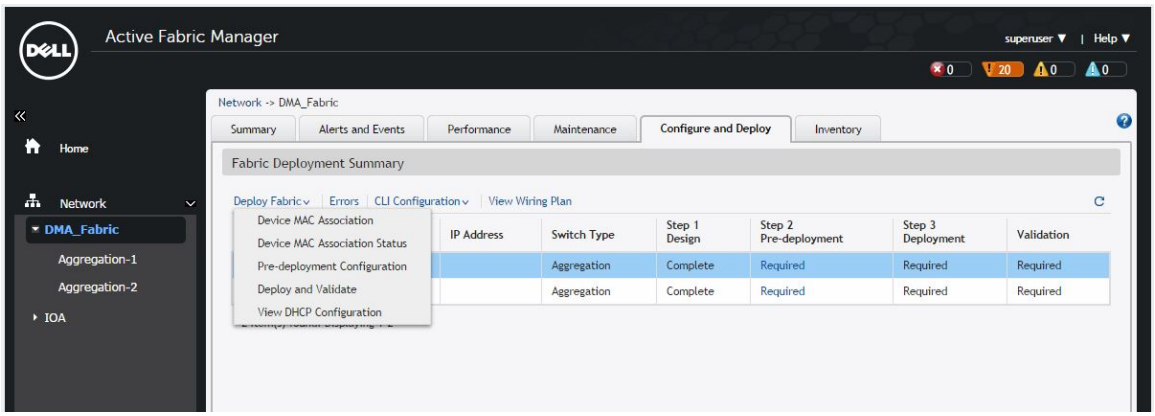


Figure 69. Configure and Deploy — Deploy and Validate

NOTE: During initial deployment, the BMP process wait time to install the software onto the switches in the fabric depends on whether stacking is enabled. Approximate wait times are:

- 10 minutes for a non-stacked fabric
- 20 minutes for stacked fabric

To view a custom configuration file, navigate to the **Network >** *Fabric Name>* **Configure and Deploy** screen. From the **CLI Configuration** drop-down menu, select the **Custom Configuration** option.

Use the following Deployment Status table to troubleshoot deployment issues.

Table 31. Deployment Status

Number	Status	Status Details	Recommended Action
1	Required	Deployment Required	None
2	Complete	Deployment successfully completed	None
3	Error	Protocol transfer failed	Verify TFTP/FTP connectivity and FTP credentials
5	Error	Device cleanup task failed	1. Verify the switch connectivity from AFM using Telnet or SSH. 2. Re-deploy the switch from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and then clicking **Deploy Selected**.
6	Error	Complete config upload failed	1. Verify TFTP/FTP or Telnet/SSH connectivity and verify credentials. 2. Re-deploy the switch from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and then clicking **Deploy Selected**.
7	Error	Smart script transfer failed	None
8	Error	Custom config upload failed	Verify the login and configuration commands on the switch
9	Error	Backup config failed	1. Verify Telnet or SSH connectivity from AFM. 2. Re-deploy the switch from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and then clicking **Deploy Selected**.
10	InProgress	Verifying that the switch is eligible for the deploy process	None
11	InProgress	Protocol transfer in progress...	None
12	InProgress	Device cleanup task done, reload in progress...	None
13	InProgress	Complete config upload in progress...	None
14	InProgress	Smart script transfer in progress...	None
15	InProgress	Custom config upload in progress...	None
16	InProgress	Backup config in progress...	None
17	InProgress	Merged config upload in progress...	None

1. Verify that the software images for the switches are installed on the TFTP or FTP server.
2. Verify that you have configured the correct TFTP or FTP address on the **Administration > Settings** screen. If you change the TFTP server now, the address is not correct unless you reconfigure the pre-deployment.

3. If you use a remote DHCP server, verify that the DHCP configuration file generated by AFM for the switches in the fabric is integrated into the DHCP server. This file enables the switch to connect to the DHCP server and download the correct configuration and boot files.
4. Restart the DHCP server that contains the generated DHCP file that you created on the **DHCP Integration** screen. For information about DHCP integration, refer to DHCP Integration. For information about how to view the DHCP configuration file for a fabric, refer to Viewing the DHCP Configuration File.
5. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
6. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate** .

   The **Deploy and Validate** screen displays.
7. On the **Deploy** tab, select the switches to deploy in the **Switch Name** column.
8. Power up the selected IP-ready switches.
9. Click **Deploy Selected** and wait for the fabric to deploy.
10. Select a configuration deployment option:
    - **Apply configuration changes to the switch** — Apply new configuration changes from AFM to the switch.
    - **Overwrite entire configuration on the switch** — Overwrite the entire current configuration on the switch instead of applying only the changes to the current switch configuration.
      - If the **Reset to factory defaults** option is selected, AFM resets the switch to the factory default mode (BMP mode). AFM deploys the new configuration on the switch by overwriting the current configuration.
      - If the **Reset to factory defaults** option is not selected, AFM deploys the new configuration on the switch by overwriting the current configuration.
    - **Skip Deployment and proceed to Validation** — Skip the deployment process and validate the switch.
11. Check the progress and status of the deployment in the **Status**, **Status Details**, **Response Actions**, and **Last Deployed** columns.

    For information about how to view validation errors, refer to Validation. See also Troubleshooting.
    For information about the progress and status of selected switches and operations allowed during a fabric state, refer to Operations Allowed During Each Fabric State and Understanding Fabric Phases.

Aborting Deployment

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate** .

   The **Deploy and Validate** screen displays.
3. On the **Deploy** tab, select the switches.
4. Click **Abort Selected**.
5. Click **Yes**.

Advanced Configuration

To perform the following tasks, use the **Advanced Configuration** screen:

- View the Auto-Generated Configuration
- Associate the Templates to Fabric Switches

  NOTE: Create a template for the fabric before associating it to the fabric. For more information, refer to the Adding Templates section in Managing Templates.

- Add the Switch Specific Custom Configuration
- Preview the Combined Configuration

View the Auto-generated Configuration

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy > Deploy Fabric > > Advanced Configuration > View Auto-Generated Configuration** screen.
2. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**.
3. On the **Deploy** tab, click **Advanced Configuration**.
4. Click **View Auto-Generated Configuration** link and wait for the configuration to display.

Associating Templates

Associate one or more existing configuration templates to the entire fabric, all spines, all leaves, all aggregation switches, all core switches, all access switches, or a set of switches. If you associate a template with an entire fabric or all spines, all leaves, all core switches, all aggregation switches, or all core switches, the template is automatically applied to all new switches so you do not need to create new associations manually.

NOTE: Each template can have only one association per fabric. AFM does not support template ordering for command sequencing. If you want to order templates for command sequencing, Dell Networking recommends manually combining the templates into a single template.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down, select **Deploy and Validate**.
3. On the **Deploy** tab, click **Advanced Configuration**.
4. Click **Associate Templates to Fabric Switches**.
   The **Associate Templates** screen displays:
5. Click **Add Association**.
6. In the **Template Name** drop-down menu, select a template.
7. (Optionally) In the **Comments** field, enter any comments for the template.
8. In the **Select Association** area, select one the following options:
   - **All** — Associate the template to all the switches in the fabric.
   - **Aggregation** — Associate the template to all aggregation switches.
   - **Access** — Associate the template to all access switches.
   - **Core** — Associate the template to all core switches.
   - **Spines** — Associate the template to all spine switches.
   - **Leafs** — Associate the template to all leaf switches.
   - **Custom** — Associate the template with specific switches. In the **Available Switches**, select the switches to associate with the template.
9. Click **Apply**.

Adding a Switch-Specific Custom Configuration

Before editing the existing configuration, back up the existing running configuration in the flash with a unique name that includes the date and time.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down, select **Deploy and Validate**.

3. On the **Deploy** tab, select **Advanced Configuration** and then **Add Switch Specific Custom Configuration**.

   The Switch Specific Custom Configuration screen displays.

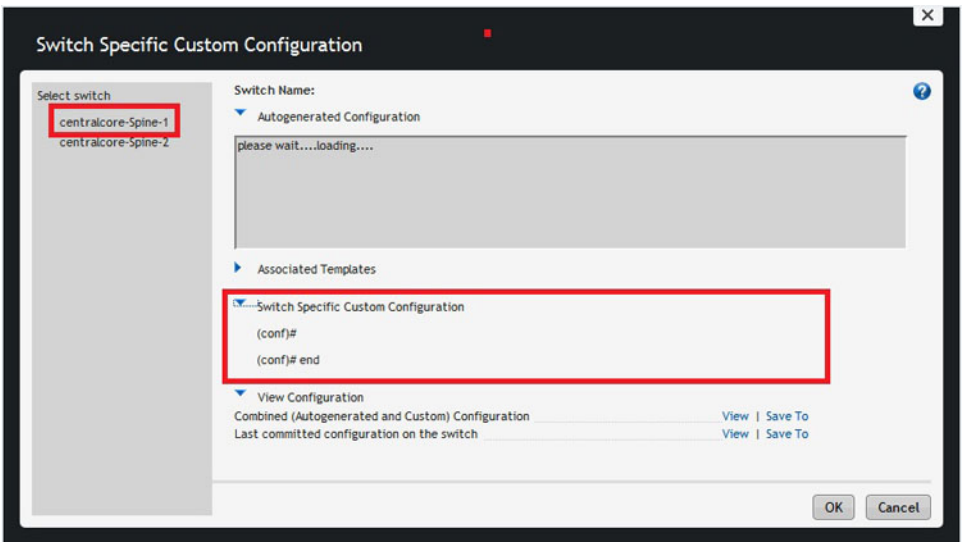


Figure 70. Switch Specific Custom Configuration

   View the auto-generated configuration and switch-specific custom configuration applied to the deployed switches in the fabric on the **Switch Specific Custom Configuration** screen.

4. Enter the switch specific-custom configuration using CLI commands in the **Switch Specific Custom Configuration** area.
5. Under the **View Configuration** heading, click **View** next to **Preview the combined auto-generated and custom configuration**. To view the auto-generated configuration, global custom configuration, and switch specific configuration, select this option.

   The **View Combined Configuration** screen displays.
6. To view the last applied configuration or save it, click **View** or **Save To ...** next to the **Last committed configuration on the switch** area. AFM displays the timestamp for the last committed configuration on the switch.
7. Review the combined configuration and make any necessary changes.
8. Click **Save To ...** to save the combined auto-generated and custom configuration.
9. Click **Close**.

Preview Combined Configuration

To preview the combined configuration:

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** pull-down menu, select the **Deploy and Validate** option.
3. On the **Deploy** tab, click the **Advanced Configuration** link.
4. Click the **Preview Combined Configuration** screen.

   The **Combined Configuration** screen displays.

Validation

To verify that the discovered fabric matches the planned fabric and correct any errors, use the **Validate** screen. AFM reports mismatches as errors and generates the corresponding alarms. After fixing any errors found during validation, verify that all issues were resolved according to the planned fabric by re-validating the fabric.

Validation Status

Number	Status	Status Details	Response Action
1	Required	Validation Required	None
2	Complete	Validation completed	None
3	Error	HOSTNAME/MAC Address/MODEL Mismatch	To check for switch mismatch errors: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error detailsClick the **Discovered Errors** tab. 4. Fix any errors.
4	Error	HOSTNAME/MAC Address/MODEL Mismatch and STANDBY UNIT down	To check for switch mismatch errors: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Discovered Errors** tab. 4. Fix any errors.
5	Error	STANDBY UNIT down	To check for switch mismatch errors: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Discovered Errors** tab . 4. Fix any errors.
6	Error	Switch is not reachable	To verify switch connectivity from AFM: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**.

Number	Status	Status Details	Response Action
			3. To view error details, click the **Discovered Errors** tab . 4. Fix any errors.
7	Error	Switch is not Discovered	To verify switch connectivity from AFM: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Discovered Errors** tab . 4. Fix any errors.
8	Error	Configuration mismatch errors exist	To check for switch configuration mismatch errors: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Config Mismatch Errors**. 4. Fix any errors.
9	Error	Custom Configuration errors exist	To check for switch custom configuration errors: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Custom Config Errors** tab. 4. Fix any errors.
10	Error	Wiring Errors Exist	To verify the Errors in the **Wiring Error** tab: 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deployment** screen. 2. Click **Errors**. 3. To view error details, click the **Wiring Errors** tab. 4. To sort the errors by tier (aggregation, access or all), use the **Tier**drop-down menu. To sort the errors by type (missing link, wiring mismatch, or all), use the **Show** drop-down menu.

Number	Status	Status Details	Response Action
			5. Fix any errors.
11	InProgress	Node validation in progress...	None
12	InProgress	Configuration Validation in progress...	None
13	InProgress	Wiring Validation in progress...	None

Validating the Fabric

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
   The **Configure and Deploy** screen displays.
2. In the **Switch** column, select the switches for validation.
3. Click **Validate Selected**.
4. Review the progress in the **Status**, **Status Details**, **Response Actions**, and **Last Validated** columns.
5. Correct any errors.
6. If you fix any errors found during validation, verify that all issues were fixed according to the planned fabric by re-validating the fabric.

Viewing Deployment and Validation Status

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. Select the fabric.
3. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**.
   You can also view the status of the fabric deployment on the **Network** > *Fabric Name* > **Configure and Deploy > Errors** screen.

Custom CLI Configuration

This section contains the following topics.

Managing Templates

Adding Templates

To apply a custom configuration to the following switch types, create a CLI configuration template:

- Specific switches in a fabric
- All aggregation switches in the fabric
- All access switches in the fabric
- All core switches
- All switches in the fabric

- All leaf switches in the fabric
- All spines in the fabric

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.
2. From the **CLI Configuration** pull-down, select **Associate Template**.
   The **Templates** screen displays.
3. Click **Add Template**.
4. In the **Template Name** field, specify a unique name for the template.
5. (Optional) In the **Description** field, enter a description for the template.
6. In the **Configuration Commands:** area, enter the CLI configuration commands that you want to include in the template.
7. Click **OK**.

For information on how to associate a template to a switch or fabric, refer to Associating Templates.

Editing Templates

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.
2. From the **CLI Configuration** drop-down menu, select **Manage Templates**.
   The **Templates** screen displays.
3. Select the template.
4. Click **Edit Template**.
   The **Edit Template** window displays.
5. (Optional) In the **Template Name** field, enter a description for the template.
6. In the **Configuration Commands** area, edit the CLI commands.
7. Click **OK**.

Deleting Templates

- Before you delete a template, make sure that the template is not in use. You can only delete templates that are not being used. If you attempt to delete a template that is being used, AFM displays an error message with the associated fabric for the template.
- You cannot delete a template if it is associated with one or more switches.
- You can only delete one template at a time.
- To delete a template, you must have superuser or administrator privileges.

1. Navigate to the **Network** > **Configure and Deploy** screen.
2. From the **CLI Configuration**, select the **Managing Templates** drop-down menu.
3. Select the template and then click **Delete Link**.
4. Click **Yes**.

Copying Templates

You can copy an existing template, modify it, and then apply it to fabric or switch. If you copy a template, AFM does not copy any associations to the switches. For information about how to associate templates, refer to Associating Templates.

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.
2. From the **CLI Configuration** drop-down, select **Manage Templates**.
   The **Templates** screen displays.

3. Click **Copy Template**.
   The **Copy Template** screen displays.
4. Select the template to copy.
5. In the **Template Name** field, enter a unique name for the new template. \
6. Click **OK**.

Associating Templates

Associate one or more existing configuration templates to the entire fabric, all spines, all leaves, all aggregation devices, all access devices, all core switches, or a set of switches. If you associate a template with an entire fabric, all spines, all leaves, all aggregation devices, all access devices, or core switches, the template is automatically applied to the newly added switches so you don't have to create new associations manually. You can also edit and delete templates.

NOTE: Each template can have only one association per fabric. AFM does not support template ordering for command sequencing. If you want sequence commands, Dell Networking recommends manually combining the templates into a single template.

Associating Templates

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.
2. From the **CLI Configuration** drop-down menu, select the **Associate Templates** option.
3. Click **Add Association**.
4. In the **Template Name** drop-down menu, select the template.
5. (Optional) In the **Comments** field, enter any comments about this association.
6. In the **Select Association** area, select one the following options:
   - **All** — Associate the template with all switches in the fabric
   - **Aggregation** — Associate the template with all aggregation switches
   - **Access** — Associate the template with all access switches
   - **Core** — Associates the template with all core switches
   - **Custom** — Associate the template with specific switches. Specify the switches in the **Available Switches** area.
   - **Leafs** — Associate the template with all leaf switches
   - **Spines** — Associate the template with all spine switches
7. Click **Apply**.

Editing Template Associations

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.
2. From the **CLI Configuration** drop-down menu, select **Associate Templates**.
3. Select the template.
4. Click **Edit Association**.
5. Edit the association.
6. Click **OK**.

Deleting Template Associations

1. Navigate to the **Network** > *Fabric* > **Configure and Deploy** screen.

2. From the **CLI Configuration** drop-down menu, select **Associate Templates**.
3. Select the template.
4. Click **Delete**.
5. Click **OK**.

Adding a Switch-Specific Custom Configuration

Before editing the existing configuration, back up the existing running configuration in the flash with a unique name that includes the date and time.

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **Deploy Fabric** drop-down, select **Deploy and Validate**.
3. On the **Deploy** tab, select **Advanced Configuration** and then **Add Switch Specific Custom Configuration**.

   The Switch Specific Custom Configuration screen displays.

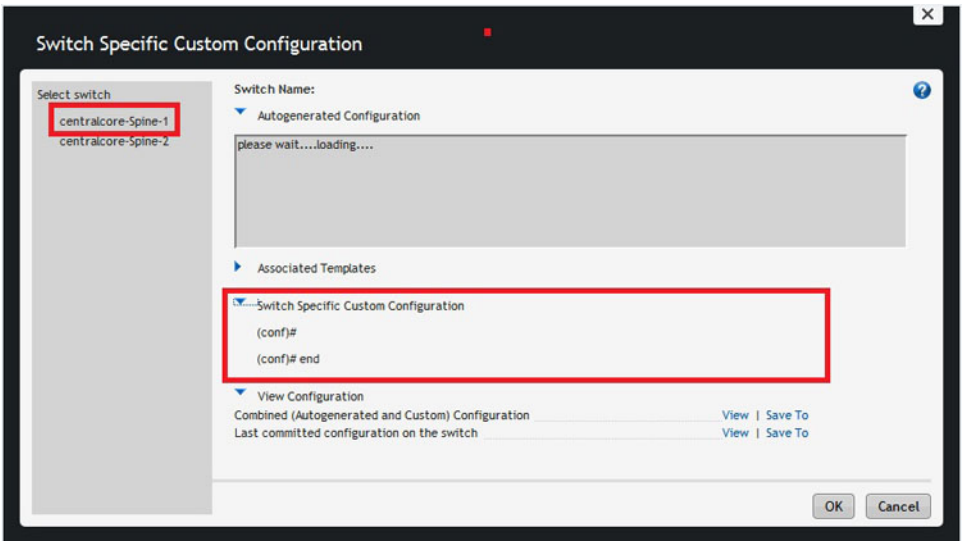


Figure 71. Switch Specific Custom Configuration

   View the auto-generated configuration and switch-specific custom configuration applied to the deployed switches in the fabric on the **Switch Specific Custom Configuration** screen.

4. Enter the switch specific-custom configuration using CLI commands in the **Switch Specific Custom Configuration** area.
5. Under the **View Configuration** heading, click **View** next to **Preview the combined auto-generated and custom configuration**. To view the auto-generated configuration, global custom configuration, and switch specific configuration, select this option.

   The **View Combined Configuration** screen displays.

6. To view the last applied configuration or save it, click **View** or **Save To ...** next to the **Last committed configuration on the switch** area. AFM displays the timestamp for the last committed configuration on the switch.
7. Review the combined configuration and make any necessary changes.
8. Click **Save To ...** to save the combined auto-generated and custom configuration.
9. Click **Close**.

Viewing Custom Configuration History

To view a complete history of all custom configuration applied to each of the switches, use the **Custom Configuration History** screen.

- **Custom Configuration History** — View a chronological list of custom configurations applied to the switch. To view details for a configuration, select a row in the table.
- **Applied Custom Configuration Commands** — View all template-based custom configuration commands and switch-specific custom configuration commands applied during deployment or redeployment, including command execution errors .

1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen.
2. From the **CLI Configuration** drop-down menu, select **View Custom Configuration History**.

   The **Custom Configuration History** displays.

8

Discovering and Deploying an Existing Fabric

To discover an existing fabric or an IOA blade switch in a M1000e chassis, use the **Discover Fabric** option. After you deploy the discovered fabric, the fabric sends alarms and events to AFM. For information about IOA, refer to Designing an IOA Fabric.

Figure 72. Discovering and Deploying an Existing Fabric

1. Initiate discovery of an existing fabric on the **Network** > **Design** > **Discover Fabric** screen. Refer to Step 1: Discover an Existing Fabric.
2. Check the status of the discovered fabric on the **Network** > **Design Fabric** > **Discover Status** screen. Refer to Step 2: View Discovery Status.
3. Deploy the successfully discovered fabric on the **Network** >**Design Fabric** screen. Refer to Step 3: Deploy Discovered Fabric.
4. Perform maintenance, such as monitoring and software updates. Refer to Maintenance and Performance Management.

Step 1: Discover an Existing Fabric

For more information about discovering and deploying an existing fabric, refer to Discovering and Deploying an Existing Fabric.

1. Click **Network** and then the **Design Fabric** tab.
   The **Network Deployment Summary** screen displays.
2. Click **Discover Fabric**.
   The **Introduction** screen for the **Discover Fabric** wizard displays.
3. Read the introduction and click **Next**.
   The **Fabric Name and Type** screen displays.
4. Enter the fabric name in the **Fabric Name** field.

   NOTE: The fabric name must be unique.
5. (Optional) Enter a description for the fabric in the **Description** field.
6. Click **Next**.
   The **Discovery Information** screen displays.
7. Enter the switch's IP address in the **Enter the Switch IP Address** field. To add the IP address, click the **+** button.

   NOTE: You can add an individual IP address or IP address with a subnet or a range. AFM does not support netmasks less than 24.
   - IP range example: `10.16.133.1-150`
   - Network with mask example: `10.16.132.0/24`

   - To search for a previously entered IP address, enter a portion of or the entire IP address in the **Search IP address list:** field. The software displays all IP addresses that match the search term in the **List of added IPs** field. If you do not enter a search term, all known IP addresses display.
   - To remove an IP address from the displayed list, select the IP address and click the **—** button.
   - To exclude an IP address, enter it in the **Enter Exclusion IP Address** field.
   - To view a list of all IP addresses selected for discovery, click **Preview IP**.The **Preview IP** screen displays only the devices participating in the discovery. To view additional pages, use the arrow buttons or enter the page number in the page number entry field to the left of the arrow buttons.

Figure 73. Preview IP Address Window

8. Add at least one IP address to the **List of added IPs:** field and click **Next**.
   The **Credentials** screen displays.
9. In the **SNMP** section, click **Add**.
   The **SNMP Credential** window displays.

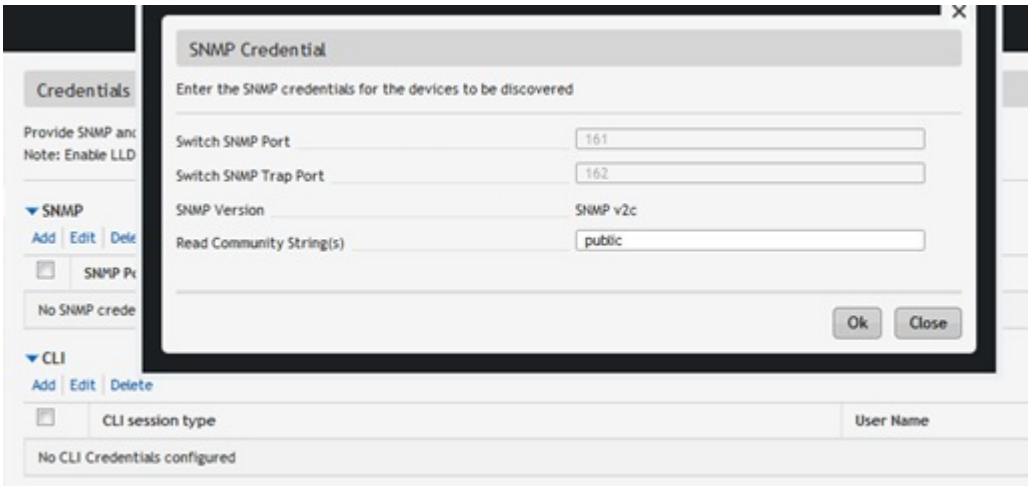


Figure 74. Discover Fabric SNMP Credential Screen

10. Enter the SNMP credential information and click **OK** to confirm the information or click **Close** to close the window. By default, the SNMP port number is 161 and the trap port number is 162. The maximum number of SNMP credentials is five.
    - Enter the read community string in the **Read Community String(s)** field. You can only enter one read community string.

      NOTE: The SNMP credential information requires the read community string.

    NOTE:
    - To delete SNMP credentials, check the checkbox for the credentials you want to delete and click **Delete** in the SNMP section. There is no confirmation message before the credentials are deleted.
    - To edit SNMP credentials, check the checkbox for the credentials you want to edit and click **Edit** in the SNMP section. Click **OK** to save changes or click **Close** to close the window.
11. Click **Add** in the **CLI Credentials** section.

    The **CLI Credential** window displays.

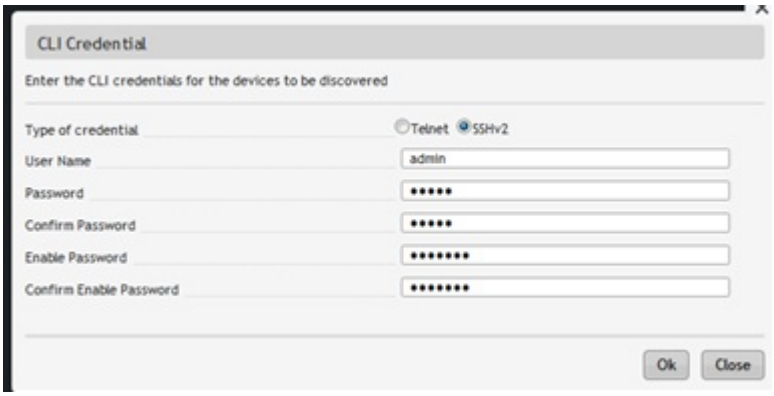


Figure 75. Discover Fabric CLI Credential Screen

NOTE: Configure up to five CLI credentials for a single fabric. AFM supports combinations of credential types (SSHv2 and Telnet).

12. Enter the CLI credential information.
    a. Select the appropriate credential type (Telnet or SSHv2).
    b. Enter the user name in the **User Name** field and enter the password in the **Password** and **Confirm Password** fields.
    c. If you configured an enable password, enter it in the **Enable Password** and **Confirm Enable Password** fields.
    d. Click **OK** to confirm the information or click **Close** to close the window.

    NOTE:
    - To delete CLI credentials, check the checkbox for the credentials you want to delete and click **Delete** in the CLI section. There is no confirmation message before the credentials are deleted.
    - To edit CLI credentials, check the checkbox for the credentials you want to edit and click **Edit** in the CLI section. Click **OK** to save changes or click **Close** to close the window.
13. Click **Next**.

    The **Summary** screen displays.
14. In the **Summary** screen, review the summary information and click **Finish**. AFM starts the fabric discovery process and displays the **Network Deployment Summary** screen.

    To check the discovery status of an existing fabric, click **Discover Status**. For information about the **Discover Status** screen, refer to Step 2: View Discovery Status Screen.

Step 2: View Discovery Status of an Existing Fabric

Use the **Discovery Status** screen to:

- Display the current fabric discovery status and details for switches and chassis used in the existing fabric or an IOA in a M1000e chassis.
- Verify that AFM has discovered all the switches in an existing fabric or IOA fabric.
- Rediscover an existing chassis or switch for troubleshooting.
- Remove a switch from the discovered fabric.

For more information about fabric discovery, refer to Discovering and Deploying an Existing Fabric.

The following discover options are available:

- **Rediscover Fabric** — Rediscover an existing fabric.
- **Rediscover Switches** — Rediscover an existing chassis or switch for troubleshooting. If a device is not discovered, check the **Reason** column for the recommended action. To rediscover an existing chassis or switch, select the checkbox for the device and then click **Rediscover Switches**. To select all devices, selecting the top-left checkbox.
- **Remove Switches** — Remove a switch from the discovered fabric by excluding the switch's IP from the fabric.

The following information displays:

- IP address
- Switch name
- Vendor
- Model

NOTE: Only Dell IOA and MXL blades are identified. All other blade types are listed as `Unknown`.

- Software version
- SNMP status
- CLI login status
- Discovery status
- Reason (Completed, In Progress, Failed, or Not Yet Started) — If a device is not discovered, check the **Reason** Column for the recommended action.

For information about how to discover a fabric, see Discovering an Existing Fabric.

View the tabular wiring plan for a discovered fabric on the **Network** > **Design** > **View Wiring Plan** screen.

To view the discovery status of an existing fabric

1. Navigate to the **Network** > **Design Fabric** > **Discover Status** screen.

   NOTE:
   To remove a chassis, navigate to the **Edit Fabric** screen and delete the IP address of the chassis.
2. To check the discovery status of an existing fabric, click **Discover Status**. Check for failed devices and look for error messages in the **Reason** column for the cause, such as an authentication failure. .

After you close the Discovery Status screen, deploy the discovered fabric. For information about deploying an existing fabric, refer to Step 3: Deploy Discovered Fabric.

Step 3: Deploy Discovered Fabric

After you deploy the discovered fabric, the fabric sends alarms and events to AFM. The design, pre-deployment, and validation fields on the **Network** > *Fabric Name* > **Configure and Deploy** screen do not apply to fabric discovery. For more information, refer to Discovering and Deploying an Existing Fabric.

1. Close the **Discovery Status** screen.
2. Navigate to the **Network** > **Design Fabric** screen.
3. Navigate to the **Step 3 Deployment** column and
4. To deploy the discovered fabric, click the **Required** link for the discovered fabric.
   The **Deploy and Validation** screen displays.
5. On the **Deploy** tab, select the switches in the fabric you want to deploy.
6. Click **Deploy Selected**.
   The **Configuration deployment option** screen displays.
7. Select **Apply configuration changes to the switch** or **Skip Deployment and proceed to Validation** and click **OK**.

9

Viewing the Fabric

This section contains the following topics:

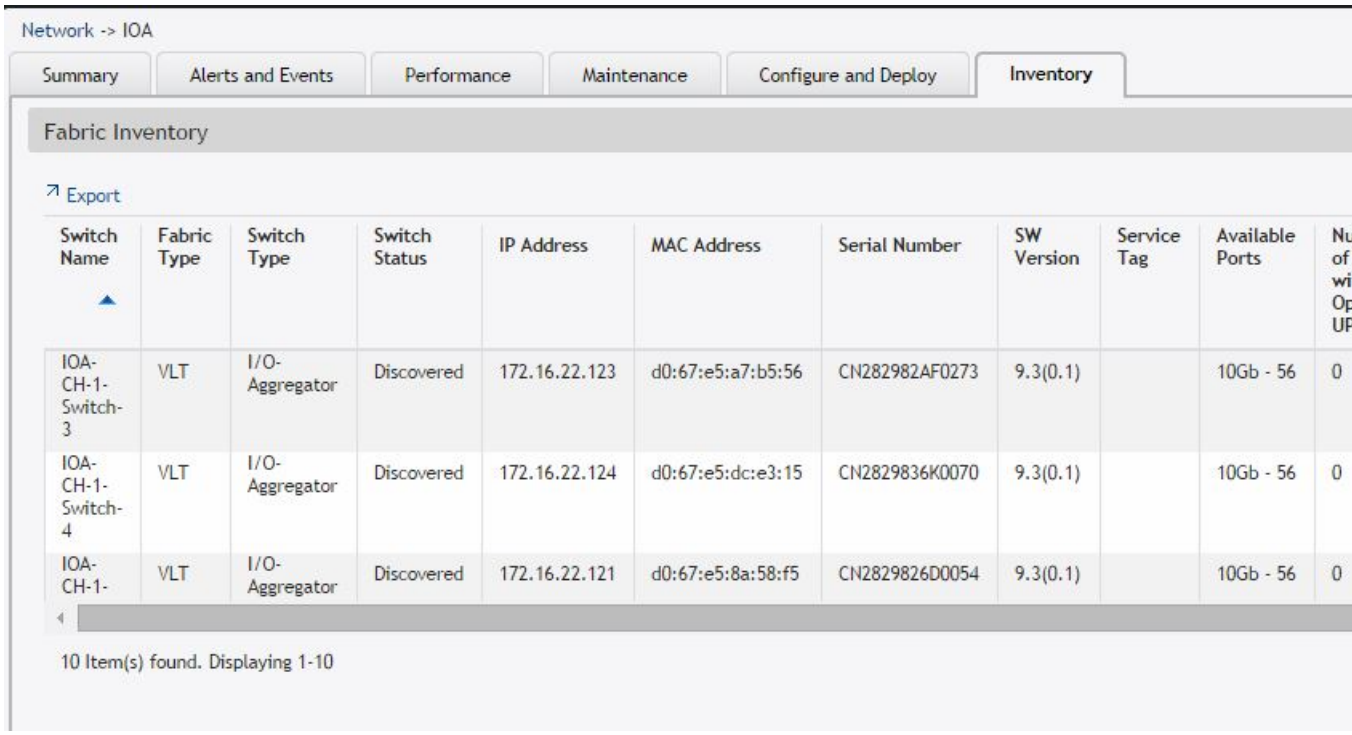
- Inventory Management
- Dashboard
- View Network Summary
- View Fabric Summary
- Switch Summary

Related Links: Fabric Performance Management.

Inventory Management

The **Inventory Management** screen displays all discovered switches in the fabric. From this screen, you can:

- View simplified or detailed inventory information
- Refresh the inventory
- Export the current inventory as a comma-separated value (CSV) file



NOTE: To refresh the inventory, click the blue **Refresh** button above the last column heading and below the **Help** button.

Network-Level

1. Navigate to the **Network** and click the **Inventory** tab.
   The list of all switches displays in tabular format.
2. To export the data, click **Export**.

Fabric-Level

1. Navigate to the **Network** > *Fabric Name* screen and click the **Inventory** tab.
   Details for the switches in the selected fabric display in tabular format.
2. To export the data, click **Export**. AFM exports the fabric data as a spreadsheet.

Dashboard

To view the fabric and system health, use the **Home > Dashboard** screen.

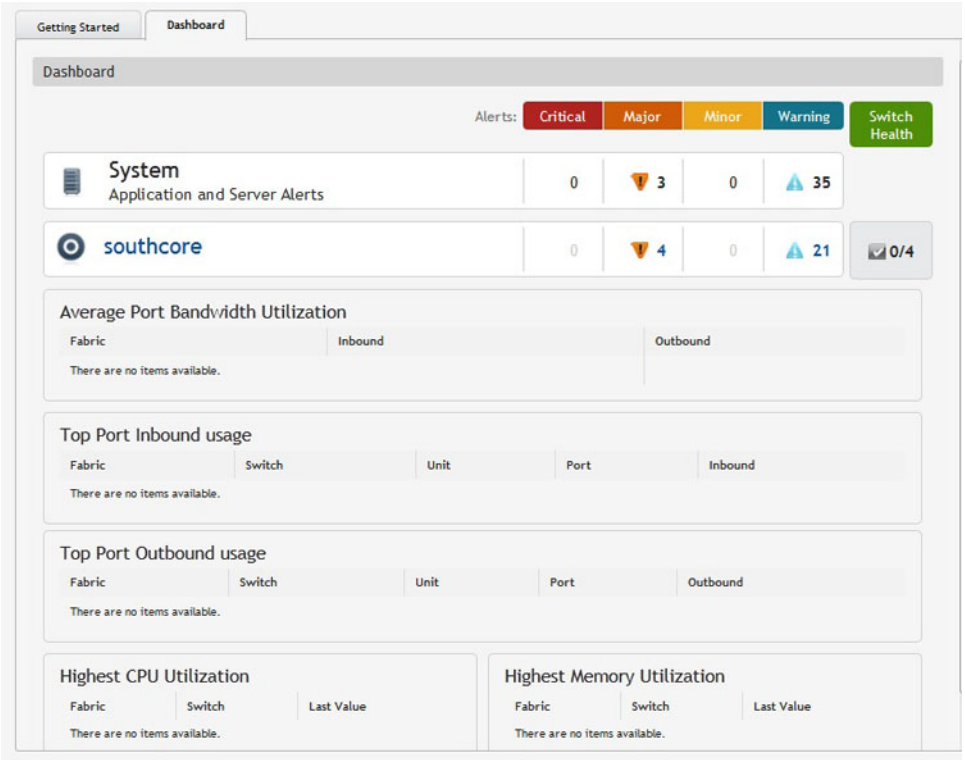


Figure 76. Dashboard

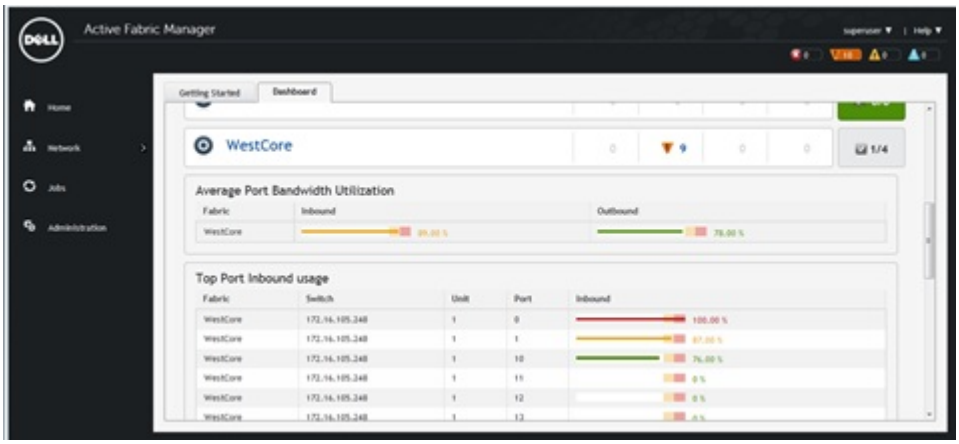


Figure 77. Dashboard with Color Codes

The Dashboard provides the following key performance information:

- **System** — View a tabular listing of system health and fabrics and the corresponding alert count in order of severity. The **Switch Health** column displays the number of switches that have no alerts and the number of switches in the fabric.
- **Average Port Bandwidth Utilization** — View the average port bandwidth utilization for all fabrics.
- **Top Port Usage** — View the ten most frequently-used ports for all fabrics by:
  - Fabric
  - Switch
  - Port number
  - Inbound (%): number with color code bar
  - Outbound (%): number with color code bar

Table 32. Inbound and Outbound Link Utilization Color Codes

Color	Range	Description
Green (Good)	x < 80 %	Represents normal inbound or outbound link utilization.
Yellow (Minor)	x > = 80 % and x < 90 %	Represents low link utilization.
Red (Critical)	x > = 90 %	Represents high link utilization.

NOTE: If the color code is yellow or red, AFM displays an alarm on the **Network** > *Fabric Name* > *Switch Name* **> Alerts and Events > Current** screen.

- **Highest CPU Utilization** — View the five CPUs with the highest utilization (by five-minute intervals) for all fabrics by:
  - Fabric
  - Switch
  - Last Values (%): number with color code bar

Table 33. CPU Utilization Color Codes

Color	Range	Description
Green (Good)	x < 70 %	Represents normal CPU utilization.
Yellow (Minor)	x > = 70 % and x < 80%	Represents low CPU utilization.
Red (Critical)	x > = 80 %	Represents high CPU utilization.

NOTE: If the color code is yellow or red, AFM displays an alarm on the **Network** > *Fabric Name* > *Switch Name* **> Alerts and Events > Current** screen.

- **Highest Memory Utilization** — View the highest five instances of memory utilization for all fabrics by:
  - Fabric
  - Switch
  - Last value (%): number with color code

Table 34. Memory Utilization Color Codes

Color	Range	Description
Green (Good)	x < 82 %	Represents normal memory utilization.
Yellow (Minor)	> = 82 % and < 92%	Represents low memory utilization.
Red (Critical)	> = 92 %	Represents high memory utilization.

NOTE: If the color code is yellow or red, AFM displays an alarm on the **Network** > *Fabric Name* > *Switch Name* **> Alerts and Events** > **Current** screen.

For more information, refer to Alerts.

Network Topology

To display all the fabrics in the network topology in a graphical or tabular view, use the **Network > Summary** screen. The network topology view contains a collection of fabric icons with a color-coded status and fabric names. There are no links between fabrics.

Network Topology Tabular View

Navigate to the **Network > Summary** screen and then click the **Tabular** tab.

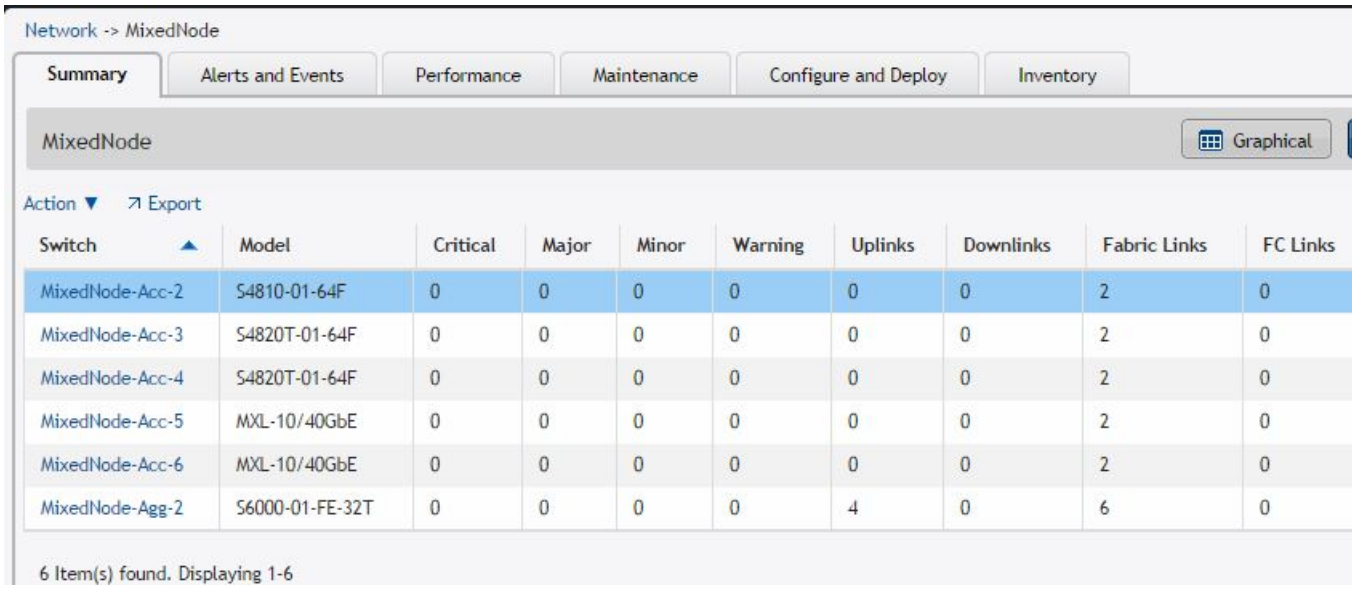


Figure 78. Network Topology Tabular View

Network Topology Graphical View

Navigate to the **Network > Summary** screen and then click the **Graphical** tab.

The network topology contains fabric icons. Each fabric icon has the following functions:

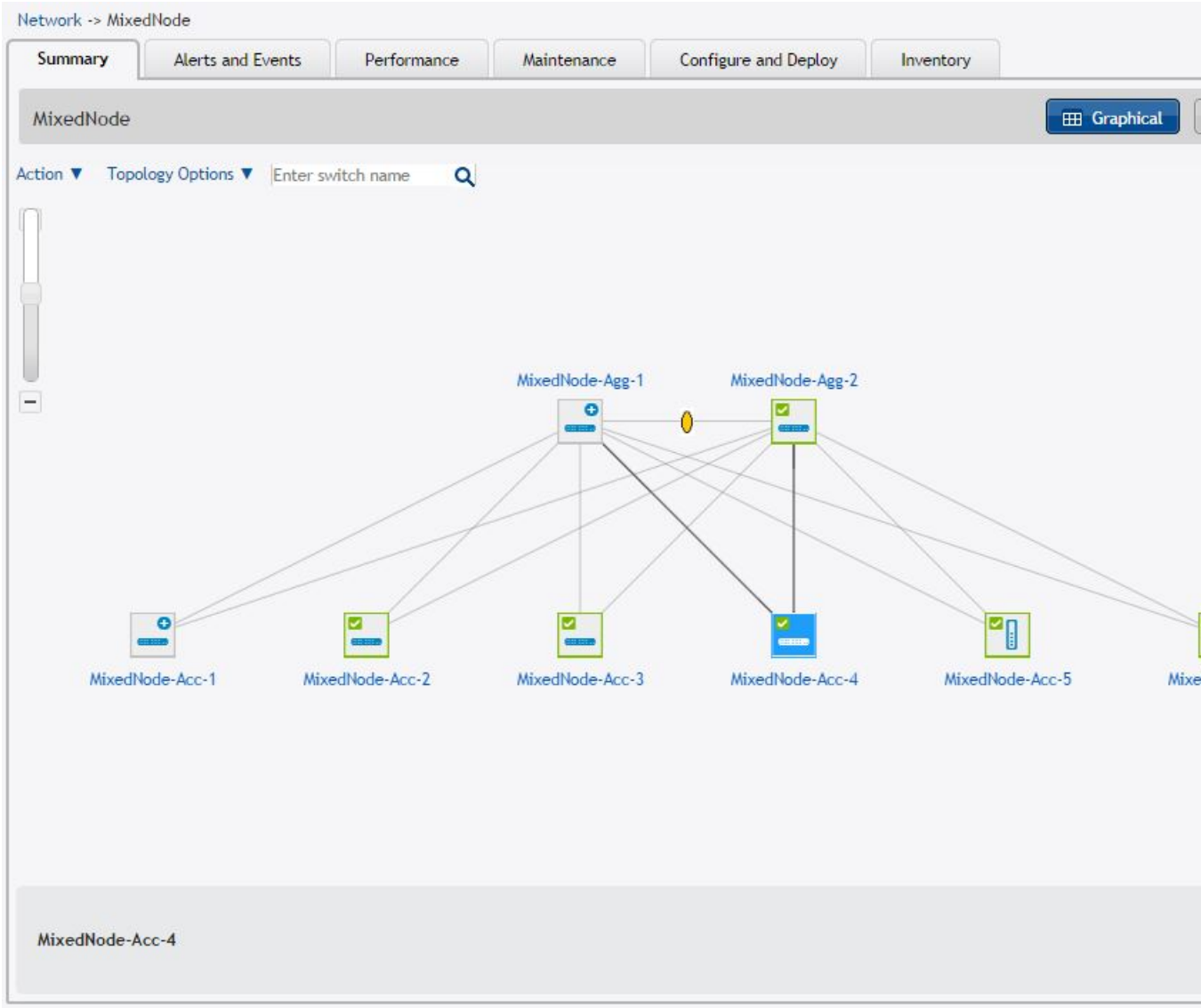


Figure 79. Network Topology Graphical View

- **Status:** — View the status of the fabric using the following colors:
  - Red: Critical alerts
  - Orange: Major alerts
  - Yellow: Minor alerts
  - Blue: Warning alerts
  - Green: Information alerts or no alerts
  - Gray: AFM does has not deployed or managed these fabrics
- **Selection** — To view the fabric data in the **Detail** tab, click a fabric icon.
- **Show Tooltips** — View information about a fabric, such fabric name, status, active alerts, and the number of switches in the fabric, as a tooltip when you place your mouse over a fabric icon.
- **Enable Move** — To move each fabric icon to a new location in the map, enable this option.

- **Revert to Last Saved** — Revert fabric locations to the last saved version.
- **Save Move** — Save changes to fabric locations.
- **Popup menu** — To display a menu of available actions and the fabric name, right-click a fabric.
- **Enter fabric name** — To locate a fabric, enter the name and then click the search icon.
- **Background Map Actions** — Load or delete a geographical background map for the network.

Fabric Summary

To change the display mode of the **Fabric Summary** screen, use the **Network** > *Fabric Name* > **Summary** screen. To display the status of the fabric in a graphical view which is the default view, click **Graphical**. To use the tabular view, click **Tabular**.

Displaying the Fabric in a Tabular View

To view the switches in the fabric and check alarms, click **Tabular**.

- To export results, click **Export**.
- To manage or remove a switch, click **Manage/Unmanage Switch**.
- To view additional performance statistics about a fabric:

  a. Navigate to the **Network > Fabric level > Tabular** screen.
  b. From the **Action** drop-down menu, select the switch row.
  c. Click **Launch Active Link**.

For information about how to configure the Active Link, navigate to the **Administrative > Settings > Active link Settings** screen. For additional information about the fabric, select the following tabs:

- **Detail**
- **Links**
- **Hardware**
- **VLANS**
- **Port Channels**

Displaying the Fabric in a Graphical View

To view the fabric topology, click **Graphical**. The fabric type and name display at the top of the screen. View the leaf switches associated with a spine by clicking the spine or view aggregation switches associated with the access switches by clicking an aggregation switch. The following options are also available:

- **Manage/Unmanage** — `Unmanaged` switches are switches that appear in the fabric but AFM does not manage them. To monitor and manage a switch, place it in a managed state.
- **Launch Active Link** — View additional performance statistics about a fabric in a graphical view by navigating to the following screens:
  - On the **Network >Fabric level > Graphical** screen, right-click the switch icon and select **Active Link**.
  - On the **Network >Fabric level > Graphical** screen, select the **Active Link** option from the **Action** drop-down menu.

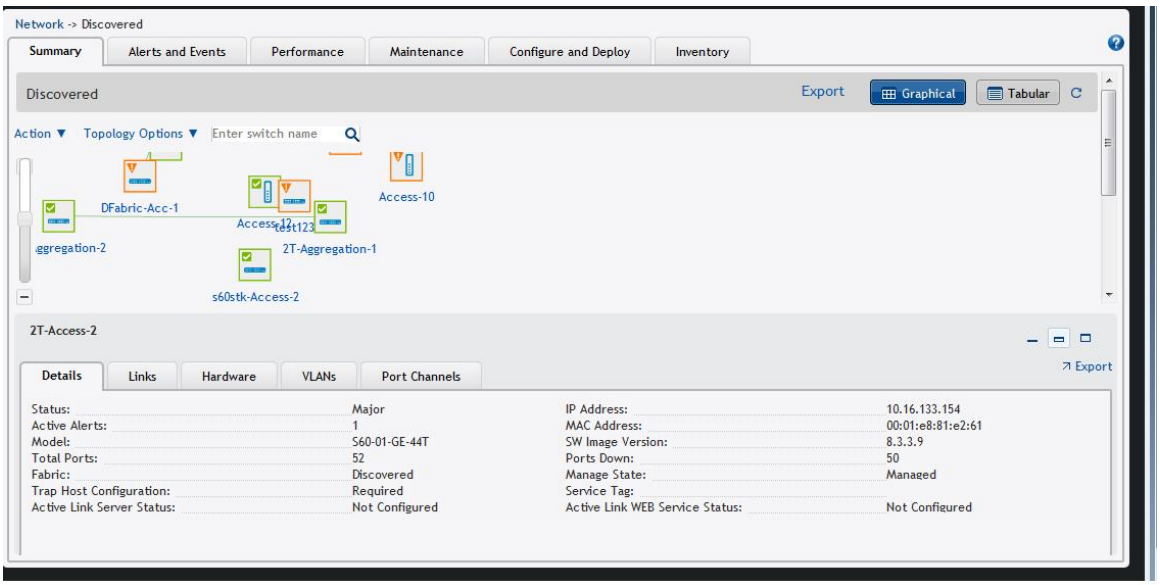


Figure 80. Fabric Summary Screen — Graphical View

For information about how to configure the Active Link, navigate to the Administrative > Settings > Active Link Settings screen.

- **Show Tooltips** — View information about a switch such as associated fabric, switch name, model name, IP address, alarm status, and managed state when you place the cursor over the switch.
- **Show All Links** — View all the links between the spines and the leaves, aggregation and access, or aggregation, access, and core.
- **Enter switch name** — To locate a switch in the fabric, enter the switch name and click the search icon. The switch name is case-sensitive.

Switch Summary

To view the following switch summary information from a graphical view, navigate to the **Network** > *Fabric Name* > *Switch Name* screen and then click the **Summary** tab. Make sure that the **Graphical** button is selected in the upper right of the screen. You can also view this information in a tabular view by selecting the **Tabular** button.

- Click on a port to display information about the state of the port
- Click on the **Port Legends** arrow to display the port legends.
- Click on the **Launch Active Link** from the graphical or tabular view to display additional statistics about a switch through the AFM using a OMNM server. For information about how to configure a element management service, navigate to the Administrative > Settings > Active Link Settings screen.
- Status
- Active Alerts
- Speed
- Manage State

10

Troubleshooting

This section contains the following topics:

For more information about troubleshooting, see Ping, Traceroute, SSH, and Telnet.

Ping, Traceroute, SSH, and Telnet

To troubleshoot a switch in the fabric, use ping, traceroute, SSH, or Telnet.

NOTE: SSH or Telnet functionality depends on the switch protocol configuration.

Ping

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Troubleshoot** screen.
2. To display the ping results, click **Ping**.

Traceroute

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Troubleshoot** screen.
2. To display the traceroute results, click **Traceroute**.

SSH

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Troubleshoot** screen.
2. Click the **SSH** tab.
3. In the **SSH Command** field, enter the SSH command.
4. To display the SSH results, click **Send Command**.

Telnet

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Troubleshoot** screen.
2. Click the **Telnet** tab.
3. In the **Telnet Command** field, enter the Telnet command.

4. To display the Telnet results, click **Send Command**.

Validation Alarms

To troubleshoot alarms triggered during deployment, use the following table:

Table 35. Validation Alarms

Alarm	Recommended Action
Validation failed because the switch cannot be discovered.	Log on to the switch console to isolate the fault. **NOTE:** Make sure that the switch has been power cycled and check the physical connection.
Validation failed because the switch has a mismatch MAC address.	1. To verify that you have correctly mapped the system MAC address to the associated switches: a. Navigate to the **Network**> *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** pull-down menu, select **Pre-deployment Configuration**. c. Navigate to the **Assign Switch Identities** screen and check the system MAC address mapping for the associated switches. 2. To verify changes, validate the switch: a. Navigate to the **Network**> *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switch. d. Click **Validate Selected**.
Validation failed because the switch has a name mismatch.	1. To verify that you have correctly mapped the system MAC address to the associated switches: a. Navigate to the **Network**> *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**. c. Navigate to the **Assign Switch Identities** screen and check the system MAC address mapping for the associated switches. 2. To verify changes, validate the switch: a. Navigate to the **Network**> *Fabric Name* > **Configure and Deploy** screen.

Alarm	Recommended Action
	b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switch. d. Click **Validate Selected**.
Validation failed because the switch has a model mismatch.	1. Verify that you have correctly mapped the system MAC address to the associated switches: a. Navigate to the **Network**> *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select the Pre-deployment Configuration option c. Navigate to the **Assign Switch Identities** screen and check the system MAC address mapping for the associated switches. 2. To verify changes, validate the switch: a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switch. d. Click **Validate Selected**.
Validation failed because the switch is in a disconnected state.	The switch is not reachable. Verify the connectivity of the switch.
Validation failed because Te 0/1 has a wiring mismatch.	1. Review the wiring plan. 2. Wire according to the wiring plan to fix the wiring mismatch. 3. Make sure that the ports on the switches are mapped accurately.
Validation failed because Te 0/1 has a missing link.	No connectivity is detected to the switch. Check the cables.
Validation failed because only a partial link can be verified for Te 0/1.	Check the connectivity of the link and the connectivity of the switch.
Validation failed because the switch has a configuration mismatch.	1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. 2. Click **Errors**. 3. Select the **Configuration Mismatch** tab. 4. Review the configuration mismatch and correct the configuration errors.

Deployment and Validation Errors

Pre-deployment Errors

To troubleshoot pre-deployment errors, use the following table. For information about IOA pre-deployment errors, refer to IOA Pre-deployment Errors.

Error Details	Recommended Action
Failed to transfer minimum configuration file via TFTP/FTP.	Verify the TFTP or FTP connectivity from AFM. For FTP, verify the credentials and restart the **DHCP Integration** step using the **Pre-deployment Configuration** wizard. 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. 2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration**. 3. Restart the **DHCP Integration** step.
Overwrite DHCP contents to local DHCP server failed.	Verify the following: • the permissions of the directory • disk space availability on the AFM server • the local DHCP server configuration Restart the **DHCP Integration** step using the **Pre-deployment Configuration** wizard. 1. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. 2. From the **Deploy Fabric** drop-down menu, select **Pre-deployment Configuration** . 3. Restart the **DHCP Integration** step.

Deployment Errors

To troubleshoot deployment errors, use the following table.

Error Details	Recommended Action
Protocol transfer failed	1. Verify TFTP or FTP connectivity from AFM. For FTP, verify the credentials. 2. Restart switch deployment from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**.
Device cleanup task failed	1. Verify Telnet or SSH connectivity from AFM. 2. Restart switch deployment from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**.

Error Details	Recommended Action
Complete configuration upload failed	1. Verify TFTP/FTP or Telnet/SSH connectivity from AFM. 2. Restart the deployment of the switch from the **Network > Fabric Name > Configure and Deploy** screen by selecting the switch from the list and then click **Deploy Selected**.
Smart script transfer failed	1. Verify connectivity to the switch from AFM. 2. Restart switch deployment from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**.
Custom configuration upload failed	1. Verify the switch login credentials and commands. 2. Restart switch deployment from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**.
Backup config failed	1. Verify the Telnet SSH connectivity. 2. Restart switch deployment from the **Network** > *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**.

Validation Errors

To troubleshoot the following validation errors when you deploy a fabric, use the following tables. The validation process reports any inconsistencies between the design and the discovered fabric. AFM reports mismatches as errors and generates the corresponding alarms.

To view validation errors, navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen and click **Errors**. The validation process reports the following error types:

- Configuration
- Custom Configuration
- Custom Configuration Deployment
- Discovered Switch Errors
- Pre-deployment
- Undiscovered Switch Errors
- Wiring

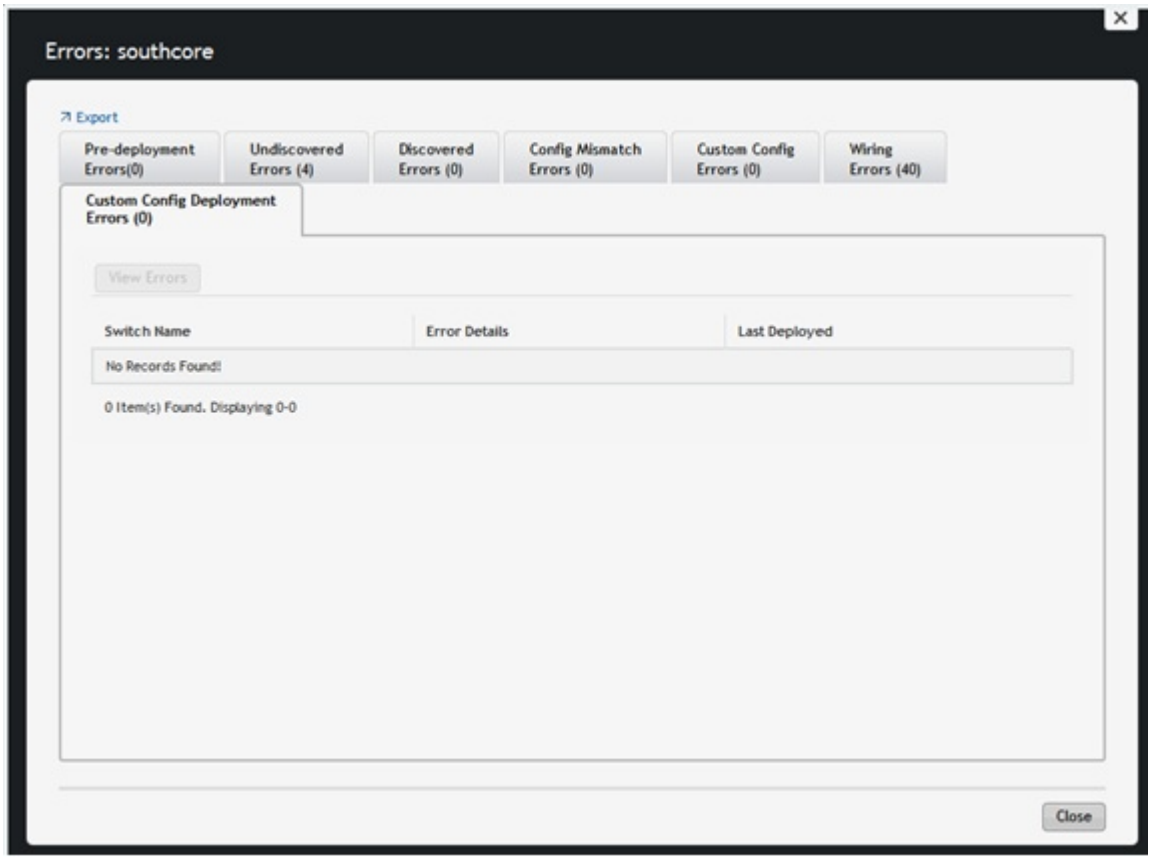


Figure 81. Validation Errors Screen

Table 36. Configuration Errors

Error Details	Recommended Action
Configuration Mismatch	1. On the **Deployment and Validation Status** screen, select the switch. 2. Click **View Mismatch**. 3. Review the configuration mismatch and correct the configuration errors. 4. Restart switch validation from the **Deploy and Validate** screen by selecting the switch from the list and clicking **Start Validation**.

NOTE: To filter the wiring errors by type, click the drop-down **Tier** menu and select a switch type (Aggregation, Access, or all). Only the selected error types display.

Table 37. Wiring Errors

Error Details	Recommended Action
Wiring Mismatch	1. Review the wiring plan. 2. Wire the switch according to the wiring plan to fix the wiring mismatch.

Error Details	Recommended Action
	3. Validate the switch from the screen by selecting the switch from the list and clicking **Start Validation**.
Missing Link	1. Review the wiring plan. 2. Wire the switch according to the wiring plan to fix the missing link. 3. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and then select the switches. d. Click **Deploy Selected**.
Partial Link	1. Verify that the switch is wired according to the wiring plan. 2. Verify the connectivity on AFM from both switches in the link. 3. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and then select the switches. d. Click **Deploy Selected**.

Table 38. Undiscovered Switch Error

Error Details	Recommended Action
Undiscovered Switch Error	1. Verify that the IP address for the switch is valid. 2. If required, correct the pre-deployment configuration. 3. From the AFM server, verify connectivity to the switch. 4. Verify that the switch is running the minimum required software. 5. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switches. d. Click **Deploy Selected**.

Table 39. Discovered Switch Error

Error Details	Recommended Action
Disconnected	1. Verify connectivity from the AFM server to the switch. 2. Verify that the switch is running the minimum required software. 3. Validate the switch.

Error Details	Recommended Action
	a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switches. d. Click **Deploy Selected**.
Switch Name Mismatch	1. Verify that the IP address to switch name mapping is correct in the pre-deployment configuration. If the pre-deployment configuration is updated, redeploy the switch. 2. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switches. d. Click **Deploy Selected**.
Switch Model Mismatch	1. Verify that the IP address to switch name mapping is correct in the pre-deployment configuration. If the pre-deployment configuration is updated, redeploy the switch. 2. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy**. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switches. d. Click **Deploy Selected**.
System MAC Address Mismatch	1. Verify that the IP address to switch name mapping is correct in the pre-deployment configuration. If the pre-deployment configuration is updated, redeploy the switch. 2. Validate the switch. a. Navigate to the **Network** > *Fabric Name* > **Configure and Deploy** screen. b. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. c. Click the **Validation** tab and select the switches. d. Click **Deploy Selected**.

Switch Deployment Status Errors

Table 40. Switch Deployment Status Errors

Switch Deployment Status	Description	Requires Action	Recommended Actions
NOT STARTED	Not Started	No	1. Start the switch deployment on the **Network >** *Fabric*

Switch Deployment Status	Description	Requires Action	Recommended Actions
			Name > **Configure and Deploy** screen. 2. Select the switch from the list and click **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
CONFIG GENERATION IN PROGRESS	Configuration File Generation In-progress	No	Information only
CONFIG GENERATION FAILED	Configuration File Generation Failed	Yes	1. Check the write permission for the AFM installation directory on the AFM server. 2. Verify that there is enough disk space on the AFM server. 3. Restart switch deployment from the **Network >** *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
CONFIG GENERATION SUCCESS	Configuration File Generation Completed Successfully	No	Information only
CONFIG FILE TRANSFER IN PROGRESS	Configuration File Transfer In-progress	No	Information only
CONFIG FILE TRANSFER FAILED	Configuration File Transfer Failed	Yes	1. Verify the connectivity to the TFTP server from the AFM server. 2. Restart switch deployment from the **Network >** *Fabric Name* > **Configure and Deploy** by selecting the switch from the list and clicking **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
CONFIG FILE TRANSFER SUCCESS	Configuration File Transferred Successfully	No	Information only
REQUEST TO DISCOVER NODE	Request To Discover Switch	Yes	1. Power on the switch. 2. Restart switch deployment from the **Network >** *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and

Switch Deployment Status	Description	Requires Action	Recommended Actions
			then clicking **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
MIN CONFIG UPLOAD INPROGRESS	Minimum Configuration Upload In-Progress	No	Information only
MIN CONFIG UPLOAD ERROR	Minimum Configuration Upload Error	Yes	1. Verify the connectivity to the TFTP/FTP server from the switch. 2. Resolve any errors the **Validation Status** column. 3. Verify that the system MAC address in the **dhcpd.conf** file matches the **csv.** file with the MAC addresses of the switches. 4. Verify that the **min.cfg** file is in the correct directory on the TFTP/FTP server. 5. Redeploy the switch from the **Network >** *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
MIN CONFIG UPLOAD COMPLETED	Minimum Configuration Upload Successful	No	Information only
INIT SOFT RELOAD	Initiated Soft Re-load on Switch	No	Information only
INIT SOFT RELOAD ERROR	Error During Soft Re-load on Switch	Yes	1. Check the switch syslogs for a reload command failure. 2. Resolve any errors. 3. Restart switch deployment from the **Network >** *Fabric Name* > **Configure and Deploy** screen by selecting the switch from the list and clicking **Deploy Selected**. NOTE: Verify that the switch is in BMP mode.
PROTOCOL CONFIG UPLOAD INPROGRESS	Protocol Configuration Upload In-Progress	No	Information only
PROTOCOL CONFIG UPLOAD ERROR	Protocol Configuration Upload Error	Yes	1. Verify the connectivity to the TFTP server from switch.

Switch Deployment Status	Description	Requires Action	Recommended Actions
			2. Resolve any errors in the **Validation Status** column. 3. Verify that the DHCP server is running. 4. Verify that the CFG file is on the TFTP/FTP server and the switch can reach it using the **ping** command. 5. Redeploy the switch. NOTE: Verify that the switch is not in BMP mode. 6. Navigate to the **Network >** *Fabric Name* > **Configure and Deploy** screen. 7. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. 8. On the **Deploy** tab, select the switch and click **Deploy Selected**.
PROTOCOL CONFIG UPLOAD COMPLETED	Protocol Configuration Upload Successful	No	Information only
DEVICE DEPLOYMENT SUCCESS	Switch Deployment Successful	No	Information only
UPLINK CONFIG GENERATED	Uplink Configuration Generated	No	Information only
UPLINK CONFIG UPLOAD IN PROGRESS	Uplink Configuration Upload In-Progress	No	Information only
UPLINK CONFIG UPLOAD ERROR	Uplink Configuration Upload Error	Yes	1. Verify the connectivity between AFM and the switch. 2. Resolve any errors in the **Validation Status** column. 3. Restart the deployment. NOTE: Verify that the switch is not in BMP mode. 4. Navigate to the **Network >** *Fabric Name* > **Configure and Deploy** screen. 5. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. 6. On the **Deploy** tab, select the switch and click **Deploy Selected**.

Switch Deployment Status	Description	Requires Action	Recommended Actions
UPLINK RECONFIGURED REDEPLOY REQUIRED	Uplink re-configured, Re-deployment of Switch is required	Yes	Restart switch deployment. NOTE: Verify that the switch is not in BMP mode. 1. Navigate to the **Network >** *Fabric Name* > **Configure and Deploy** screen. 2. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. 3. On the **Deploy** tab, select the switch and click **Deploy Selected**.
REDEPLOYMENT REQUIRED	Re-deployment of the switch is required	Yes	Restart switch deployment. NOTE: Verify that the switch is not in BMP mode. 1. Navigate to the **Network >** *Fabric Name* > **Configure and Deploy** screen. 2. From the **Deploy Fabric** drop-down menu, select **Deploy and Validate**. 3. On the **Deploy** tab, select the switch and click **Deploy Selected**.

Deployment Task Errors

AFM Deployment Task	Error Status	Recommended Action
Verify switch eligibility	Eligibility check for deployment: Failed	Verify that the VLT switch deployment has a management IP for all peers.
Ping verification	Ping verification: Failed	Verify that the DHCP offer was received on the device console. Power cycle if needed.
Telnet/SSH connectivity verification	Telnet/SSH session verification: Failed	Verify Telnet/SSH connection and that the DHCP offer was received on the device console. Power cycle if needed.
Reset to factory defaults	Reset to factory defaults task: Failed	Verify Telnet/SSH connectivity and redeploy.
Minimal configuration upload to switch	Minimal config upload: Failed	Verify Telnet/SSH connectivity and redeploy.
	Minimal config upload on Unit-1: Failed	Verify Telnet/SSH connectivity and redeploy.

AFM Deployment Task	Error Status	Recommended Action
Reload of switch	Reboot of switch: Failed	Verify Telnet/SSH connectivity and redeploy.
Boot image error	Boot image was not loaded from flash	1. To change the boot image path to flash, enter CONFIG mode and use the following CLI command through console session: `no boot system stack-unit 0 primary tftp://10.16.148.24/FTOS-SE-9.5.0.0P3.bin` 2. Enable BMP on the switch. • For S55 or S60, use the `reload-type jump-start config-download enable` command. • For all other switch types, enter CONFIG mode and use the `reload-type bmp config-scr-download enable` command.
Stack unit cleanup	Stack unit renumbering task: Failed	Verify Telnet/SSH/SNMP connectivity.
Upgrade standby	Upgrade standby: Failed	The standby MAC was not found or reported a card problem. Verify that the standby switch is active.
Full configuration file transfer	Full config file transfer to TFTP/FTP server: Failed	Verify the TFTP/FTP connectivity and FTP credentials.
TFTP/FTP connectivity	TFTP/FTP connection issue between switch and TFTP server	Verify TFTP/FTP connectivity from the switch to the TFTP server.
Full configuration upload to switch	Full config upload: Failed	Verify TFTP/FTP and Telnet/SSH connectivity and redeploy. Verify that optional modules are installed according to the fabric design. Verify that AFM is using the supported software version.
Smart script transfer failed	Smart script transfer: Failed	Verify Telnet/SSH connectivity and redeploy.
Wiring validation	Unable to validate Wiring	Verify SNMP connectivity.
	Wiring Errors Exist	To resolve the errors, review error details on the Errors screen.
Merge configuration changes	Apply configuration changes: Failed	Verify Telnet/SSH connectivity and redeploy.
Custom configuration upload	Custom configuration upload: Failed	Verify Telnet/SSH connectivity and redeploy.
Backup running configuration	Backup config: Failed	Verify Telnet/SSH connectivity and redeploy.

AFM Deployment Task	Error Status	Recommended Action
Deployment	Software image selected in pre-deploy wizard is not available in AFM image location.	Upload the software image as a superuser using the AFM Virtual Appliance: 1. Log in to the AFM server as a superuser. 2. Select **Upload Switch Software Image**. 3. Enter the number for the switch model. 4. Enter your user name and password for the FTP connection. 5. Enter the URL location for the switch software image. 6. Press Enter. For more information, refer to *Uploading Switch Software Images* in the *AFM Deployment Guide*.

TFTP/FTP Errors

Table 41. Deployment Status Configuration Errors

Deployment Status	Error Category	Error Details	Recommended Action
TFTP/FTP Failed	Configuration Deployment Error	Error occurred during TFTP/FTP	1. Check the TFTP/FTP connectivity on the network. 2. Make sure that you have specified the correct TFTP/FTP address at the **Administration > Settings** screen.

Validating Connectivity to the ToR

1. Ping the ToRs from the leaf or access switches.
2. Confirm the VLAN configured on the leaf or access switch is the same on the port.

11

Alerts and Events

This section contains the following topics:

Current Active Alerts

To view active network, fabric, and switch alerts, use the **Current** tab. To acknowledge an active alert, select the active alert and then click **Acknowledge**. To display more information about the active alert, select the active alert. The system displays more information about the alert at the bottom of the screen. To dismiss an active alert, select the active alert and then click the **Unacknowledge**.

- To filter active network alerts, navigate to the **Network** > **Alerts and Events** screen.

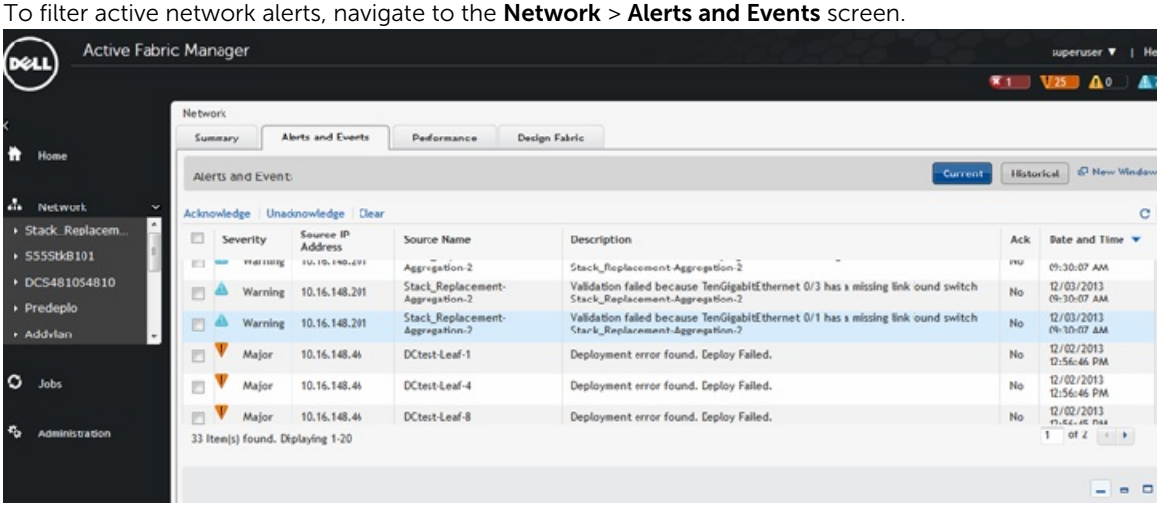


Figure 82. Network Alerts

- To filter active fabric alerts, navigate to the **Network** > *Fabric Name* **> Alerts and Events** screen.

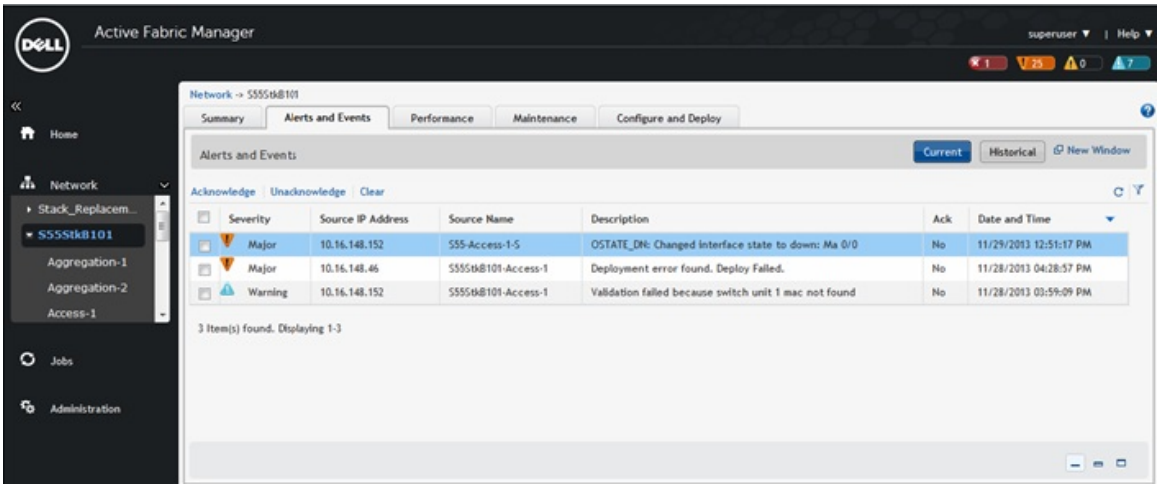


Figure 83. Fabric Alerts

- To filter active switch alerts, navigate to the **Network** > *Fabric Name* > *Switch Name* > **Alerts and Events** screen.

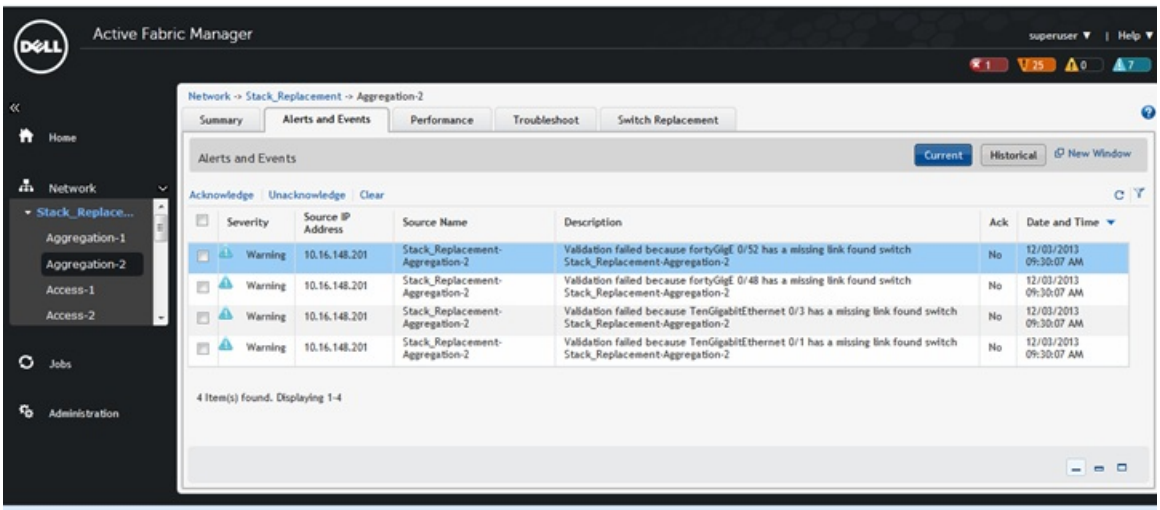


Figure 84. Switch Alerts

1. Click **Current**.
2. Click the filtering icon on the right of the screen. To filter results, use the filter options: **from date** and **to date**.

   The filtering options display.
3. In the **Severity** drop-down menu, select one of the following filtering criteria:
   - **All**
   - **Critical**
   - **Major**
   - **Minor**
   - **Cleared**
   - **Warning**
   - **Unknown**
   - **Info**

- **Indeterminate**

4. In the **Source IP** field, enter the source IP address.
5. In the **Source Name** field, enter the source name.
6. In the **Description** field, enter a description.
7. In the **Ack** (acknowledgement) drop-down menu, select one of the following options:
   - **All**
   - **Yes**
   - **No**
8. Click **Apply**.

Historical Alerts and Event History

To view historical events at the network, fabric or switch level, use the **Alerts and Events** screen.

- To filter active alerts at the network level, navigate to the **Network** > **Alerts and Events** screen.
- To filter active alerts at the network level, navigate to the **Network** > *Fabric Name* **> Alerts and Events** screen.
- To filter active alerts at the switch level, navigate to the **Network** > *Fabric Name* > *Switch Name* > **Alerts and Events** screen.

1. Click **Historical**.
2. Click the filtering icon. To filter results, use the filter options: **from date** and **to date**.
   The filtering options display.
3. In the **Severity** drop-down menu, select one of the following filtering criteria:
   - **All**
   - **Critical**
   - **Major**
   - **Minor**
   - **Warning**
   - **Cleared**
   - **Unknown**
   - **Info**
   - **Indeterminate**
4. In the **Source IP** field, enter the source IP address.
5. In the **Source Name** field, enter the source name.
6. In the **Description** field, enter a description.
7. In the **Ack** (acknowledgement) drop-down menu, select one of the following options:
   - **All**
   - **Yes**
   - **No**
8. Click **Apply**.
9. To export your results, click **Export**.

12

Performance Management

This section contains the following topics:

Network Performance Management

To monitor the following network historical data for all the fabrics, use the **Network** > **Performance** screen:

- Bandwidth utilization
- Top 25 port inbound usage
- Top 25 port outbound usage
- Highest CPU utilization
- Highest memory utilization

For information about the color codes for the historical data, refer to Dashboard.

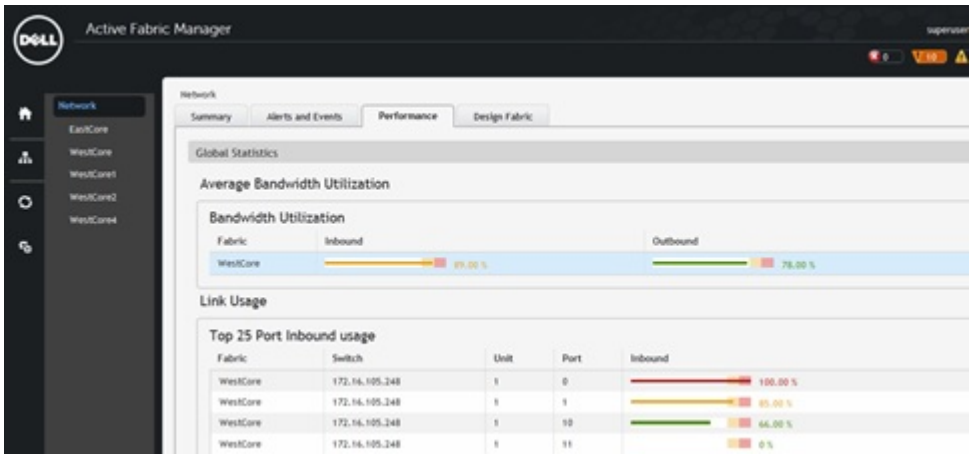


Figure 85. Network Performance Management Screen

Fabric Performance Management

To monitor the following information for all the switches in the fabric, use the **Network** > *Fabric Name* > **Performance** screen:

- Bandwidth utilization
- Top 25 port inbound usage
- Top 25 port outbound usage
- Top 10 highest CPU utilization
- Top 10 high memory utilization

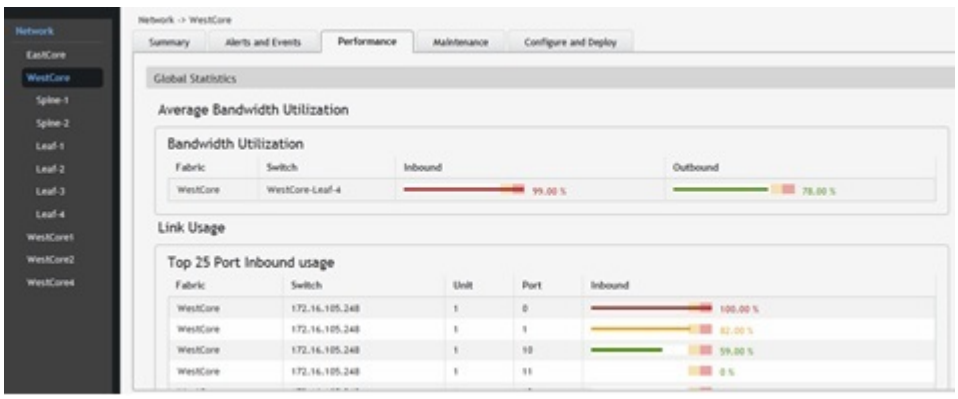


Figure 86. Fabric Performance Management Screen

Switch Performance Management

To view historical and real-time data switch level performance, use the **Network** > *Fabric Name* > *Switch Name* > **Performance** screen. By default, the historical view displays in tabular format. Monitor performance in graphical (chart or bar) format in the **View Type** area or move to the real-time data monitoring from this screen.

NOTE: To view performance, enable data collection on the **Jobs > Data Collections** screen.

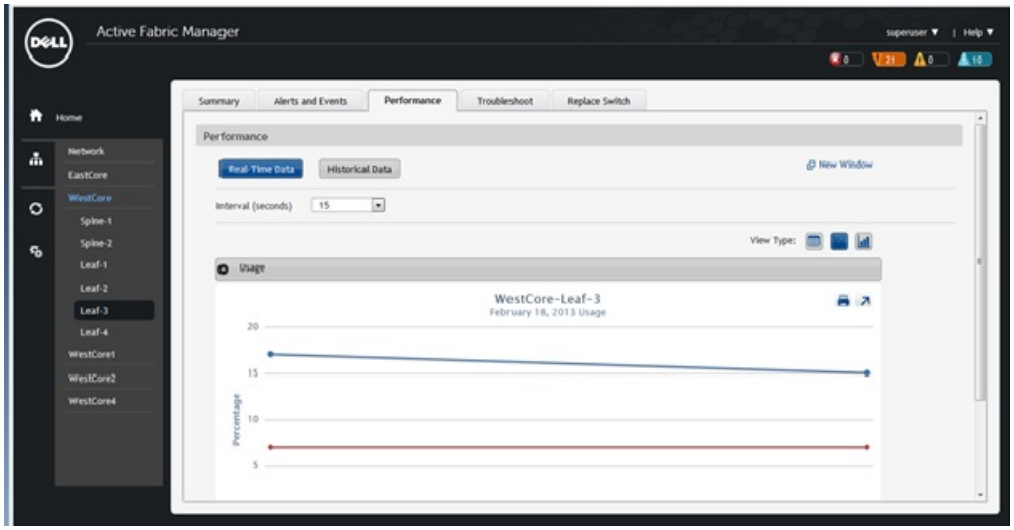


Figure 87. Switch Performance Management Screen

Port Performance Management

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Summary** screen.

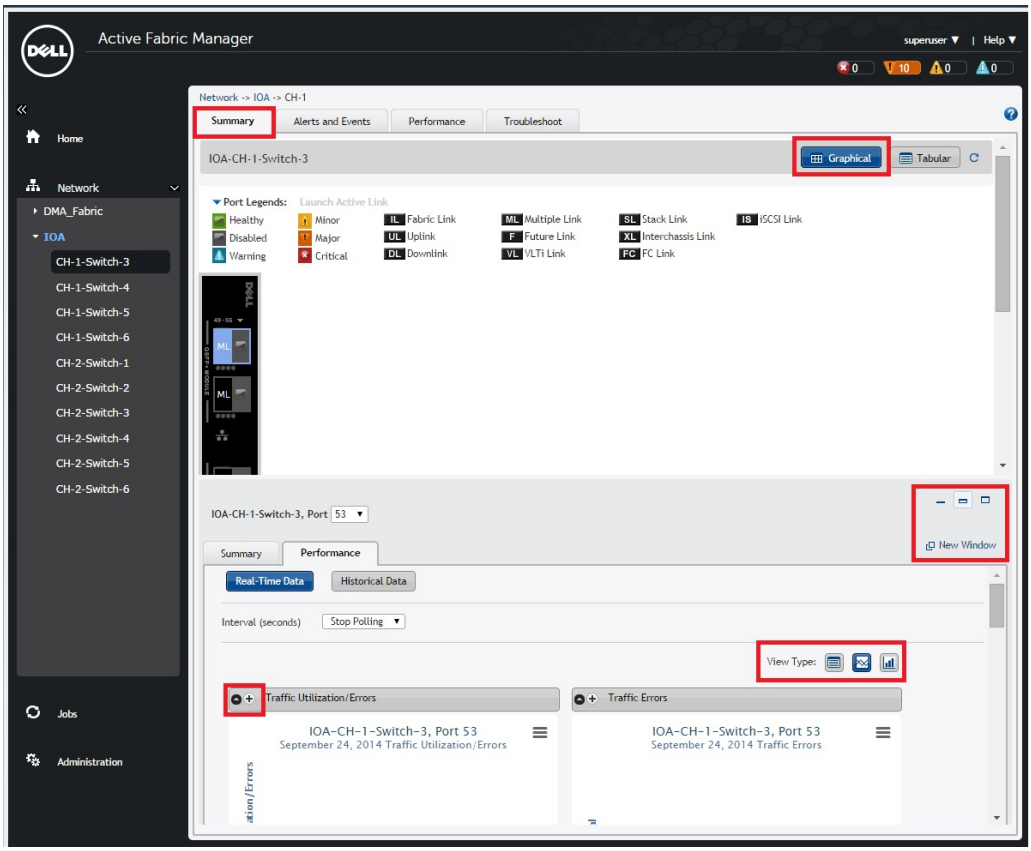


Figure 88. Port Performance Summary

2. Select a port and then click the **Performance** tab.
3. Select a date type:
   - **Real-Time Data**
   - **Historical**
4. To display port performance, select one of the following **View Type** options:
   - **Bar**
   - **Graphical**
   - **Tabular**
5. Review the performance information.

Detailed Port Performance Management

View the following information in a graphical (chart) or tabular format on the **Detailed Port Level Performance** screen:

- Traffic utilization
- Traffic errors
- Throughput

- Traffic in Kbps
- Packets

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* > **Summary** screen.
2. Click the **Performance** tab at the bottom of the screen.
3. In the upper right of the screen, select the format for the data:
   - **Graphical**
   - **Tabular**
4. In the lower left of the screen near the **Performance** tab, select a data option:
   - **Real-Time Data** (default)
     - If you select real-time data, select the interval real-time data collection (in seconds) from the **Interval (seconds)** drop-down menu:
       * **15**
       * **30**
       * **45**
       * **60**
   - **Historical Data**
     - If you select historical data, select one of the following options from the **Date Range** drop-down menu:
       * **Last 12 hours**
       * **1 d**
       * **1 w**
       * **1 m**

Data Collection

By default, AFM automatically enables data collection after deployment. To disable data collection for a fabric:

1. Navigate to the **Jobs > Data Collection** screen.
2. Click **Schedule Data Collection**.
   The **Edit Data Collection** window displays.
3. To disable data collection for a specific fabric, uncheck the checkbox for the fabric.
   The **Polling Rate** is 15 minutes.
4. Click **OK**.

Threshold Settings

To configure the monitoring link bundle and Threshold Crossing Alert (TCA) between the spine switches and the leaf switches, use the **Jobs > Data Collections > Edit Threshold Settings** screen. The **Average Traffic Threshold** option monitors the Layer 3 fabric link bundle. The **TCA bandwidth** option monitors low bandwidth and high bandwidth for Layer 2 and Layer 3 fabrics.

If the average traffic or both utilization thresholds are exceeded, AFM receives an alarm from the switch on the **Alerts > Active Alerts** screen.

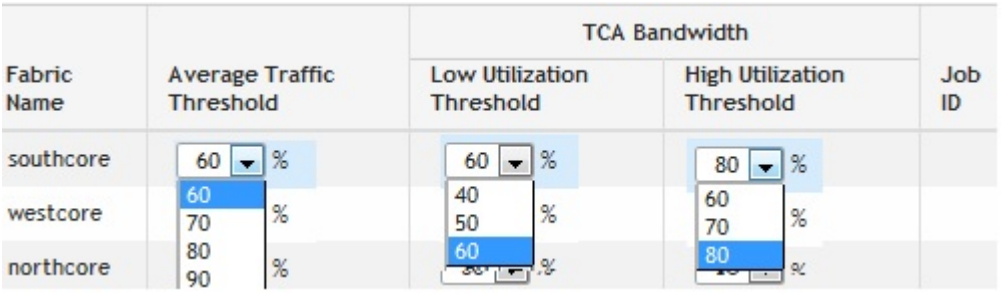


Figure 89. TCA Bandwidth

- **Average Traffic Threshold** — Configure the threshold for a Layer 3 fabric. The range is 60–90 percent. The monitoring value applies only to the fabric link between the spine and leaf switches.
- **Low Utilization** — Configure the value for TCA. The range is 40–60 percent. If AFM exceeds this value, the graphical performance monitoring displays a solid red line labeled **Traffic Utilization Alert Threshold**. AFM clears the alarm and removes the red line when traffic is within the specified values.
- **High Utilization** — sets the highest value for TCA. The range is 60–80 percent. If AFM exceeds this value, the graphical performance monitoring displays a solid red line labeled **Traffic Utilization Alert Threshold**. AFM clears the alarm and removes the red line when traffic is within the specified values.
- **Job ID** — AFM creates a job ID when you create the schedule.

Using real-time performance management at the port level, AFM displays a solid red line appears on the threshold label **Traffic Utilization Alert Threshold** when traffic exceeds the TCA.

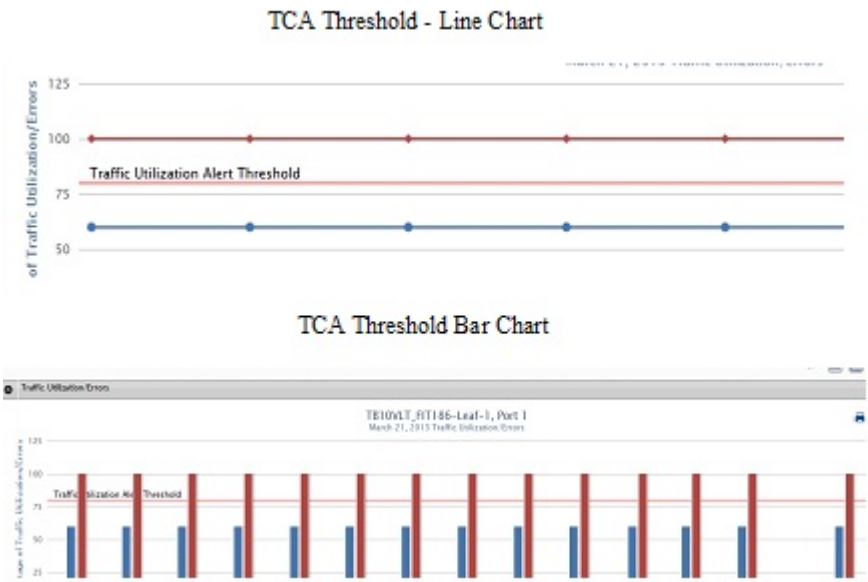


Figure 90. Traffic Utilization Alert Threshold

For information about how to view port performance, refer to Port Performance. Select the **Real-Time Data** option.

Reports

This section contains the following topics:

NOTE: To run a report, schedule data collection. Refer to Data Collection.

Creating New Reports

1. Navigate to the **Network** > *Fabric Name* > **Reports** screen.
2. Click **New Report**.
   The **Add/Modify Reports** screen displays.
3. In the **Report Name** field, enter a name for the report.
4. (Optional) In the **Description** field, enter a description for the report.
5. Click **Next**.
6. In the **Type and Output** field, select a report type:
   - **Switch**
   - **Port**
7. Select a report output format:
   - **Tabular**
   - **Chart**
8. Click **Next**.
9. In the **Date/Time Range** drop-down menu, select a date or time range using one of the following options.
   - **30 days**
   - **7 days**
   - **24 hours**
   - **Custom Range**

     NOTE: If you select a custom range, specify a start and end date.
10. Click **Next**.
11. In the **Monitors** field, select the monitors to use for the report and click the **>>** button.
    - **CpuUtilization** (CPU utilization)
    - **MemUtilization** (memory utilization)
12. In the **Query** field, select the core to query from the first drop-down menu.
13. Select the switch type from the second drop-down menu.
14. In the **Available Nodes/Ports** area, select the nodes for the report and click the **>>** button.
15. On the **Summary** screen, review the report settings.
16. To run the report now, check the **Run Report Now** checkbox.

17. Click **Finish**.

Editing Reports

1. Navigate to the **Network** > *Fabric Name* > **Reports** screen.
2. Select the report.
3. Click **Edit** .
   The **Add/Modify Report** screen displays.
4. Edit the report.
5. To navigate to different parts of the report, click **Next**.
6. In the **Summary** area, review the changes.
7. Click **Finish**.

Running Reports

Before running a report, schedule the data collection. For information on scheduling data collection, refer to Data Collection.

1. Navigate to the **Network** > *Fabric Name* > **Reports** screen.
2. Select the report.
3. Click **Run**.

Duplicating Reports

1. Navigate to the **Network** > *Fabric Name* > **Reports** screen.
2. Select a report.
3. Click **Duplicate**.
   The **Duplicate** screen displays.
4. In the **Report Name** field, enter a name for the report.
5. (Optional) In the **Description** field, enter a description.
6. Modify the report as needed.
7. To navigate to different parts of the report, click **Next**.
8. Click **Finish**.

Deleting Reports

1. Navigate to the **Network** > *Fabric Name* > **Reports** screen.
2. Select the report.
3. Click **Delete**.
   The **Delete Confirmation** window displays.
4. Click **Yes**.

13

Maintenance

Using the AFM Virtual Appliance

After you have deployed and configured AFM, use the AFM Virtual Appliance to perform the following tasks:

- Configure the system
- Change the AFM superuser password
- Update the AFM server
- Set AFM software to the next reboot
- Restart AFM
- Restart the AFM server
- Shut down the AFM server
- Transfer files
- Edit files
- Upload switch software images
- Backup the AFM database
- Restore the AFM database
- Log out

To access the AFM virtual appliance, go to the AFM VM, click the **Console** button, and login as `superuser`. The first time you log in from the console or SSH using `superuser`, if there is an IP assigned to the VM, AFM prompts you to change the password for `superuser`. This password is used for both the web URL login and console login. If no IP is assigned to the VM (which means that the DHCP is not enabled), AFM prompts you to configure the network. After you configure the network, the VM reboots.

The AFM virtual appliance options are shown in the following screen shot.

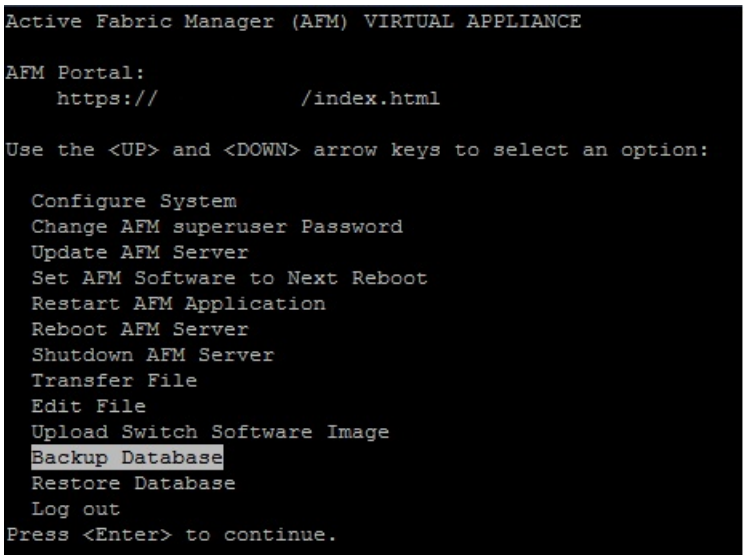


Figure 91. AFM Virtual Appliance Menu

Configuring the System

To configure the device settings, use the **Configure System** option.

- **Device configuration** (Network Configuration) — Use this option to configure a static IP as the AFM Ethernet controller or add a new device, such as an interface.
- **DNS configuration —** Use this option to configure the AFM DNS settings.

1. Select **Configure System** and press **Enter**.

   The following network configuration warning message displays: `*WARNING* System will have to restart to properly update all the service if network configuration is changed. Do you wish to continue?`

2. Enter `Y` to continue.

   The **Select Action** screen displays.

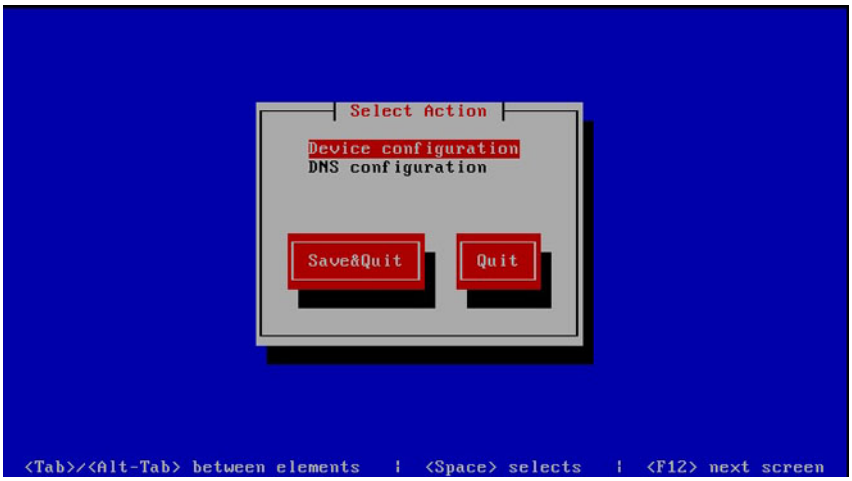


Figure 92. Select Action Screen

3. Select **Device configuration**. To navigate between elements, use the **Tab** and down arrow keys.

   The **Network Configuration** screen displays.

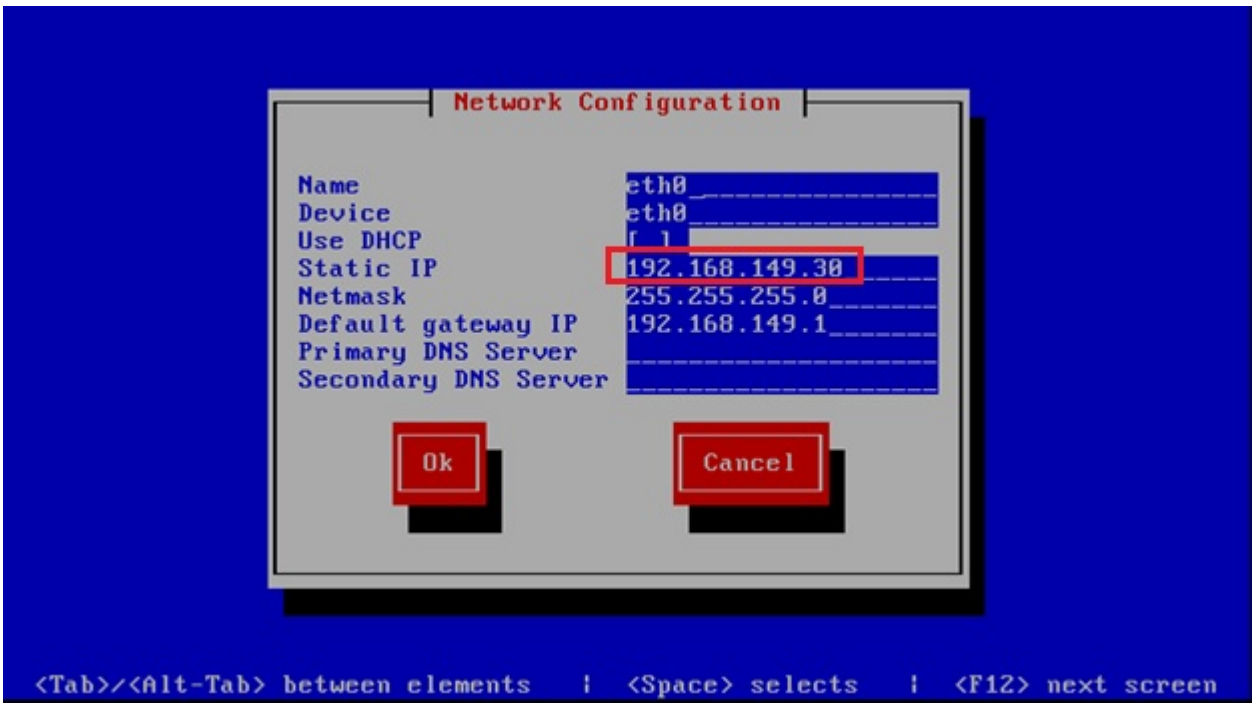


Figure 93. Network Configuration Settings

4. View or modify the following settings as needed:
   - **Name** — Displays the name of AFM Server.

     NOTE: Do not change the default device name (`eth0`).

- **Device** — Displays the NIC Card.

  NOTE: Do not change the default device name (`eth0`).
- **Use DHCP** — Allow DHCP to assign an IP address to the VM.
- **Static IP** — Specify the static IP Address of the AFM server.

  NOTE: To verify connectivity, ping the IP address assigned to the AFM. If the destination host is unreachable, assign the same IP address.
- **Netmask** — Specify the subnet mask of the static IP address for the AFM Server.
- **Default gateway IP** — Specify the gateway IP Address of the AFM server.
- **Primary DNS Server** — Specify the primary DNS server address. To enable the DNS server on AFM Server, use this option.
- **Secondary DNS Server** — Specify the secondary DNS server address.

5. Select **OK** to save your changes.
6. Select **Quit** to exit this screen.

Configuring DNS Settings

1. Select the **Configure System** option.
2. Select the **DNS configuration** option.

   To navigate between elements, use the **Tab** and down arrow.
3. Modify the following settings as needed:

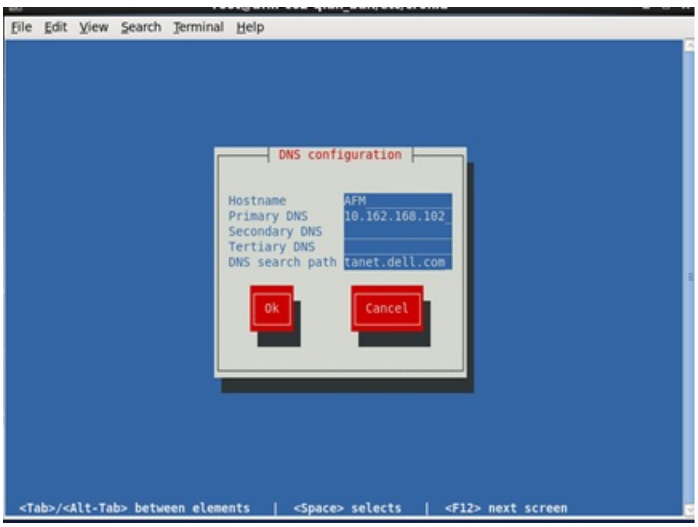


Figure 94. DNS Settings

- **Hostname** — Configure the host name for the AFM server.
- **Primary DNS** — Configure the primary DNS.
- **Secondary DNS** — (Optional) Configure the secondary DNS.
- **Tertiary DNS** — (Optional) Configure the tertiary DNS.

- **DNS search path** — Configure the DNS search path.

4. Select the **OK** option to save your changes.
5. Select **Quit** to exit this screen.

Changing the AFM Superuser Password

1. Select **Change AFM Superuser Password** option.
2. Press **Enter**.

   The **CHANGE AFM SUPERUSER PASSWORD** screen displays.

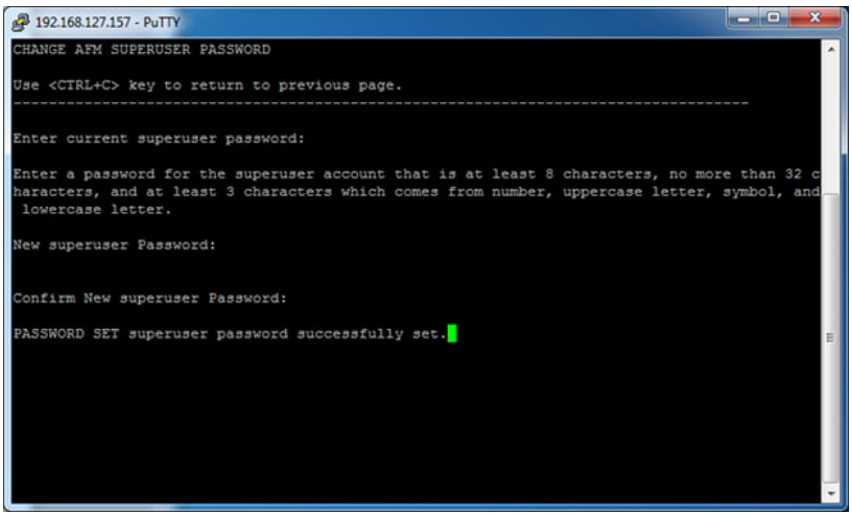


Figure 95. Change AFM Superuser Password

3. In the **Enter current superuser password** field, enter the superuser password (for example, **Superuser1**).

   NOTE:

   The password must have 8–32 characters and include at least three of the following character types:

   - lowercase alphabetic character
   - uppercase alphabetic character
   - numeric character (0-9)
   - special character

4. Press **Enter** .
5. In the **Confirm New Superuser Password** field, enter the new superuser password again to confirm the superuser password.
6. Press **Enter** to return to the main menu.

Updating the AFM Server

1. Select **Update AFM Server** and press **Enter**.

The **UPDATE AFM Server** screen displays the current software version and any available version updates. The following message displays: `The download file will overwrite the available software. Do you want to download RPM file from the Remote Server?`

2. Enter `Y` to download the latest AFM software package in RPM format from a remote URL to the available partition or enter `N` to download the AFM software package as an RPM formatted file from the local workstation (where the AFM console is launched) to the AFM server.
3. If the location is a remote server, enter the URL location of the RPM file on the remote server using the following formats and click **Enter**:
   - **https:** *//ipaddress/path_to_rpm.file*
   - **ftp:** *//ipaddress/path_to_rpm.file*
   - **sftp:** *//ipaddress/path_to_rpm.file*
4. If the location is local, enter the absolute path of the RPM file and then click **Enter** .
5. If required, enter your username and password.
6. Press **Enter** to return to the main menu.

NOTE:
To use the new RPM on the active partition, set the AFM software to the next reboot and then restart AFM.

Setting the AFM Software to the Next Restart

There are two versions of the AFM software package: one in the current partition and the other in the available partition.

1. Select **Set AFM Software to Next Restart** and press **Enter**.
2. Enter `y` and then press **Enter** to apply the available update on the next reboot.
3. Press **Enter** to return to the main menu.

Restarting AFM

1. Select **Restart AFM Application** and press **Enter**.

   The **Restart AFM Application** displays the following query: `The next software version is AFM#-#-#-# from current software. Are you sure you want to restart AFM application?` (where `#` is the software version).
2. Enter `y` to restart the application.
3. Press **Enter** to return to the main menu.

Rebooting the AFM Server (VM)

1. Select **Reboot AFM Server** and press **Enter** .
2. Enter `y` to reboot the AFM Server VM.
3. Press **Enter** to return to the main menu.

Shutting down the AFM Server (VM)

1. Select **Shutdown AFM Server** and press **Enter**.

2. Enter `y`.

Transferring Files

NOTE: FTP or TFTP is configured during the initial AFM server configuration.

1. Select **Transfer File**.

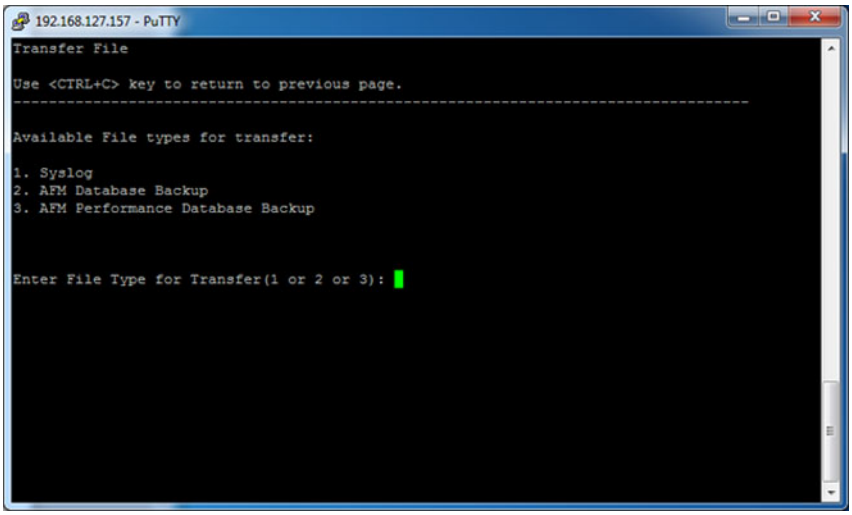


Figure 96. Transfer Files

2. Press **Enter** .
3. Enter the file type to transfer:
   - **1. Syslog**
   - **2. AFM Database Backup**
   - **3. AFM Performance Database Backup**
4. Press **Enter**.
5. Click `y` to upload all the files to the FTP or TFTP server.
6. Press **Enter** .
7. Press **Enter** to return to the main menu.

Editing AFM Files

You can edit the following types of files using the **Edit File** option:

- **1. logback.xml** — The **logback.xml** file contains the database logging file and enables or disables debugging. By default, the logging level is set to **INFO**. The logging levels are as follows: **ALL, DEBUG, ERROR, INFO, OFF, TRACE**, or **WARN**.

  The typical use case is change the logging level from **INFO** to **DEBUG**,

  ```
  <logger name="com.dell.indigo" level="INFO" /> change to <logger
  name="com.dell.indigo" level=" DEBUG" />
  ```

```
<logger name="com.dell.dfm" level=" INFO " /> changed to <logger
name="com.dell.dfm" level="DEBUG" />
<logger name="com.dell.wnm" level=" INFO " /> changed to <logger
name="com.dell.wnm" level="DEBUG" />
```

2. config.properties — The **config.properties** file contains the system level configuration for the database backup.

1. Select **Edit File** .
2. Enter the edit file option **1** to select the **1.logback.xml** option.

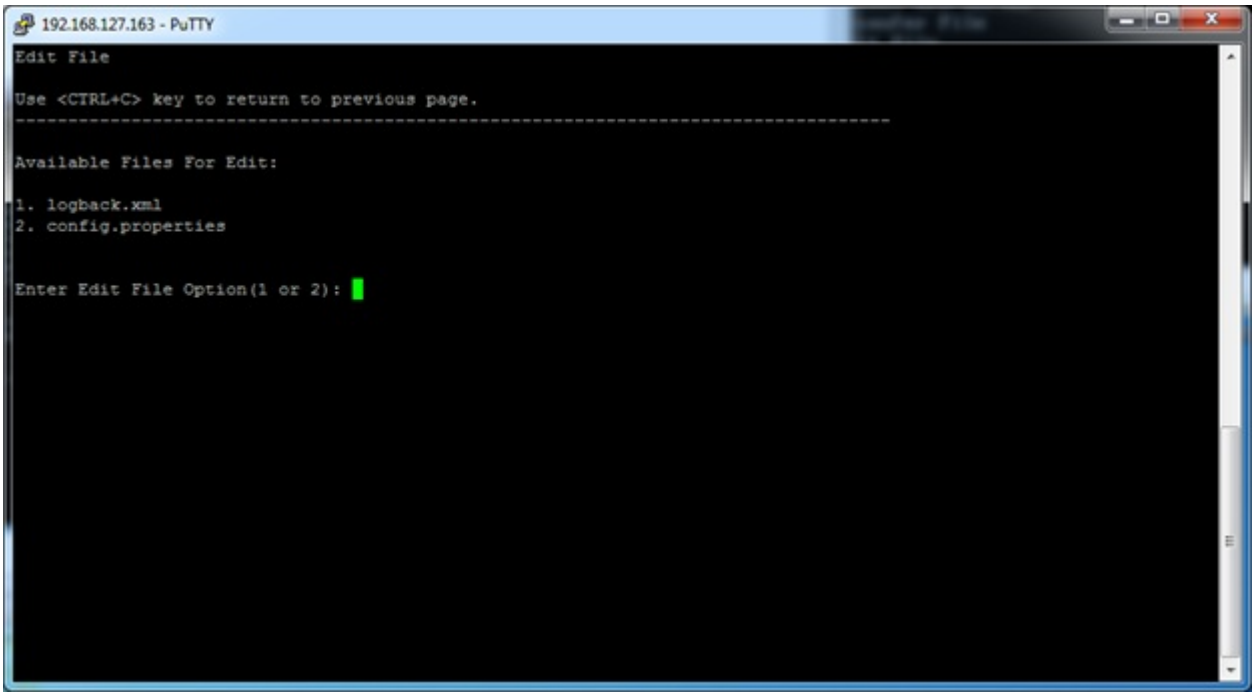


Figure 97. Edit AFM File System

3. Press **Enter**.
4. Search for `com.dell.dfm` and `com.dell.wnm`. Change the logging level from `level=INFO` to `level=DEBUG`.

   For example:

```
<logger name="com.dell.dfm" level="DEBUG">
                                <appender-ref ref="DCM-MESSAGE" />
                                <!-- appender-ref ref="DCM-ERROR" />
                                <appender-ref ref="DCM-TRACE" /-->
                </logger>
                <logger name="com.dell.wnm" level="DEBUG">
                                <appender-ref ref="WNM-MESSAGE" />
                                <!-- appender-ref ref="WNM-ERROR" />
                                <appender-ref ref="WNM-TRACE" /-->
                </logger>
```

5. Save the file using the **vi** editor commands such as **:w** (save file) and quit **:q**: (quit editing).

6. Press **Enter** to return to the main menu.

To edit a config.properties AFM system file:

1. Select **Edit File**.
2. Enter the edit file option **2** and then select the **2. config.properties** option.

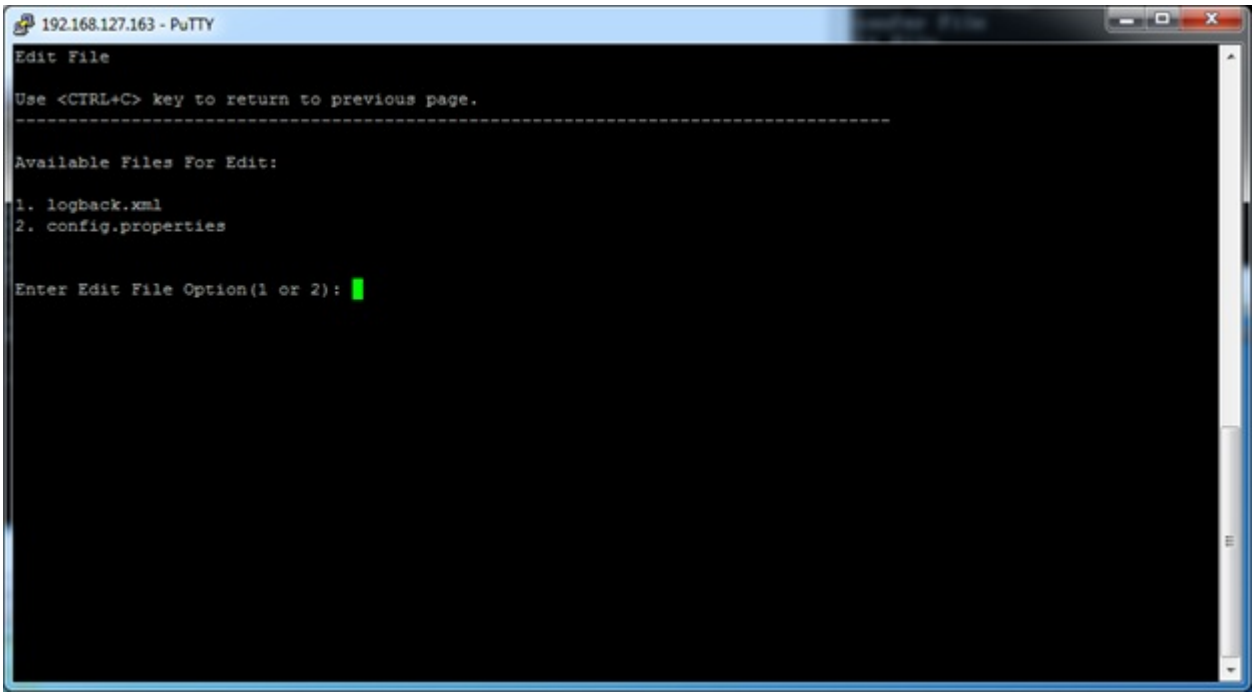


Figure 98. Edit AFM File System

3. Press **Enter**.
4. To change the time, search for **2am** or **1am** You can change **2am** to **3am** for backup postgres DB or change it from **1am** to **4am** for the Hbase.

   For example,

```
# The folder to store backed up database files. If the folder does not
exist, the backup program will try to create it
wnm.database.backup.folder=/data/backup/postgres
# The backup job will be started every day at 2am.
wnm.database.backup.schedule=0 0 2am * * ?
# *************** Database parameter : END ***************************
# *************** HBASE parameter : Start ****************************
# The folder to store backed up database files. If the folder does not
exist, the backup program will try to create it
wnm.database.hbase.backup.folder=/data/backup/hbase
#The backup job will be started every day at 1am.
wnm.database.hbase.backup.schedule=0 0 1am * * ?
```

   Save the file using the **vi** editor commands such as **:w** (save file) and quit **:q**: (quit editing).

5. Press the **Enter** button to return to the main menu.

Uploading Switch Software Images

To upload a new switch software image to the AFM local FTP/TFTP server from a remote URL, use the **Upload Switch Software Image** option.

To upload switch software from the AFM:

1. Select the **Upload Switch Software Image** option and press the **Enter** button.

   The **Upload Switch Software Image** screen displays.

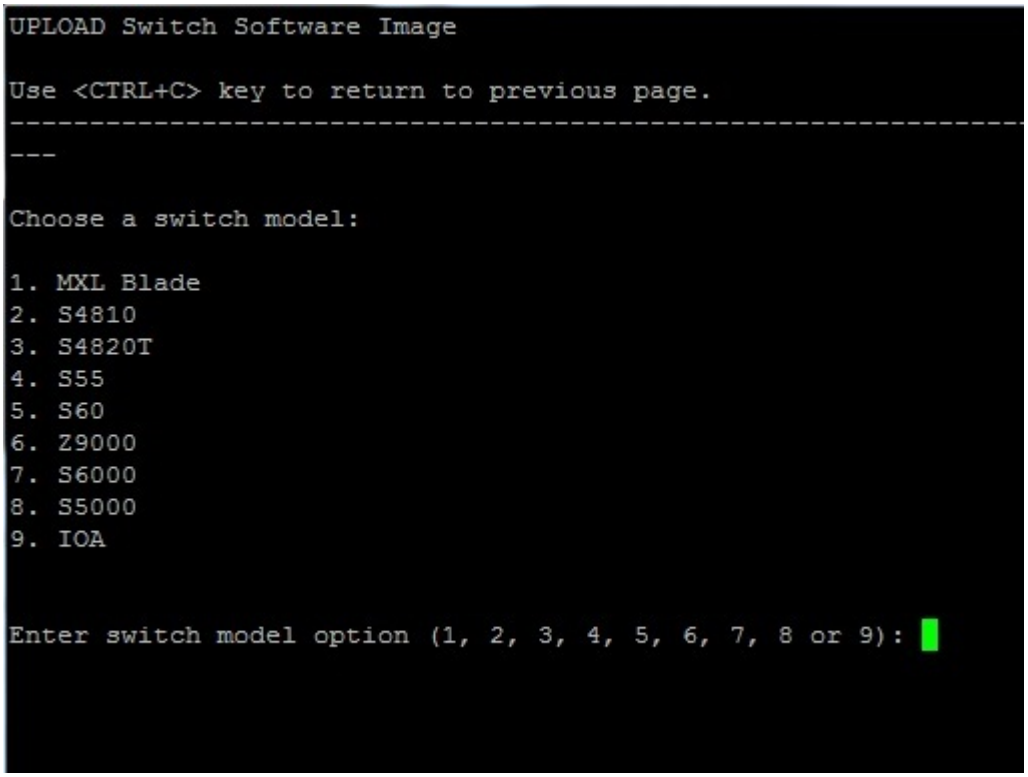


Figure 99. AFM Virtual Appliance Upload Software Image Screen

2. Enter a switch model option. The range is 1–9.

   - 1. MXL Blade
   - 2. S4810
   - 3. S4820T
   - 4. S55
   - 5. S60
   - 6. Z9000
   - 7. S6000
   - 8. S5000
   - 9. IOA

For FTP, enter your user name and password. This option transfers the Dell Networking OS image file into the **/data/FTOS/**<*SwitchModel*> directory and copies the files to the TFTP/FTP location.

3. Enter the URL location to upload the switch software image using the formats listed in the **Upload Switch Software Image** screen.
4. To return to the main menu, press **Enter**.

Backing up the AFM Database

NOTE:

- The backup file does not include AFM historical performance data.
- The AFM server IP must be the same as the location of the database backup file.

1. Select **Backup Database**.

   The **Backup Configuration and Database** screen displays.
2. Select a backup option:

   NOTE: If AFM uses the local DHCP server and/or a local FTP server, select **AFM Configuration and Database** to back up the database instead of **AFM Database**.

   - **1. AFM Database** — Back up the AFM database files only. The switch configuration and `dhcpd.conf` files are not included.
   - **2. AFM Configuration and Database** — Back up the AFM configuration and database files.

   NOTE: The backup file extensions are type-specific. You cannot restore the AFM database files using the **2. AFM Performance Database** or **3. AFM Configuration and Database** options. You must use the **1. AFM Database** option. Similarly, you cannot restore configuration files using the **1. AFM Database** option.
3. Wait while AFM backs up the files.

   The backup location is displayed at the bottom of the screen.

```
pg_dump: dumping contents of table wnm_seededipaddr
pg_dump: dumping contents of table wnm_slot
pg_dump: dumping contents of table wnm_stackport
pg_dump: dumping contents of table wnm_swmodule
pg_dump: dumping contents of table wnm_unit
pg_dump: dumping contents of table wnm_vlan
pg_dump: dumping contents of table wnm_vltdomain
pg_dump: dumping contents of table wnm_vltmember
pg_dump: dumping contents of table wnm_vltpeerlag
pg_dump: dumping contents of table wnm_vrrpoperation

Database backup created: /data/backup/postgres/afm-db-backup-2014_06_04-04_32_27.custom


Backup completed. Press <Enter> to return main menu.
```

Restoring the Database

NOTE:

- AFM historical performance data is not included in the database file.
- The AFM server IP must be the same as the location of the database backup file.
- Restoring backup files overwrites all existing data.

1. Select **Restore Database** .

   The **RESTORE DATABASE** screen displays.

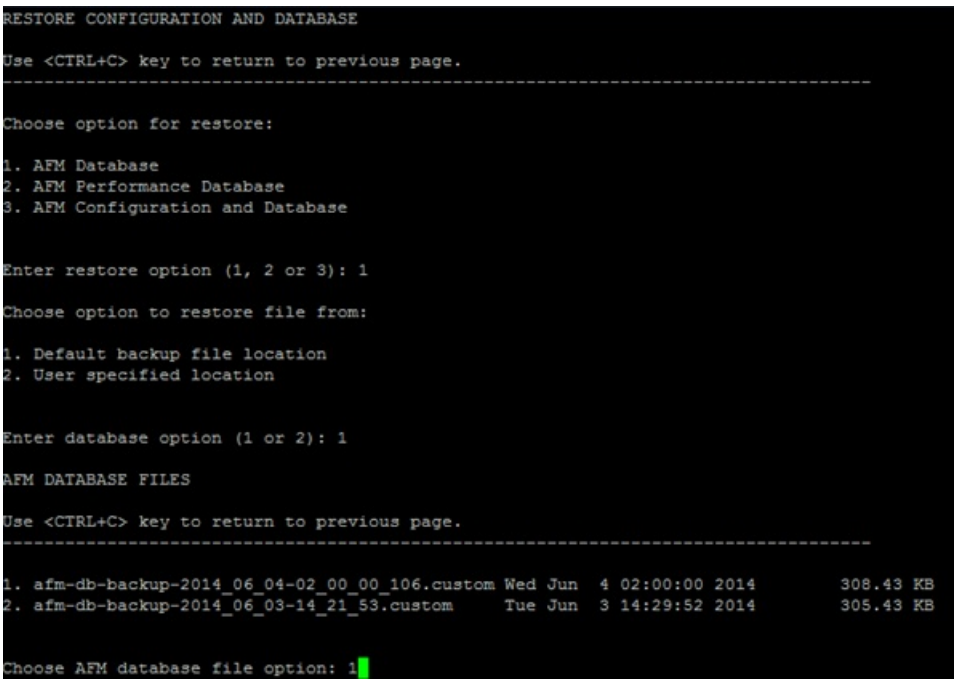


Figure 100. Restore Configuration and Database Screen

2. Select a restoration option:

   NOTE: The backup file extensions are type-specific. You cannot restore the AFM database files using the **2. AFM Performance Database** or **3. AFM Configuration and Database** options. You must use the **1. AFM Database** option. Similarly, you cannot restore configuration files using the **1. AFM Database** option.

   - **1. AFM Database** — Restore the AFM database files only.
   - **2. AFM Performance Database** — Restore the AFM historical performance files only.
   - **3. AFM Configuration and Database** — Restore the AFM configuration and database files.
3. Specify the location of the backup file:

   - **1. Default backup file location** — Displays a list of database files available in the default backup file location.
   - **2. User specified location** — Select a specific location for the database file.
4. Select the backup file:

   - If you selected **1. Default backup file location** in the previous step, enter the number of the backup file to restore.
   - If you selected **2. User specified location** in the previous step, type the complete file path of the backup file location.
5. Enter `Y` to restore the database and restart AFM.

Logging Out of the AFM Virtual Appliance

1. Select the **Log out** option.
2. Press the **Enter** button.

Backing Up a Switch

To schedule the number of days to keep switch backup files, view the fabric, switch name, software version that the switch is running, the startup configuration, running configuration, backup time, and description of the backup configuration, use the **Back Up Switch** screen.

This screen has the following options:

- **Switch Backup** — Schedule a backup for a switch's running configuration and startup configuration files now or later. For information about this option, refer to Scheduling a Back Up Switch Configuration.
- Edit Description — Edit the description of the backup. This option is only available for existing backups.
- Restore — Restore the startup configuration (default) or running configuration from a backup.
- Delete — Delete a backup configuration.

Restoring a Switch Configuration

NOTE: AFM only supports startup configuration restoration for an IOA blade switch.

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. To display the switch backup options, click **Switch Backup**.
3. Select a backup switch configuration for restoration.
4. Click **Restore**.
5. Select one of the following restoration options:
   - **Restore Startup Config (default)**
   - **Restore Running Config**
6. Click **OK**.

Deleting a Backup Configuration

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. To display the switch backup options, click **Switch Backup**.
3. Select a backup switch configuration for deletion.
4. Click **Delete**.
5. Click **Yes**.

Editing a Description

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. To display the switch backup options, click **Switch Backup**.
3. Select a backup switch configuration.
4. Click **Edit Description** .
5. Edit the description.
6. Click **OK**.

Viewing and Editing the Switch Backup Configuration

To edit the running or startup configuration on deployed devices, use the **View/Edit** option. The edited configuration is available after you restore the switch backup configuration.

1. Navigate to the **Network** > *Fabric Name*> **Maintenance** screen.
2. Click **Backup Switch** in the upper right of the screen then click **View/Edit**.
   The **View and Edit Switch Backup Screen Configuration** screen displays.

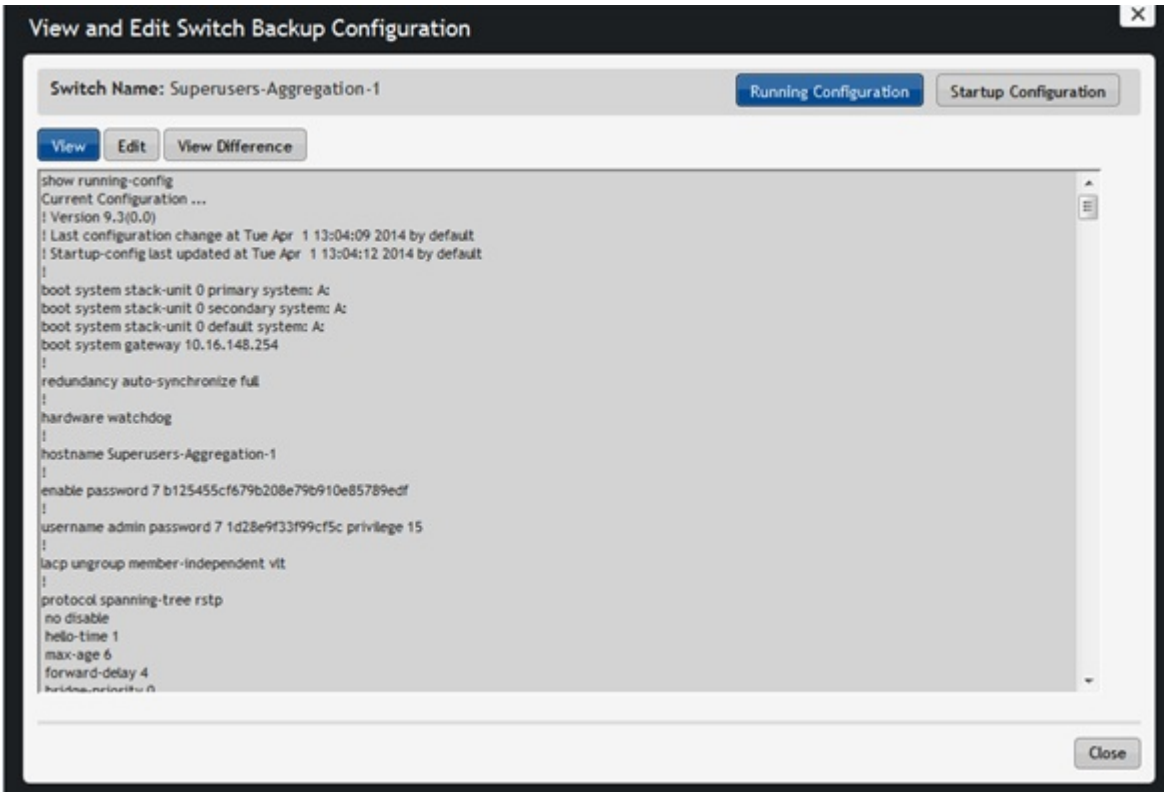


Figure 101. View and Edit Switch Backup Screen Configuration Screen

3. Select one of the following options:
   - **Edit** — Edit the running or startup configuration on the deployed devices.
   - **View Difference** — View differences between the running and startup configurations on deployed devices.
   - **View** — View the running or startup configuration on deployed devices.
4. To exit from this screen, click **Close**.

Updating the Switch Software

To view a summary of software for each switch in the fabric, use the **Network** > *Fabric Name* > **Maintenance** > **Update Software** screen. This screen has the following options:

- Schedule Switch Software Update — Create a new scheduled software image upgrade and software image activation job.
- Schedule Activate Standby Partition— Activate the software in the standby partition of the device as a scheduled job later or immediately.

Replacing an IOA Blade Switch

This section describes how to replace an IOA blade switch. For information about how to replace other switch types, refer to Replacing a Switch.

1. Remove the decommissioned IOA blade switch from the M1000e chassis.
2. Replace the decommissioned IOA blade switch with the replacement IOA blade switch in the same slot of the M1000e chassis.
3. Rediscover the chassis using the **Network > Design Fabric > Discover Status** screen.

   NOTE: During the rediscovery process, AFM restores the previously configured IP address to the replacement IOA blade switch.
4. To deploy the successfully discovered replacement IOA blade switch, select **Overwrite entire configuration on the switch** and click **OK**.

   NOTE: For IOA replacement, the **Overwrite entire configuration on the switch** option is selected by default and the **Apply configuration changes to the switch** option is not available.

Replacing a Switch

NOTE: To replace an IOA blade switch, refer to Replacing an IOA Blade Switch.

1. Decommission Switch
2. Replace Switch
3. Deploy Switch

   NOTE: Replace the decommissioned switch with same switch type.

Step 1: Decommission a Switch

When you decommission (replace) a switch, consider the following requirements:

- The switch must be powered off manually.
- The switch is automatically placed in `unmanaged state` and AFM stops managing the switch.
- The new switch must use the factory default setting.
- To use the old switch, reset it to the factory default setting.
- AFM generates information for Return Material Authorization (RMA) for submittal to iSupport.

  NOTE: Replace the switch with the same switch type. For information about how to replace a switch, refer to Replacing a Switch.

1. Navigate to the **Network** > *Fabric Name* > *Switch Name*.
2. Click the **Switch Replacement** tab.

   The **Switch Replacement Summary** screen displays.
3. Click **Decommission Switch**.

   The **Decommission Switch** screen displays.
4. Review and follow the instructions on the **Decommission** screen.

5. To save the text file that contains information for submitting a Return Material Authorization (RMA), click **Save**. Send this information to your Dell Networking software support representative for switch replacement.
6. Once a replacement switch is available, click **Replace Switch**.

Step 2: Replacing a Switch

NOTE: To replace an IOA blade switch, refer to Replacing an IOA Blade Switch.

Before you replace a switch, gather the following useful information:

- System MAC address, Service Tag and serial number for the replacement switch
- (MXL only) IP address of the replacement MXL switch
- Location of the switch, including the rack and row number
- Remote Trivial File Transfer Protocol (TFTP) / File Transfer Protocol (FTP) address
- Last deployed Dell Networking operating system software image for the replacement switch uploaded to the TFTP/FTP site so the switch can install the appropriate software image and configuration file
- Updated Dynamic Host Configuration Protocol (DHCP) server configuration file.

  NOTE:

  – If you use a remote DHCP server, manually update the DHCP configuration file based on the configuration AFM provides.
  – If you use a local DHCP server, AFM updates the DHCP server automatically.

  After you power cycle the switches, the switches communicate with the DHCP server to obtain a management IP Address based on the system MAC Address. The DHCP server contains information about the location of the TFTP/FTP site for the software image configuration file for each switch type used during bare metal provisioning (BMP).

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* screen.
2. Click the **Switch Replacement** tab and click **Replace Switch** .
3. Review the introduction and the instructions on the **Switch Cabling** screen.
4. Confirm that the replacement switch is racked, cabled, and powered on.
5. Click **Next**.

   The **MAC Assignment** screen displays.
6. (MXL only) Enter the new IP address of the replacement MXL switch in the **New IP Address** field.
7. In the **MAC Assignment** screen, enter the new serial number for the replacement switch in the **New Serial Number** field.
8. Enter the new Service Tag for the replacement switch in the **New Service Tag** field.
9. Enter the new system MAC address for the replacement switch in the **New MAC Address** field.
10. Click **Next**.

    The **DHCP** screen displays.
11. Save the replacement switch DHCP configuration file.
12. Review the **Summary** screen and click **Finish**.
13. Before deploying the switch:
    a. If you use a remote DHCP server, integrate the new DHCP file with the system MAC address of the replacement switch and then restart the DHCP service.
    b. Rack the hardware according to the wiring plan.
14. Click **Deploy Switch**.

Step 3: Deploy Replacement Switch

1. Navigate to the **Network** > *Fabric Name* > *Switch Name* screen.
2. Click the **Switch Replacement** tab.
3. Click **Deploy Switch**.

   NOTE: If you change the switch outside of AFM (for example, using Telnet), use the restore option to restore the switch configuration. For information about how to replace a switch, see Replacing a Switch.

Updating AFM

To view and manage AFM server updates, use the **Administration** > **Update Server** screen.

1. Navigate to the **Administration** > **Update Server** screen and click **Update Server**.
   The **Update Server** screen is displayed.
2. In the **Select RPM packing file location** area, select one of the following options:
   - **Local Drive (DVD, USB)**
   - **Remote Server**
     If the location is a remote server, enter the URL location of the RPM file on the remote server.
     1. From the **Protocol Type** drop-down menu, select the protocol type:
        - **https**
        - **ftp**
        - **sftp**
     2. Specify the path of the RPM package using the following formats:

        NOTE: The RPM filename must start with AFM and must end with **.noarch.rpm** (for example, **AFM2.5.0.79.noarch.rpm**).

        - **https://***ipaddress/path_to_rpm.file*
        - **ftp**://*ipaddress/path_to_rpm.file*
        - **sftp**://*ipaddress/path_to_rpm.file*
     3. (Optional) Enter the user name.
     4. (Optional) Enter the password.
3. From the **Select the software method** area, select one of the following options:
   - **AFM Upload/Download** — Copy the update to the standby partition on the server but do not apply it or restart. To update, manually start the update from the AFM server update page.
   - **Apply Installation and Restart Server** — Copy the update to the standby partition on the server. Apply the update and restart automatically after the update completes.
4. Click **Update**.

Activating the AFM Standby Partition

Navigate to the **Administration** > **Update Server** screen and click **Activate Available Partition**.

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Jobs

This section contains the following topics:

Displaying Job Results

To view job status, use the **Job Results** screen.

1. Navigate to the **Jobs > Jobs Results** screen.
2. In the upper right of the screen, click the filter icon to filter the job results.
3. In the **Job Name** field, enter the job name.
4. From the **Status** drop-down menu, select a filter option:
   - **All**
   - **Success**
   - **Failure**
   - **In Progress**
5. In the **Start From** area, click the select date and time icon to specify the beginning date of the range of the starting date of the job.
6. In the **Start To** area, click the select date and time icon to specify the ending date of the range of the starting date of the job.
7. In the **End Date From** area, click the select date and time icon the beginning date of the range of the ending date of the job.
8. In the **End Date to** area, click the select date and time icon to specify the ending date of the range of the ending date of the job.
9. Click **Apply**.

Scheduling Jobs

To schedule jobs, use the **Jobs** > **Scheduled Jobs** screen or the **Network** > **Fabric Name** > **Maintenance** screen.

- **Add Job** — Schedule a new job for the following tasks:
  - Switch Backup — Back up a switch running configuration and startup configuration file.
  - Switch Software Update — Create a job to upgrade the switch software image.
  - Switch Software Activation — Activate the software available in the standby partition of the switch as a scheduled job for later or to run immediately.

- **Run Now** — Start a job immediately. Select a job and click **Run**.
- **Edit** — Edit or modify an existing job schedule.

  NOTE: You can only change the scheduled time. You cannot change the job name, image location, or switch.
- **Delete** — Delete a job. Select a job and then click **Delete**.
- **Enable** — Enable the job or activate the schedule.
- **Disable** — Disable the job or the schedule without deleting the job.

Switch Backup

To back up a running configuration and startup configuration files from a switch, use the **Switch Backup** screen.

1. Navigate to the **Jobs** > **Scheduled Jobs** screen.
2. From the **Add** drop-down menu, select **Switch Backup**.
   The **Switch Backup** screen displays.
3. In the **Name** field, enter the name of the job.
4. (Optional) In the **Description** field, enter a description for the job.
5. Click **Next**.
   The **Selected Switches** screen displays.
6. In the **Available** area, select the fabric and then switches to back up:
   - **Two-tier distributed core filtering options** — All, Spine, and Leaves
   - **Two-tier VLT options** — All, Aggregation and Access
   - **Three-tier filtering options** — All, Core, Aggregation and Access
7. To move the switches to the **Selected Switches** area, click the **>>** button and click **Next**.
8. On the **Schedule** screen, select one of the following options:
   - **Run Now** — Back up the switch software immediately.
   - **Schedule job to start on** — Specify a date and time for the switch software backup.

   The **Summary** screen displays.
9. Review the settings on the **Summary** screen and click **Finish**.

Switch Software Updates

As part of ongoing data center operations, periodically update the software and configurations in the fabric. Update one or more switches by specifying the location for the software updates and then schedule the updates immediately or for a later date and time.

1. Navigate to the **Jobs** > **Scheduled Jobs** screen.
2. From the **Add** drop-down menu, select **Switch Software Update**.
   The **Switch Software Update** screen displays.
3. In the **Job Name** field, enter the name of the switch software job.
4. (Optional) In the **Description** field, enter a description of the job.
5. Click **Next**.
   The **Switch Select** screen displays.
6. In the **Available** area, select the fabric and the switch types to update:

- **Two-tier distributed core filtering options** — All, Spine, and Leaves
- **Two-tier VLT options** — All, Aggregation and Access
- **Three-tier filtering options** — All, Core, Aggregation and Access

7. To move the switches to the **Selected** area, click the **>>** button and click **Next**.
8. In the **Update Location** area, if necessary, click **Edit TFTP or FTP settings**.
9. In the **Path and Image file name to the software updates on selected TFTP or FTP site** field, specify the path and image file for the switch software update.
10. Click **Next**.
11. In the **Update Option** area, select one of the following options and click **Next**:

    - **Manual** — Stage the update to the secondary partition but do not apply it.
    - **Automatic** — Apply the software update and reboot.

    The **Schedule** screen displays.
12. On the **Schedule** screen, select one of the following options:

    - **Run Now** — Update the switch software immediately.
    - **Schedule job to start on** — Specify a date and time for the switch software update.

      The **Summary** screen displays.
13. Review the settings on the **Summary** screen and click **Finish**.

Switch Software Activation

To activate the software available in the standby partition of the switch as a scheduled job to happen at later time or to run immediately, use the **Switch Software Activation** option.

1. Navigate to the **Jobs** > **Scheduled Jobs** screen.
2. From the **Add** drop-down menu, select **Switch Software Activation**.
   The **Activate Standby partition** screen displays.
3. In the **Job Name** field, enter a name for the job.
4. (Optional) In the **Description** field, enter a description for the job.
5. Click **Next**.
   The **Switch Select** screen displays.
6. In the **Available Switches** area, select the fabric and then the switch types to update:

    - **Two-tier distributed core filtering options** — All, Spine, and Leaves
    - **Two-tier VLT options** — All, Aggregation and Access
    - **Three-tier filtering options** — All, Core, Aggregation and Access
7. To move the selected switches into the **Selected** area, click the **>>** button and click **Next**.
   The **Schedule** screen displays.
8. Select one of the following options and click **Next**:

    - **Run Now** — Active the standby partition immediately.
    - **Schedule job to start on** — Schedule the job by specifying a date and time.

    The **Summary** screen displays.
9. Review the settings and then click **Finish**.

Scheduling Switch Software Updates

The **Update Software** screen displays a software summary for each switch in the fabric. To create a new scheduled job for backup, software image upgrade, and software image activation, use the **Schedule Switch Software Update** option.

As part of ongoing data center operations, periodically update the software and configurations in the fabric. Update one or more switches. Specify the location for the software updates and then schedule the update to load immediately or schedule it for a later date and time.

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. Click **Update Software** .
3. Click **Schedule Switch Software Update** .
4. On the **Job Name** screen, in the **Job Name** field, enter a unique name for the software job.
5. (Optionally) In the **Description** field, enter a description for the schedule software update.
6. Click **Next**.
   The **Select Switches** screen displays.
7. On the **Select Switches** screen, in the **Available** area, select the fabric and then the switches to update:
   - **Two-tier distributed core filtering options** — All, Spine, and Leaves
   - **Two-tier VLT options** — All, Aggregation and Access
   - **Three-tier filtering options** — All, Core, Aggregation and Access
8. To move the selected switches to the **Selected Switches** area, click the **>>** button.
9. Click **Next**.
   The **Update Location** screen displays.
10. On the **Update Location** screen, to select the TFTP or FTP site for the software updates, click **Edit TFTP or FTP settings**.
11. Enter the path and image name of the software file on the TFTP or FTP site for each type of switch.
12. Click **Next**.
    Update Option screen displays.
13. On the **Update Option** screen, select one of the following options:
    - **Manual** — Stage the update to the secondary partition but do not apply it.
    - **Automatic** — Apply software update and reboot.
14. Click **Next**.
    The **Schedule** screen displays.
15. On the **Schedule** screen, select one of the following options and click **Next**:
    - **Run Now** — Run the switch software update immediately.
    - **Schedule job to start on** — Schedule the job for later. Specify the start date and time for the software update job.
16. On the **Summary** screen, review the software update software settings and click **Finish**.

Activating Standby Partition Software

To activate the software available in the standby partition of the switch as a scheduled job to occur later or to run immediately, use the **Schedule Activate Standby Partition** option.

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. Click **Update Software**.
3. Click **Schedule Activate Standby Partition**.
4. In the **Job Name** field, enter a name for the job.
5. (Optional) In the **Description** field, enter a description for the job.
6. Click **Next**.
7. From the drop-down menu, select one of the following options:
   - **Two-tier distributed core filtering options** — All, Spine, and Leaves
   - **Two-tier VLT options** — All, Aggregation and Access
   - **Three-tier filtering options** — All, Core, Aggregation and Access
8. Select the switches for standby partition activation and then click the **>>** button to move them to the **Selected** area.
9. Click **Next** .
10. From the **Schedule** screen, select one of the following options and click **Next**:
    - **Run Now** — Schedule the job to run immediately.
    - **Schedule job to start on** — Schedule the job to run later.
11. Review the **Summary** settings and click **Finish**.

Scheduling a Back Up Switch Configuration

1. Navigate to the **Network** > *Fabric Name* > **Maintenance** screen.
2. Click the **Switch Backup** button.
   The switch backup options display.
3. Click **Switch Backup**.
   The **Job Name** screen displays.
4. In the **Name** field, enter the name of the software job name.
5. (Optional) In the **Description** field, enter a description.
6. Click **Next**.
   The **Select Switches** screen displays.
7. Navigate to the **Available** area.
8. From the **Switch Type** pull-down menu, select the type of switches to update.
9. In the **Available Switches** area, select the types of switches to update:
   - **Two-tier distributed core filtering options** — All, Spine, and Leaves
   - **Two-tier VLT options** — All, Aggregation and Access
   - **Three-tier filtering options** — All, Core, Aggregation and Access
10. To move the selected switches to the **Selected Switches** area, click the **>>** button and then click **Next**.
    The **Schedule** screen displays.
11. In the **Start** area, select one of the following options:
    - **Run Now** — Run the job now.
    - **Schedule job to start** — Specify when to schedule the job.
12. In the **Summary** screen, review your settings, and then click **Finish**. For more information about backing up switches, refer to Viewing and Editing Switch Backup Configuration..

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Administration

This section contains the following topics:

Administrative Settings

To configure administrative settings, use the **Administration** > **Settings** screen:

NOTE: AFM allows you to configure the SNMP configuration and CLI credentials before designing and deploying the fabric. You cannot edit SNMP and CLI credentials settings during the run phase.

Active Link Settings

To display additional performance statistics in AFM using a Dell OpenManage Network Manager (OMNM) server, use the **Active Link Settings** option. OMNM monitors and manages Dell network devices. It automates common network management operations and provides advanced network element discovery, remote configuration management, and system health monitoring to proactively alert network administrators to potential network problems. OMNM provides SOAP-based web services to allow third-party integration.

AFM provides view-only integration with the Dell OMNM web application. When you enable **Active Link**, it displays another browser to view AFM performance statistics. For information about how to install and configure OMNM, refer to http://www.dell.com/support/Manuals/us/en/555/Product/dell-openmanage-network-manager. Refer to the release notes or the *AFM Installation Guide* for supported versions of OMNM.

NOTE: Install the Dell OMNM software on a different server than AFM. To activate the performance statics, log in to Dell OMNM web service directly using `write` permissions.

NOTE: By default, the web service is turned off in the OMNM server. To enable web service:

1. On the OMNM server, go to the server installation directory.
2. Navigate to the **installed.properties** file at **C:\ProgramFiles\Dell\OpenManage\Network Manager\owareapps\installprops\lib**.
3. Disable the Application Server and Synergy Network Management server.
4. Add the following three lines in the **installed.properties** file:

```
com.dorado.core.ws.disable=false
com.dorado.core.ws.legacy.soap.enabled=true
oware.webservices.authrequired=false
```

5. Enable the **Resource Monitoring** option for performance monitoring.
6. Start the Application server and Synergy Network Management server.

Before configuring Active Link, gather the following OMNM server information:

- OMNM server IP address
- communication protocol (HTTP or HTTPS)
- user name and password

AFM provides the Active Link server and Active Link web service status on the following screens:

- **Administration-> Settings > Active Link Settings**
- **Network** > **Alerts and Events** screen in the **Description** column
- **Network** > *Fabric* > **Details**
- **Network** > *Switch* > **Summary**

AFM disables the **Active Link** feature if:

- AFM cannot connect to Active Link server
- AFM cannot connect to Active Link web service
- AFM does not manage the selected switch
- The Active Link server is not configured

The topology view and link status refresh every 60 seconds by default. Change the refresh rate interval on the **Administration > Settings** > **Client Settings** > **GUI Polling** screen.

- The AFM UI provides the Active Link server status and Active Link web service status on the following screens:
  - **Administration > Settings >Active Link Settings** screen
  - **Network** > *Fabric* > **Details** screen
  - **Network** > *Switch* > **Summary** screen

  The Active link is available at the following screens.
- Navigate to the **Network** > *Fabric* > **Graphical** view. From the **Action** menu, select **Launch Active Link**.
- Navigate to the **Network** > *Fabric* > **Graphical** view. Right-click the switch icon and select **Launch Active Link** .
- Navigate to the **Network** > *Fabric* > **Tabular** view. From the **Action** menu, select the switch row and then select **Launch Active Link**. The Active Link displays the selected switch view and performance charts.
- Navigate to the **Network** >*Switch* > **Graphic** view and click **Launch Active Link**. The Active Link displays the selected switch view and performance charts.

- Navigate to the **Network** >*Switch* > **Tabular** view and click **Launch Active Link**. The Active Link displays the selected switch view and performance charts.

To configure active link settings:

1. Navigate to the **Administration > Settings** screen.
2. Navigate to the **Active Link Settings** area and click **Edit**.
3. In the **Active Link** area, check the **Integrate to Dell OpenManage Network Manager (OMNM)** checkbox to display additional performance statistics.
4. In the **Active Link System IP Address** field, enter the Active Link server IP address for the element management system. In the **Communication Protocol** area, select one of the following protocols:
   - **Use HTTP protocol to connect through AFM Server**
   - **Use HTTPS protocol to connect through AFM Server**
5. In the **User Name**, enter the Active Link user name.
6. In the **Password** field, enter the Active Link user password.
7. Click **OK** .

CLI Credentials

To provision the fabric, enter the FTOS CLI user's credential and enable the configuration credentials for all the switches in the fabric. This option allows you to remotely make configuration changes to the switches in the fabric.

NOTE: If you change the password on a switch in a currently deployed fabric, the switch reboots and redeploys. Re-deploy the fabric using the pre-deployment wizard and update the password on the **CLI Credentials** screen.

To configure the CLI credentials and enable the configuration credentials for all the switches in the fabric:

1. Navigate to the **Administration > Settings** screen.
2. In the **CLI Credentials** area, click the **Edit** button.
3. In the **Protocol** pull-down menu, select one of the following options:
   - **Telnet**
   - **SSHv2**
4. In the **User Name** field, enter the user name.
5. In the **Password** field, enter the password.
6. In the **Confirm Password** field, confirm the password.
7. In the **Enable Password** field, enter a password for the privilege level. The privilege level is 15 and is a read-only field.
8. In the **Confirm Enable Password** field, confirm the enable password for the privilege level.
9. Click **OK**.

Client Settings

To configure the polling interval and the maximum number of browser windows for each user's session:

1. Navigate to the **Administration > Settings** screen.

2. In the **Client Settings** area, click **Edit**.
3. From the **GUI Polling Interval (in Seconds)** drop-down menu, select one of the following options. The default value is 60 seconds.
   - **15 Seconds**
   - **30 Seconds**
   - **60 Seconds**
   - **120 Seconds**
4. From the **Pop-out Client Session** drop-down menu, select the maximum number of browser windows for each user's session. The range is 3–7 and the default value is 3.
5. Click **OK**.

Data Retention Settings

To configure the amount of time to retain performance history:

1. Navigate to the **Administration > Settings** screen.
2. In the **Data Retention** area, click **Edit**.
3. In the **Performance History** area, enter the number of days to retain the performance history. The range is 1–180.
4. From the **Daily Purge Execution Time** drop-down menu, specify when to purge the performance history data.
5. Click **OK**.

DHCP Server Settings

To select a local or remote DHCP server:

1. Navigate to the **Administration > Settings** screen.
2. Navigate to the **DHCP Server Settings** area and select one of the following settings:
   - **Local** — Provision AFM as a DHCP server. If you select this option, AFM automatically integrates the generated **dhcp.config** file into the DHCP server on AFM during pre-deployment
   - **Remote** — Use an external DHCP server. If you select this option, manually install the **dhcp.config** file generated during pre-deployment on the DHCP server before deploying the fabric.
3. Click **OK** .

NTP Server Settings

To configure NTP server settings:

1. Navigate to the **Administration** > **Settings** screen.
2. In the **NTP Server Settings** area, click **Edit**.
3. Enter the NTP server primary IP address.

   NOTE: The **IP Status** and **Secondary IP Status** fields display the current status of the servers.
4. Enter the NTP server secondary IP address.
5. Click **OK** .

SMTP Email

To configure SMTP email:

1. Navigate to the **Administration > Settings** screen.
2. In the **Secure SMTP Email Settings** area, click **Edit**.
3. In the **Outgoing Mail Server** field, enter the IP address or complete host name of the email server.
4. In the **Server Port** field, enter the port number of the email server.
5. In the **User Name** field, enter the user name.
6. In the **To Email Address(es)** field, enter the mail addresses separated by a semicolon (`;`).
7. From the **Minimum severity level to Email Notification** drop-down menu, select one of the following settings:
   - **Critical**
   - **Major**
   - **Minor**
   - **Warning**
8. Click **OK** .

SNMP Configuration

Configure SNMP so that AFM can perform SNMP queries on the switches in the fabric. AFM uses the SNMP configuration values for configuring and monitoring the switches.

1. Navigate to the **Administration > Settings** screen.
2. In the **SNMP Configuration** area, click **Edit**.
3. In the **Read Community String** field, enter the read community string (for example, `public`).
4. In the **Write Community String** field, enter the write community string (for example, `private`).
5. In the **Port** field, enter the SNMP port number of the switches. The port number is typically 161.
6. In the **Trap Host** field, specify the IP address for AFM so that the traps are sent to AFM.
7. Click **OK**.

Syslog Server IP Addresses

To configure the syslog server for event logging:

1. Navigate to the **Administration > Settings** screen.
2. In the **System IP Addresses** area, configure up to eight syslog server IP addresses for logging events on the switches in the fabric. By default, the first syslog IP address entry is the AFM system IP address.

System Information

1. Navigate to the **Administration > Settings** screen.
2. From the **System IP Address** drop-down menu, select the AFM management IP address.

   NOTE: If you configured multiple Network Interface Card (NIC) adapter cards on AFM, select the AFM management IP address.

TFTP/FTP Settings

1. Navigate to the **Administration > Settings** screen.
2. From the **File Transfer Protocol** drop-down menu, select one of the following options:
   - **TFTP** (default)
   - **FTP**
3. In the **TFTP/FTP Settings** area, select one of the following options:
   - **Local** — Provision AFM as a TFTP/FTP server.

     NOTE: If you use the **Local** option, the TFTP or FTP server must be in the same subnet as AFM.
     - If you select the local TFTP server option, the TFTP server uses the AFM management IP address.
     - If you select the local FTP server option, the FTP server uses the AFM management IP address. Enter the AFM user name and password.
   - **Remote** — Use an external TFTP/FTP server.
     - If you select the FTP protocol and remote options, enter the FTP server IPv4 address, user name and password.
     - If you select the TFTP protocol and remote options, enter the TFTP IPv4 address.

Managing User Accounts

AFM users are categorized as one of three predefined roles with the following permissions:

Superuser

- View a summary of user accounts
- Add, delete, and edit users
- Lock and unlock users
- Reset passwords for all accounts
- Perform configuration changes
- Set session timeout values
- Terminate AFM users' sessions on the **Administration > User Session** screen

Administrator

- Perform configuration changes
- View performance monitoring
- Change password for own account

User

- View configuration and performance monitoring information.
- Change password for own account.

NOTE: The AFM root user name is `superuser` and the password is `Superuser1`.

To view and manage user accounts, use the **Administration > User Accounts** screen.

- **User Accounts Summary View** — Display a summary view of all user accounts when the current user's role is `Superuser`. When the role is `user` or `administrator`, only the current user's account information displays.
- **Add User** — Add new user accounts. Configure up to 50 user accounts but AFM supports only one `superuser` account.
- **Edit User** — Edit the following information for user accounts:
  - **Role** — Select the account role (`user` or `administrator`).
  - **First Name** — Enter the user's first name.
  - **Last Name** — Enter the user's last name.
  - **Password** and **Confirm Password** — To change the password, enter the new password in these fields.
  - **Sessions Allowed** — Specify the number of permissible simultaneous sessions for a user.
  - **Session Timeout** — Specify the session timeout values. If a user is inactive for this amount of time, AFM automatically logs out of the account.
  - **Unsuccessful Login Limit** — Specify the number of permissible unsuccessful login attempts for a user's account. When the unsuccessful login limit is exceeded, AFM applies the lockout duration.
  - **Lockout Duration** — Specify the amount of time a user is locked out when he or she exceeds the unsuccessful login limit.
- **Delete User** — Delete one or more user accounts. The system default user account, `Superuser`, cannot be deleted.
- **Unlock** — Unlock account for a user who was locked out because he or she exceeded the maximum number of login attempts. To unlock a user account, select the user and click **Unlock** .
- **Default User** — During the installation process, AFM prompts you to create a `Superuser` account.
- **Reset Default User** (`Superuser`) Password — Contact technical support if you need to reset the `Superuser` password.
- **Password Rules** — Enforces special password rules for enhanced security. The password must contain at least six characters, one capital letter, and one number. AFM masks the password when you enter it.

Adding a User

To add a user account, log in as a `Superuser`. For more information about user accounts, refer to Managing User Accounts.

1. Navigate to the **Administration > User Accounts** screen.
2. Click **Add User**.

   The **Add User** screen displays.
3. In the **User Name** field, enter a unique alphanumeric name for the user. The range is 1–25 characters.
4. In the **Password** field, enter the user's password.

   The password length must be from 8 — 32 characters and include three characters from the following categories:
   - At least one upper-case letter
   - Lower-case letters
   - At least one numeric digit
   - At least one special character
5. In the **Confirm Password** field, enter the user's password.
6. In the **First Name** field, enter the user's first name. The range is 1–50 characters. There are no character restrictions.

7. (Optional) In the **Last Name** field, enter the user's last name. The range is 1–50 characters. There are no character restrictions.
8. From the**Role** drop-down menu, select one of the following roles:
   - **Admin**
   - **User**

   For information about roles, refer to Managing User Accounts.
9. In the **Sessions Allowed** drop-down menu, specify the number of sessions allowed for the user. The range is 1–5 and the default is 5.
10. In the **Session Timeout** pull-down menu, specify one of the following values. The default value is 15 minutes.
    - **15 minutes**
    - **30 minutes**
    - **45 minutes**
    - **60 minutes**
11. In the **Unsuccessful Login Limit** drop-down menu, select a value. The range is 3–10 and the default is 5.
12. In the **Lockout Duration** drop-down menu, select one of the following options. The default value is 30 minutes.
    - **15 minutes**
    - **30 minutes**
    - **45 minutes**
    - **60 minutes**
    - **Permanent**
13. Click **OK**.

Deleting a User

To add or delete users, log in as a `Superuser`. For more information about user accounts, refer to Managing User Accounts.

1. Navigate to the **Administration > User Accounts** screen.
2. Select the user.
3. Click **Delete**.
4. Click **Yes**.

Editing a User

To edit a user, log in as a `Superuser`. For more information about user accounts, refer to Managing User Accounts.

1. Navigate to the **Administration > Settings > User Accounts** screen.
2. Select the user.
3. Click **Edit**.

   The **Edit User Settings** screen displays.
4. In the **First Name** field, enter the user's first name.
5. In the **Last Name**, enter the user's last name.
6. In the **Password** field, enter the user's password.

7. In the **Confirm Password** field, enter the user's password.
8. From the **Sessions Allowed** drop-down menu, specify the number of sessions allowed for the user.
9. From the **Session Timeout** drop-down menu, specify one of the following values:
   - **15 minutes**
   - **30 minutes**
   - **45 minutes**
   - **60 minutes**
10. From the **Unsuccessful Login Limit** drop-down menu, select the number of allowed unsuccessful login attempts. The range is 3–10.
11. From the **Lockout Duration** drop-down menu, select one the following options:
    - **15 minutes**
    - **30 minutes**
    - **45 minutes**
    - **60 minutes**
    - **Permanent**
12. Click **OK**.

Unlocking a User

To unlock a user, log in as a **Superuser** . For information about user accounts, refer to Managing User Accounts.

1. Navigate to the **Administration > Users Accounts** screen.
2. Select the user.
3. Click **Unlock**.
4. Click **OK**.

Changing Your Password

1. Go to the upper right of the screen next to your login name.
   A drop-down menu displays.
2. Select **Change Password**.
   The **Change Current Account Password** screen displays.
3. In the **Current Password** field, enter the current password.
4. In the **New Password** field, enter the new password.
   The password length must be from 8 — 32 characters and include three characters from the following categories:
   - At least one upper-case letter
   - Lower-case letters
   - At least one numeric digit
   - At least one special character
5. In the **Confirm Password** field, confirm the new password.
6. Click **OK**.
   For more information about user accounts, refer to Managing User Accounts.

Managing User Sessions

To display active AFM users and terminate users' sessions, use the **User Sessions** screen. Only the **Superuser** can terminate an AFM user's session. For more information about user accounts, refer to Managing User Accounts.

This screen displays the following information:

- **User Name** — View a list of user names for users who are currently logged in.
- **Session Login Time** — View the date and time of the user's last login.
- **Client IP Address** — View the IP address of the user.
- **Current Session** — Displays a checkmark if the user is logged in.

To terminate users' sessions:

1. Navigate to the **Administration > User Sessions** screen.
2. Select the users that you want to log off.
3. Click **Force Logoff** .
4. Click **OK**.

Audit Log

To log a chronological sequence of audit records with information on who has accessed the switch and what operations the user has performed during a given period of time, use the **Audit Log** screen. The Audit Log only captures actions by AFM users.

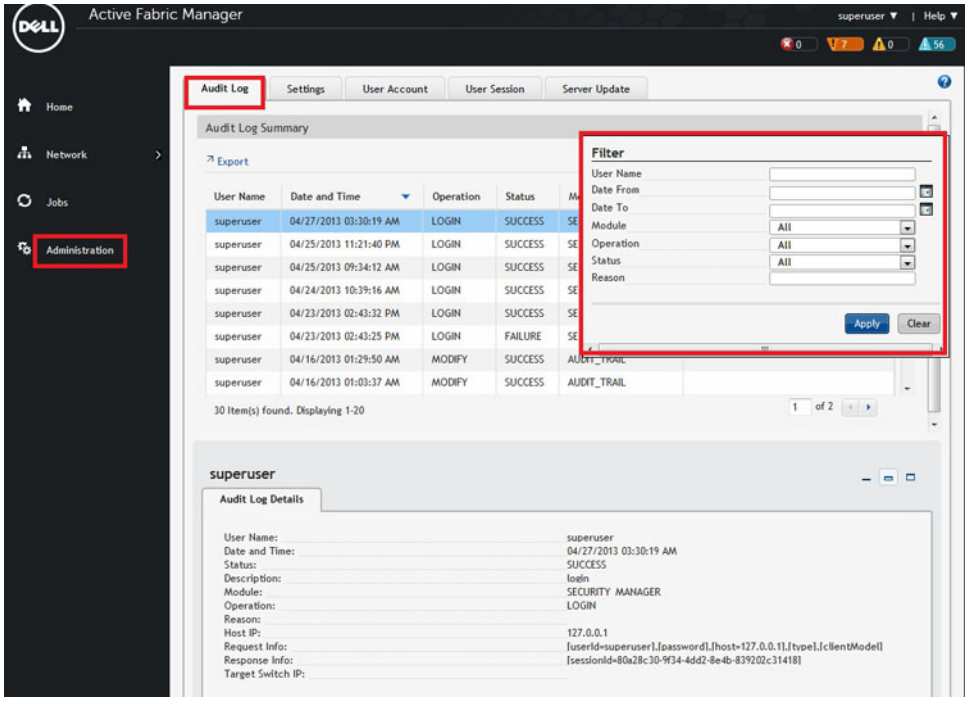

Figure 102. Audit Log

1. Navigate to the **Administration** > **Audit Log** screen.
2. To display the audit trail options, click the filter icon on the upper right of the screen.
3. Enter your filter criteria for the **User Name** field (for example, `superuser`).
4. From the **Date From** drop-down menu, select the beginning date and time of the operation.
5. From the **Date To** drop-down menu, select the end date and time of the operation.
6. From the **Module** drop-down menu, select one of the following AFM modules:
   - **Security Activation**
   - **Security Manager**
   - **Audit Trail**
   - **UI Manager**
7. From the **Status** drop-down menu, select a audit trail operation status:
   - **Queued**
   - **In Progress**
   - **Success**
   - **Failure**
   - **Timeout**
   - **Response Delivered**
   - **Invalid Request**

8. Click **Apply**.
    - To export the results, click **Export**.

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Technical Support

Dell Networking Technical Support provides a range of documents and tools to assist you with effectively using Dell Networking equipment and mitigating the impact of network outages.

Accessing Dell License Portal

When you receive the Order Fulfillment email, follow these instructions to download the software.

1. Go to http://www.dell.com/support/licensing.
2. Enter your order number and click **Available Software List**.
3. Select the latest released version.
4. Accept the End User License Agreement (EULA).
5. Chose to download the file directly or use the NetSession client.
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Contacting Dell Technical Support

Downloading Software	Download the latest released version of the software at http://www.dell.com/support/licensing
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