

PowerEdge FX2 - Upgrading from 10GbE Pass-through Modules to FN410S I/O Modules

Dell Networking Solutions Engineering
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Revisions

Date	Revision	Description	Authors
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1 Introduction

This deployment guide covers a step-by-step procedure to minimize network downtime when upgrading from Dell 10 Gigabit Ethernet (10GbE) Pass-through Modules (PTMs) to PowerEdge FN410S Input/Output Modules (IOMs) in a PowerEdge FX2 chassis.

When upgrading, all servers in the chassis may remain up throughout the process. In the scenario covered in this guide, the PTMs are hot-swapped one at a time so that no more than half of the server network ports are down at any point in the upgrade.

Upgrading from PTMs to FN410S IOMs provides the following benefits:

- Adds multilayer switching capability to the chassis
- Adds redundancy to links going to the top-of-rack (ToR) switch
- Optimizes east-west traffic by allowing server-to-server communication within the chassis
- Can significantly reduce cabling at the back of the chassis
- Additional configuration is not required on the FN410S for many common deployments

Note: If FX2 server network adapters are configured such that a single LACP NIC team spans both PTMs, and therefore will span both FN410S IOMs upon replacement, the FN410S IOMs will need to be configured as Virtual Link Trunking (VLT) peers. This will bring all network ports in the FX2 chassis down during configuration. Use the [PowerEdge FX2 – FN I/O Module – VLT Deployment Guide](#) for this scenario.

1.1 Typographical conventions

This document uses the following typographical conventions:

<code>Monospace text</code>	CLI examples
<code>Bold monospace text</code>	Commands entered at the CLI prompt
<u><code>Underlined monospace text</code></u>	CLI examples that word wrap (text is entered as a single command)
<i><code>Italic monospace text</code></i>	Variables in CLI examples

1.2 Before upgrading

Dell EMC recommends reviewing the [Dell PowerEdge FN I/O Module \(FN IOM\) - Easy Deployment Guide](#) before upgrading to FN410S IOMs. The Easy Deployment Guide covers basic FN IOM tasks such as the following:

- Resetting to factory defaults
- Establishing a remote or serial connection to the management interface
- Disabling and re-enabling Uplink Failure Detection (UFD)

2 Hardware

This section briefly describes the hardware used in this guide.

2.1 The Dell PowerEdge FX2/FX2s and supported modules

The PowerEdge FX2 and FX2s enclosures are 2U, hybrid, rack-based computing platforms. They combine the density and efficiencies of blades with the simplicity and cost benefits of rack-based systems.



Figure 1 Dell PowerEdge FX2s (front) with one PowerEdge FC630 server installed




Figure 2 Dell PowerEdge FX2s (back) with two PowerEdge FN410S IOMs installed

Note: This guide applies to either the PowerEdge FX2 or FX2s chassis. The FX2 does not offer PCIe expansion slots. The FX2s includes eight PCIe expansion slots, as Figure 2 shows.



Figure 3 FX2 with server and networking modules

PowerEdge FX2



A converged enclosure with shared power, cooling, management and PCI connectivity in just 3.5" of rack space

Flexible resources for every workload







<div style="text-align: center;"> PowerEdge FC630  </div> <p>A 2 socket, half width performance server node with the processing performance and memory scalability to handle virtually any workload.</p>	<div style="text-align: center;"> PowerEdge FC430  </div> <p>An ultra-dense 2 socket, quarter-width mainstream server, ideal for distributed environments requiring multi-node reliability & efficiency.</p>
<div style="text-align: center;"> PowerEdge FM120x4  </div> <p>A half width compute module providing four microservers per node, delivering a high density, low cost solution ideal for web serving and dedicated hosting.</p>	<div style="text-align: center;"> PowerEdge FC830  </div> <p>A full-width, 4-socket node with massive memory scalability, expandable storage, and powerful processing, great for core applications and cutting-edge virtualization.</p>
<div style="text-align: center;"> PowerEdge FD332  </div> <p>A half width direct attached storage node with up to 16 drives, it combines with compute to build highly flexible, scale-out or software defined storage solutions.</p>	<div style="text-align: center;"> PowerEdge FN IOM  </div> <p>Converged networking modules for simplified network deployment and improved "east/west" communication.</p>

Figure 4 FX2 module descriptions

2.2 Dell 10GbE Pass-through Module



The Dell 10GbE PTM provides one-to-one connectivity from blade server network adapter ports to ToR switch ports. It has eight internal ports and eight external SFP+ ports. The pass-through module does not do any switching.

2.3 PowerEdge FN410S I/O Module



The PowerEdge FN410S IOM is a Layer 2 and 3 switch with eight internal ports and four external SFP+ ports. In addition to full switching and routing features, it supports FCoE, iSCSI with data center bridging (DCB), stacking, and VLT. It comes preconfigured for many common deployments.

3 Upgrade

3.1 Overview

Figure 5 shows a fully loaded FX2 chassis configured with two 10GbE PTMs. Four FC630 servers reside in the front slots, each containing a quad-port converged network adapter (CNA). The PTMs reside in slots A1 and A2 in the back of the chassis.

This configuration requires eight uplinks from each PTM to the ToR switch, one for each server CNA port. If an uplink fails, the corresponding CNA port goes down until the link is restored.

Before Upgrade

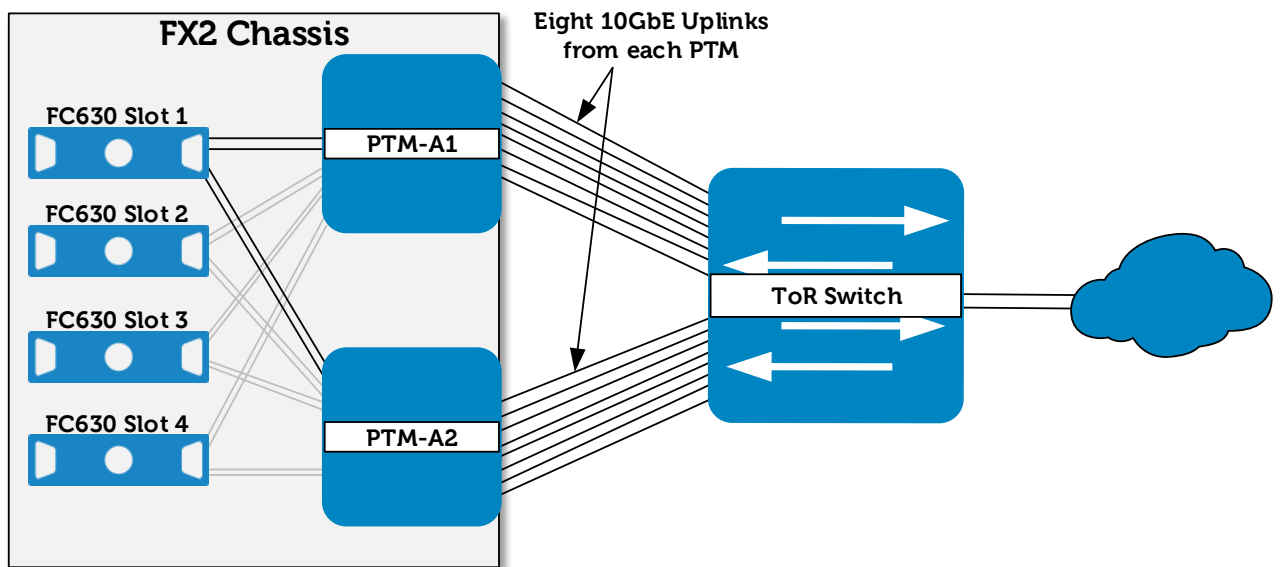


Figure 5 Fully loaded FX2 chassis before upgrade

The same FX2 chassis with the two PTMs replaced by two FN410S IOMs is shown in Figure 6.

The four external ports on each FN410S are configured in a 40GbE LACP port channel connected to the ToR switch. Anywhere from one to four uplinks can be used from each FN410S. The bandwidth of each LACP port channel will equal the sum of the connected links.

Dell EMC recommends a minimum of two uplinks from each FN410S for redundancy. If an uplink fails, traffic continues to flow on the remaining uplink(s) in the port channel without affecting connectivity of the server CNAs.

After Upgrade

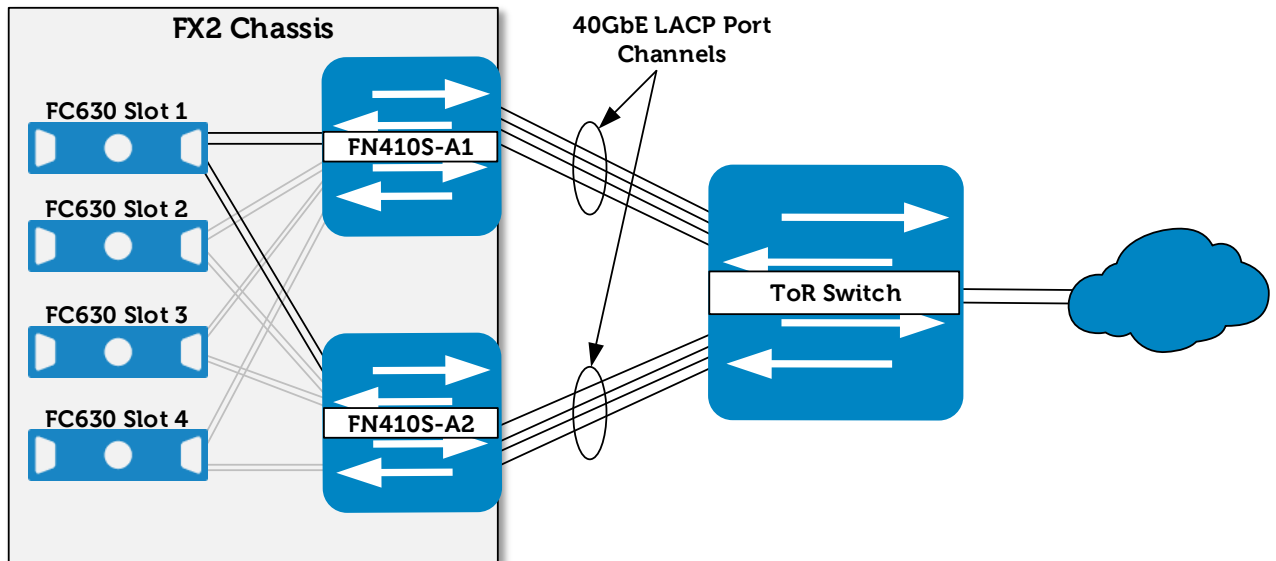


Figure 6 Fully loaded FX2 chassis after upgrade

3.2 Step-by-step example

This section provides steps to replace each PTM with an FN410S in a sequence that minimizes network downtime on the servers inside the FX2 chassis. The chassis and servers remain up and running throughout the upgrade.

For clarity in the diagrams, this step-by-step example uses a reduced number of connections as shown in Figure 7 and Figure 8.

In this example, there are two FC630 servers in the chassis, and each FC630 server has a dual-port CNA. On each server, one CNA port is untagged in the default vlan and the other port is tagged in VLAN 6. A Dell Networking S4048-ON functions as the ToR switch.

Notes:

- Any Dell or third-party switch that supports 10GbE SFP+ links and LACP may be used as the ToR switch in place of the S4048-ON. See the [Dell PowerEdge FN I/O Module \(FN IOM\) - Easy Deployment Guide](#) for LACP configuration commands on common third-party switches.
- The FN410S IOMs are at their factory default settings throughout the upgrade. See the [Dell PowerEdge FN I/O Module \(FN IOM\) - Easy Deployment Guide](#) for steps to reset FN IOMs to factory defaults if needed.
- Replace the VLANs and port numbers in this example with those in your configuration.

Step-by-Step Example: Before Upgrade

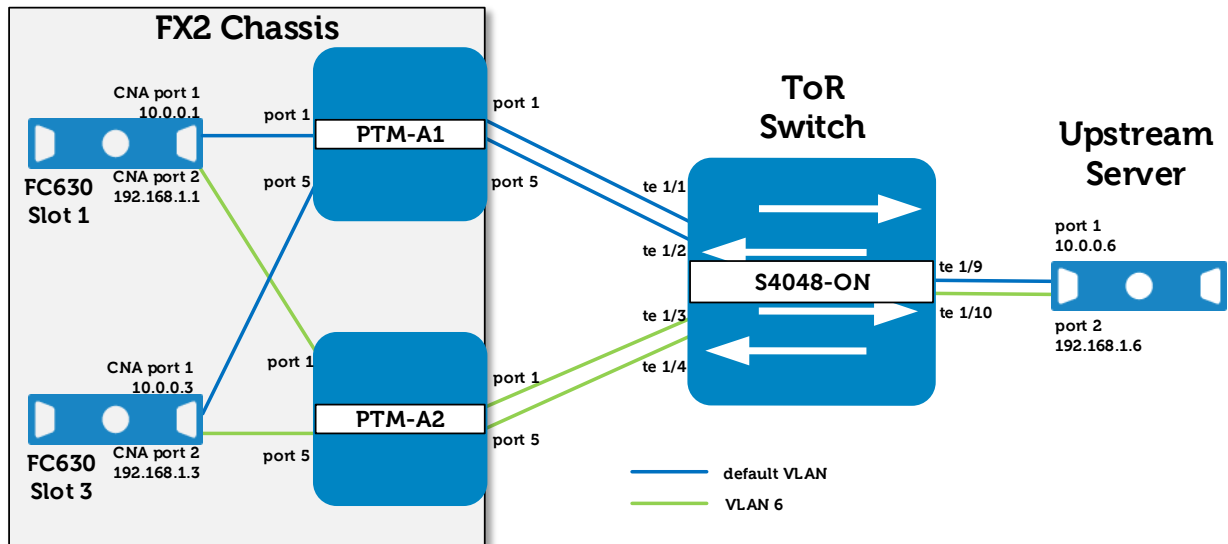


Figure 7 Step-by-step example - before upgrade with PTMs installed

Step-by-Step Example: After Upgrade

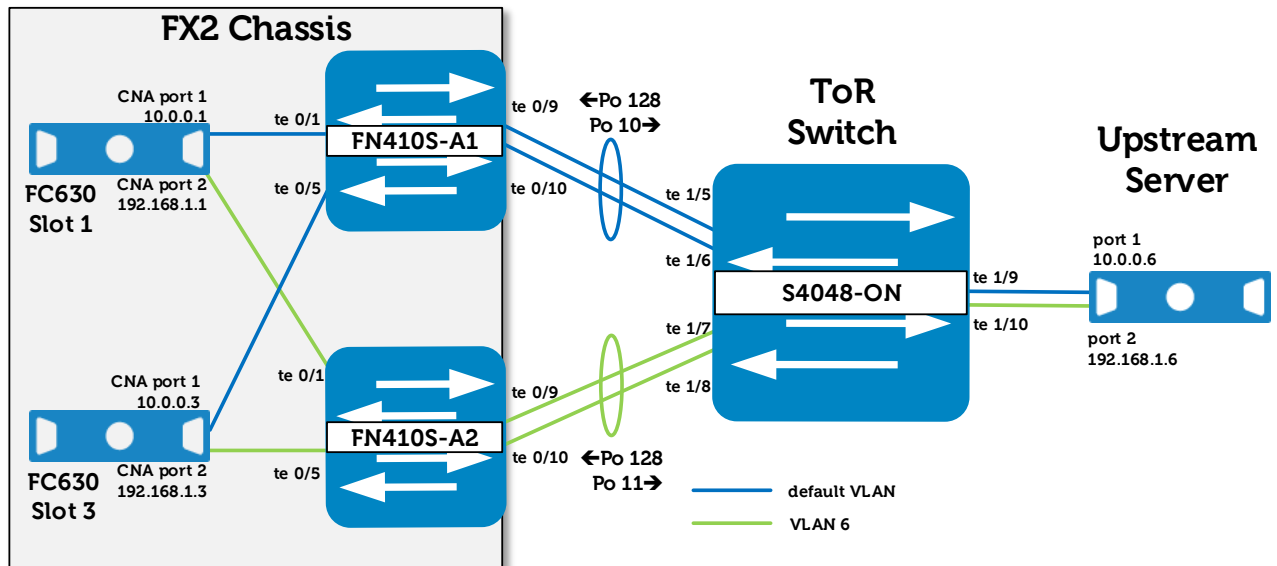


Figure 8 Step-by-step example - after upgrade with FN410S I/O modules installed

3.2.1 Part 1 - Configure the ToR switch

Notes: By default, all four external (uplink) ports on FN410S IOMs are preconfigured in LACP port channel 128. In this example, two links from each FN410S are used. The corresponding connections on the ToR switch must also be configured as LACP port channels. Port channel numbers 10 and 11 are used on the S4048-ON, but they can be assigned any number supported by the ToR switch.

Figure 7 shows that before upgrade, the two PTMs connect to four S4048-ON ports (te 1/1-1/4). Figure 8 shows that, upon completion of the upgrade, the FN410S IOMs connect to four different S4048-ON ports (te 1/5-1/8). The connections can reuse the original ports. But, if they are available, using different ports minimizes network downtime during the upgrade.

1. Configure port channel 10 on the S4048-ON to later connect to FN410S-A1 port channel 128:

```
S4048-ON(conf)#interface range tengigabitethernet 1/5-1/6
S4048-ON(conf-if-range-te-1/5-1/6)#no shutdown
S4048-ON(conf-if-range-te-1/5-1/6)#description LINK TO FN410S-A1
S4048-ON(conf-if-range-te-1/5-1/6)#port-channel-protocol lacp
S4048-ON(conf-if-range-te-1/5-1/6-lacp)#port-channel 10 mode active
S4048-ON(conf-if-range-te-1/5-1/6-lacp)#exit
S4048-ON(conf-if-range-te-1/5-1/6)#exit

S4048-ON(conf)#interface port-channel 10
S4048-ON(conf-if-po-10)#portmode hybrid
S4048-ON(conf-if-po-10)#switchport
S4048-ON(conf-if-po-10)#description PO TO FN410S-A1
S4048-ON(conf-if-po-10)#no shutdown
```

Port channel 10 does not require VLAN configuration in this example because it will only carry traffic on the default, untagged VLAN (VLAN 1).

2. Configure port channel 11 on the S4048-ON to later connect to FN410S-A2 port channel 128:

```
S4048-ON(conf)#interface range tengigabitethernet 1/7-1/8
S4048-ON(conf-if-range-te-1/7-1/8)#no shutdown
S4048-ON(conf-if-range-te-1/7-1/8)#description LINK TO FN410S-A2
S4048-ON(conf-if-range-te-1/7-1/8)#port-channel-protocol lacp
S4048-ON(conf-if-range-te-1/7-1/8-lacp)#port-channel 11 mode active
S4048-ON(conf-if-range-te-1/7-1/8-lacp)#exit
S4048-ON(conf-if-range-te-1/7-1/8)#exit

S4048-ON(conf)#interface port-channel 11
S4048-ON(conf-if-po-11)#portmode hybrid
S4048-ON(conf-if-po-11)#switchport
S4048-ON(conf-if-po-11)#description PO TO FN410S-A2
S4048-ON(conf-if-po-11)#no shutdown
S4048-ON(conf-if-po-11)#exit
```

3. Tag port channel 11 in VLAN 6:

```
S4048-ON(conf)#interface vlan 6
S4048-ON(conf-if-vl-6)#tagged port-channel 11
```

This completes S4048-ON switch configuration. It assigns the correct interfaces to LACP port channels 10 and 11, and configures the port channels in the appropriate VLANs.

3.2.2 Part 2 – Replace the PTM in Slot A1 with an FN410S

1. Disconnect all cables from the PTM in slot A1 (PTM-A1). A1 is the top slot.
2. Remove PTM-A1 from the chassis.
 - All server CNA ports connected to PTM-A1 go down.
 - The PTM in slot A2 (PTM-A2) is not affected and continues to function normally.
3. Insert an FN410S into slot A1 (FN410S-A1).
 - FN410S-A1 powers up and takes about 2 minutes to boot.
 - After FN410S-A1 has booted, the server CNA ports will continue to be down until the next step. This is due to a feature called Uplink Failure Detection (UFD) whereby when upstream connectivity is down, the FN IOM disables the downstream, server-facing links.

Notes:

- The FN410S switch console can be monitored using a serial cable, SSH, or telnet session.
- See the [Dell PowerEdge FN I/O Module \(FN IOM\) - Easy Deployment Guide](#) for console connection instructions and more information on UFD.
- By default on the FN410S, all internal ports and the uplink port channel (po 128) are untagged in the default VLAN (VLAN 1) and tagged in all other VLANs (VLANs 2-4094). This eliminates the requirement to manually configure VLANs on the FN410S for most common deployments, including this example.

4. Connect cables from S4048-ON ports te 1/5-1/6 to FN410S-A1 ports te 0/9-0/10. The network now appears as shown in Figure 9.
 - After the connection is made, the LACP port channel between FN410S-A1 and the S4048-ON comes up.
 - On FN410S-A1, UFD detects port channel 128 is up and brings up the internal, server-facing ports (FN410S-A1 ports te 0/1 and te 0/5 in Figure 9). This causes the corresponding server CNA ports to come up.

Step-by-Step Example: Upgrade Midpoint

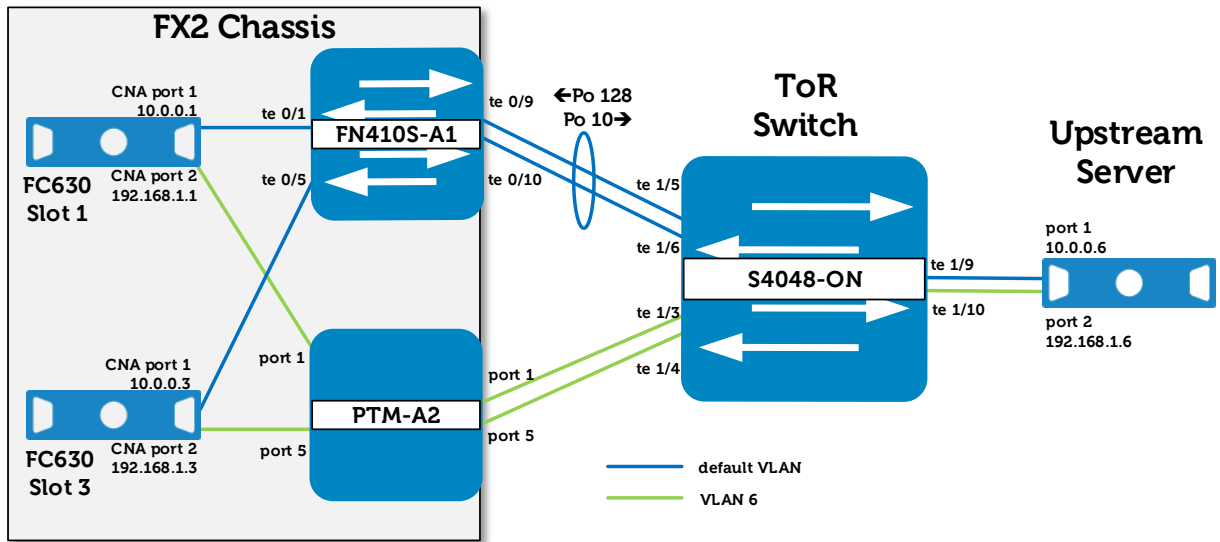


Figure 9 Upgrade midpoint with one PTM and one FN410S installed

5. After the FC630 server's CNA ports are up, a north-south connectivity check is done by pinging the servers in the FX2 chassis from an upstream device on all applicable VLANs traversing FN410S-A1.
 - The upstream server at 10.0.0.6 successfully pings the FX2 servers at 10.0.0.1 and 10.0.0.3 through the ToR and FN410S-A1 on the default VLAN.
 - PTM-A2 is not affected and functions normally.
6. An east-west connectivity check is done by pinging between the servers in the FX2 chassis on all applicable VLANs traversing FN410S-A1.

The FC630 server at 10.0.0.1 successfully pings the FC630 server at 10.0.0.3 through FN410S-A1 on the default VLAN without going through the ToR switch.

Note: If you want to verify east-west traffic bypasses the ToR switch by shutting port channel 128, disable UFD on the FN410S first. Instructions for disabling and re-enabling UFD are in the appendix of the [Dell PowerEdge FN IOM Easy Deployment Guide](#).

3.2.3 Part 3 – Replace the PTM in Slot A2 with an FN410S

1. Disconnect all cables from the PTM in slot A2 (PTM-A2).
2. Remove PTM-A2 from the chassis.
 - All server CNA ports connected to PTM-A2 go down.
 - FN410S-A1 is not affected and functions normally.
3. Insert an FN410S into slot A2 (FN410S-A2).
 - FN410S-A2 powers up and takes about 2 minutes to boot.
 - After FN410S-A2 has booted, the server CNA ports will continue to be down until the next step due to the UFD feature.
4. Connect cables from S4048-ON ports te 1/7-1/8 to FN410S-A2 ports te 0/9-0/10. The network now appears as shown in Figure 10.
 - After the connection is made, the LACP port channel between FN410S-A2 and the S4048-ON comes up.
 - On FN410S-A2, UFD detects port channel 128 is up and brings up the internal, server-facing ports (FN410S-A2 ports te 0/1 and te 0/5 in Figure 10). This causes the corresponding server CNA ports to come up.

Step-by-Step Example: After Upgrade

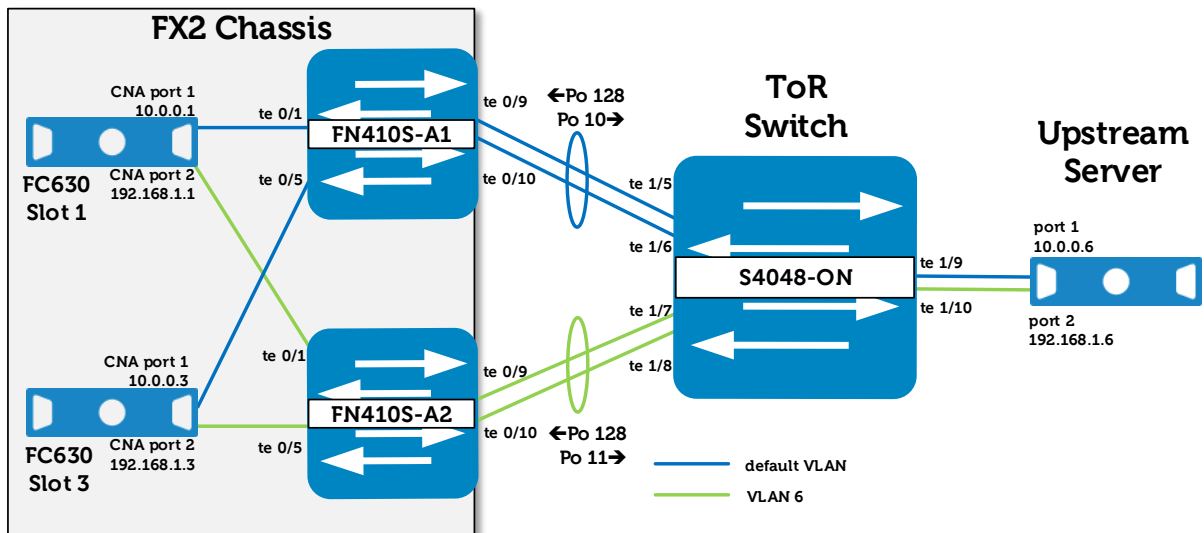


Figure 10 Both FN410S IOMs installed

5. After the FC630 server's CNA ports are up, a north-south connectivity check is done by pinging the servers in the FX2 chassis from an upstream device on all applicable VLANs traversing FN410S-A2.

The upstream server at 192.168.1.6 successfully pings the FX2 servers at 192.168.1.1 and 192.168.1.3 through the ToR and FN410S-A2 on VLAN 6.

6. An east-west connectivity check is done by pinging between the servers in the FX2 chassis on all applicable VLANs traversing FN410S-A2.

The FC630 server at 192.168.1.1 successfully pings the FC630 server at 192.168.1.3 via FN410S-A2 on VLAN 6 without going through the ToR switch.

Note: If you want to verify east-west traffic bypasses the ToR switch by shutting port channel 128, disable UFD on the FN410S first. Instructions for disabling and re-enabling UFD are in the appendix of the [Dell PowerEdge FN IOM Easy Deployment Guide](#).

All connections have been verified and the upgrade is complete.

A References and additional resources

[Dell PowerEdge FN I/O Module \(FN IOM\) - Easy Deployment Guide](#)

[Dell TechCenter Networking Home](#)

[Manuals and Documentation for PowerEdge FX2/FX2s and Modules](#)

[PowerEdge FX2 – FN I/O Module – VLT Deployment Guide](#)

B Components used in this guide

The components and versions used while developing this guide are shown below.

Component	Software Version
Dell 10GbE pass-through module	NA
PowerEdge FN410S IOM	Dell Networking OS 9.10(0.1)
Dell Networking S4048-ON ToR switch	Dell Networking OS 9.10(0.1)
PowerEdge FX2 Chassis Management Controller	1.30

C Terminology

CNA (Converged Network Adapter): Combines the functionality of a network interface controller and a storage host bus adapter. It connects to storage area networks and local area networks.

FN IOA (FN I/O Aggregator): Legacy term for FN IOM.

FN IOM (FN I/O Module): FN IOM refers to the switch modules on the rear of the Dell PowerEdge FX2/FX2s chassis that receive and transmit network IO from the blade servers. This includes the PowerEdge FN410S, FN410T and FN2210S. This term does not refer to pass-through modules.

LACP (Link Aggregation Control Protocol): LACP is used to control the bundling of several physical ports together to form a single logical channel. LACP allows a network device to negotiate an automatic bundling of links by sending LACP packets to the peer (which is a directly connected device that also implements LACP).

NIC Teaming: NIC Teaming allows multiple network interfaces on a computer to be placed into a team to combine bandwidth or provide traffic failover to prevent connectivity loss in the event of a network component failure.

Port Channel: Two or more network links bundled together to function as a single link. Port Channels provide increased bandwidth, redundancy and load balancing.

ToR (Top of Rack): A switch that is positioned at the top of a server rack in a data center.

UFD (Uplink Failure Detection): When upstream connectivity fails, the FN IOM disables the downstream, server-facing links. This feature ensures NIC teaming failovers occur properly if links are lost upstream. The FN IOM uses LACP for the uplink port channel so it is necessary for the corresponding connections at the upstream switch to also be configured as an LACP port channel.

D FN IOM internal port mapping

D.1 Quarter-width servers with dual-port CNAs

The PowerEdge FC430 is an example of a quarter-width server. For quarter-width servers with dual-port CNAs, each CNA port maps to a single port on each of the two FN IOMs. The server slots in the top row are designated 1a through 1d, and 3a through 3d on the bottom row. See Figure 11 and Table 1.

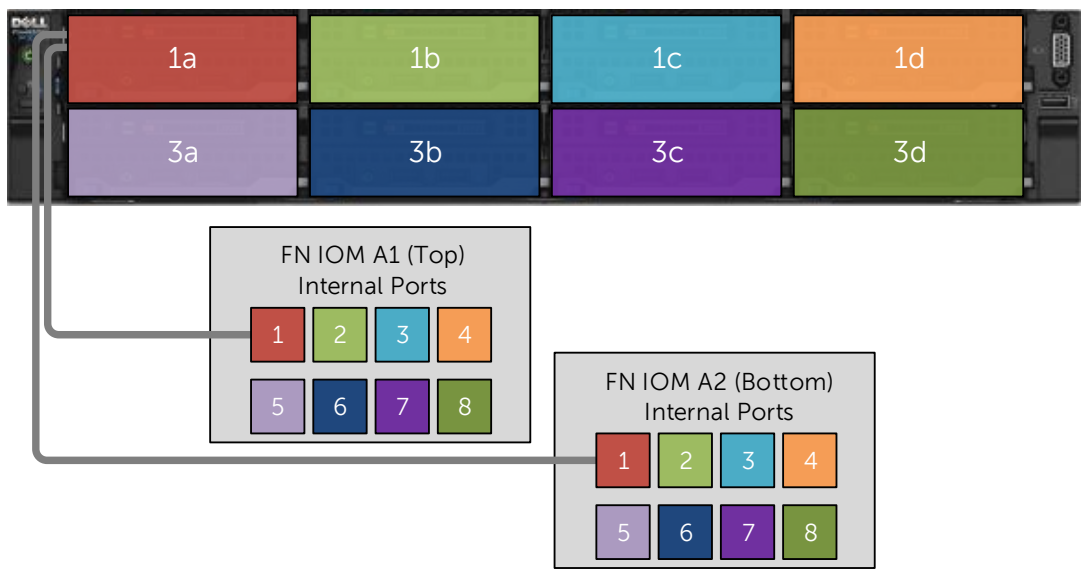


Figure 11 Quarter-width servers with dual-port CNAs

Table 1 Quarter-width servers with dual-port CNAs

Server Slot	FN IOM A1 (Top) Internal Port Numbers	FN IOM A2 (Bottom) Internal Port Numbers
1a	1	1
1b	2	2
1c	3	3
1d	4	4
3a	5	5
3b	6	6
3c	7	7
3d	8	8

Note: Quad-port CNAs are not available for quarter-width servers.

D.2 Half-width servers with dual-port CNAs

The PowerEdge FC630 is an example of a half-width server. For half-width servers with dual-port CNAs installed, the CNA ports map to a single port on each of the two FN IOMs. Figure 12 and Table 2 present the port mapping for half-width servers with dual-port CNAs.

Note: Ports 2, 4, 6 and 8 are not used when using half-width blades with dual-port adapters.

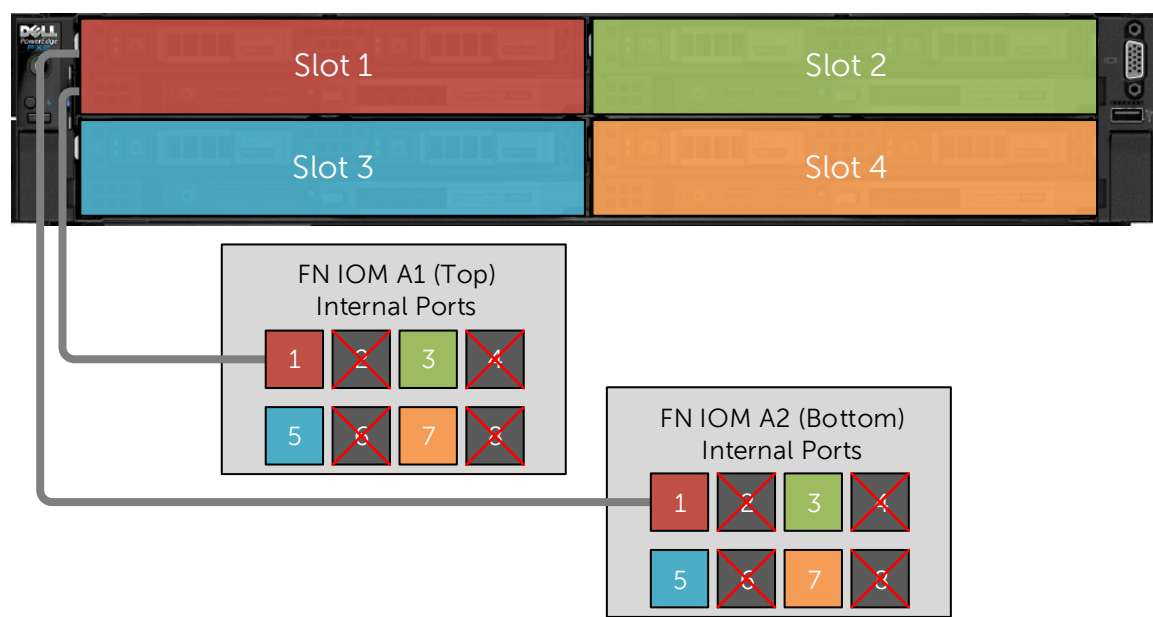


Figure 12 Half-width servers with dual-port CNAs

Table 2 Half-width servers with dual-port CNAs

Server Slot	FN IOM A1 (Top) Internal Port Numbers	FN IOM A2 (Bottom) Internal Port Numbers
1	1	1
2	3	3
3	5	5
4	7	7

D.3 Half-width servers with quad-port CNAs

For half-width servers with quad-port CNAs installed, the CNA ports map to two ports on each FN IOM. Figure 13 and Table 3 present the port mapping for half-width servers with quad-port CNAs.

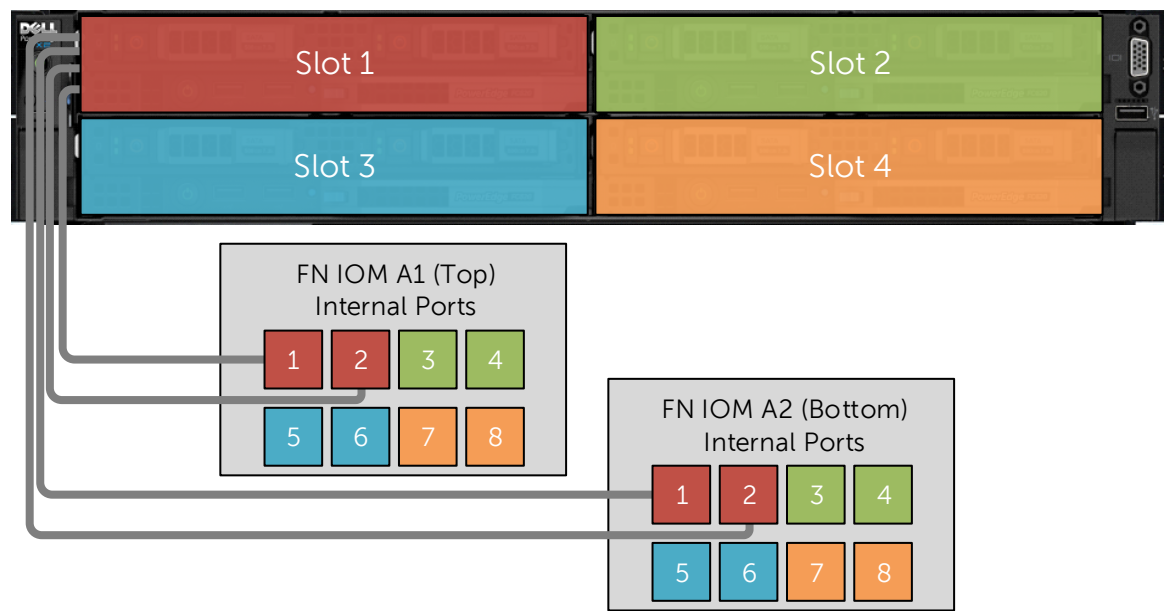


Figure 13 Half-width servers with quad-port CNAs

Table 3 Half-width servers with quad-port CNAs

Server Slot	FN IOM A1 (Top) Internal Port Numbers	FN IOM A2 (Bottom) Internal Port Numbers
1	1,2	1,2
2	3,4	3,4
3	5,6	5,6
4	7,8	7,8

D.4 Full-width servers with dual-port CNAs

The PowerEdge FC830 is an example of a full-width server. For full-width servers with dual-port CNAs installed, the CNA ports map to two ports on each FN IOM. Figure 14 and Table 4 present the port mapping for full-width servers with dual-port CNAs.

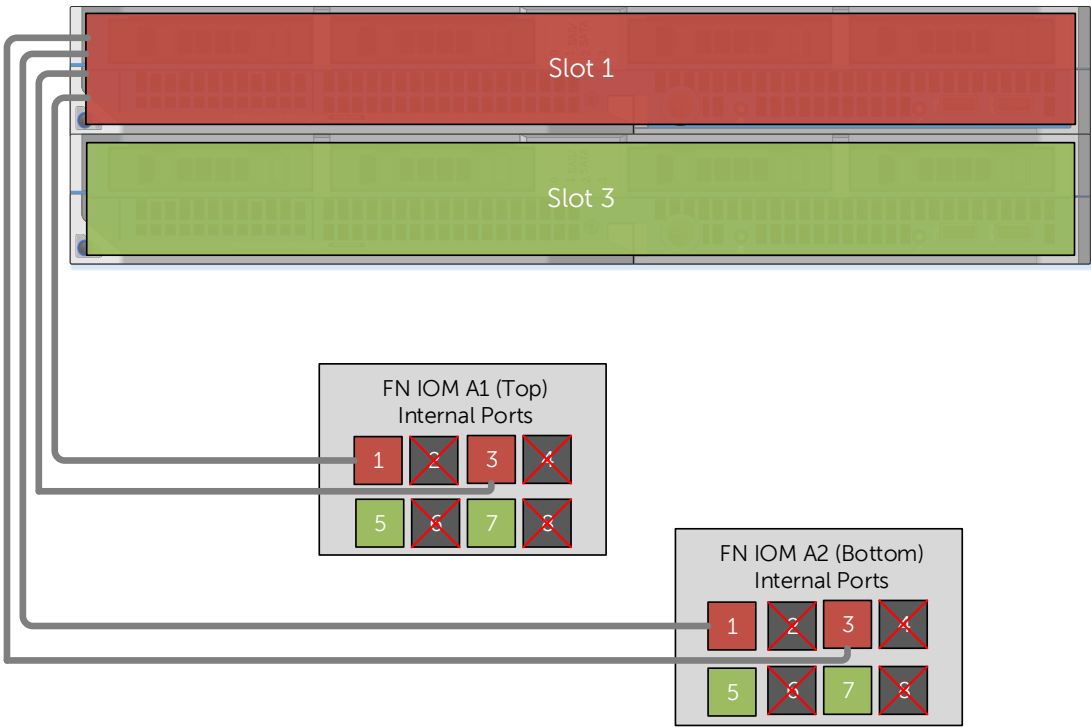


Figure 14 Full-width servers with dual-port CNAs

Table 4 Full-width servers with dual-port CNAs

Server Slot	FN IOM A1 (Top) Internal Port Numbers	FN IOM A2 (Bottom) Internal Port Numbers
1	1 , 3	1 , 3
3	5 , 7	5 , 7

D.5 Full-width Servers with quad-port CNAs

For full-width servers with quad-port CNAs installed, the CNA ports map to four ports on each FN IOM. Figure 15 and Table 5 present the port mapping for full-width servers with quad-port CNAs.

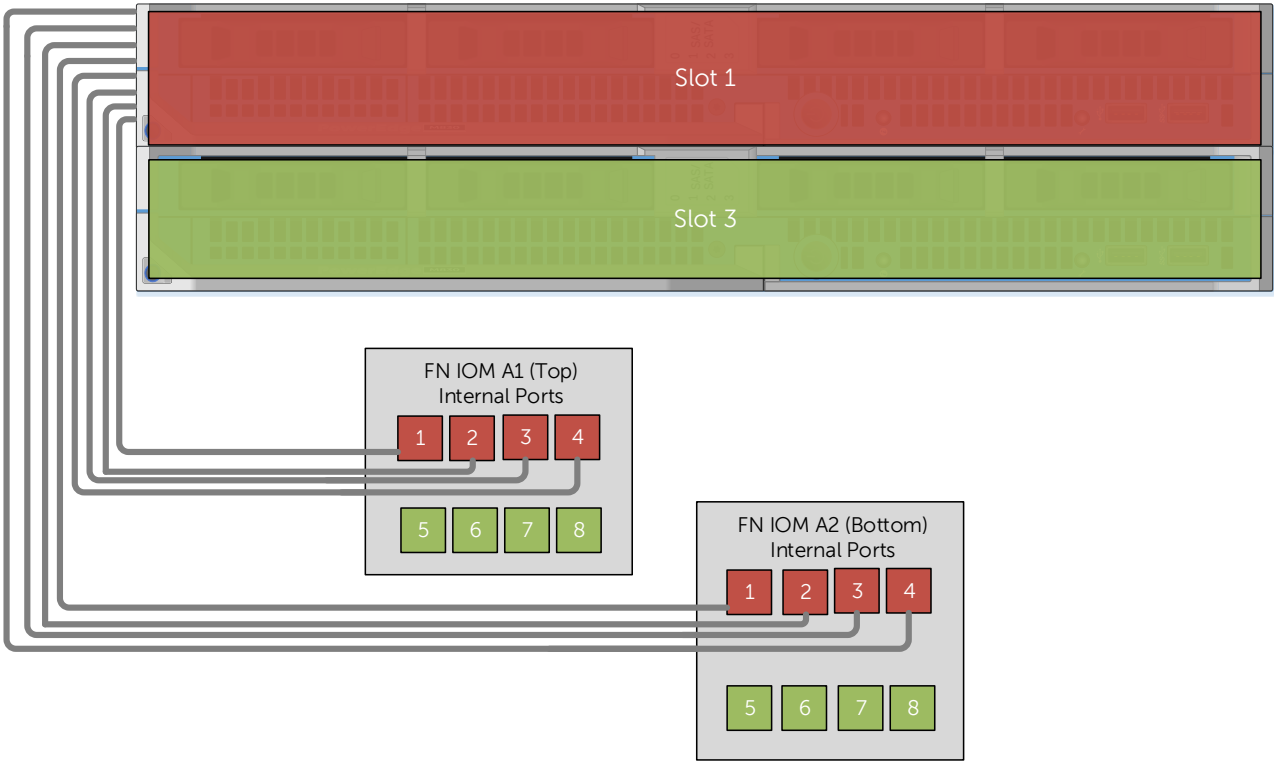


Figure 15 Full-width servers with quad-port CNAs

Table 5 Full-width servers with quad-port CNAs

Server Slot	FN IOM A1 (Top) Internal Port Numbers	FN IOM A2 (Bottom) Internal Port Numbers
1	1 , 2 , 3 , 4	1 , 2 , 3 , 4
3	5 , 6 , 7 , 8	5 , 6 , 7 , 8

E Support and feedback

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