Slingshot Hardware Guide

Version:

Contents

1 Installation

1.1 Installing a Slingshot Top-of-Rack (ToR) Switch

This topic describes how to install a Slingshot ToR switch in a standard 19in EIA rack.

A standard rack can support one, two, or four, rack-mounted Slingshot ToR switches. Each switch supports a total of 64 fabric ports. 32 QSFP-DD connectors on the front panel connect 64 ports to the fabric.

All front-panel connectors support either passive electrical cables (PEC) or active optical cables (AOC).

Two versions of the ToR switch are available that support air flow direction from the rear fan side to the front port side, or from the front port side to the rear fan side. Therefore, switch can be mounted in the rack in either direction to support the rack or site cooling requirements.

- Time: 30 minutes
- Tools:
  - #1 Phillips Screwdriver
  - #2 Phillips Screwdriver
  - Flathead screwdriver

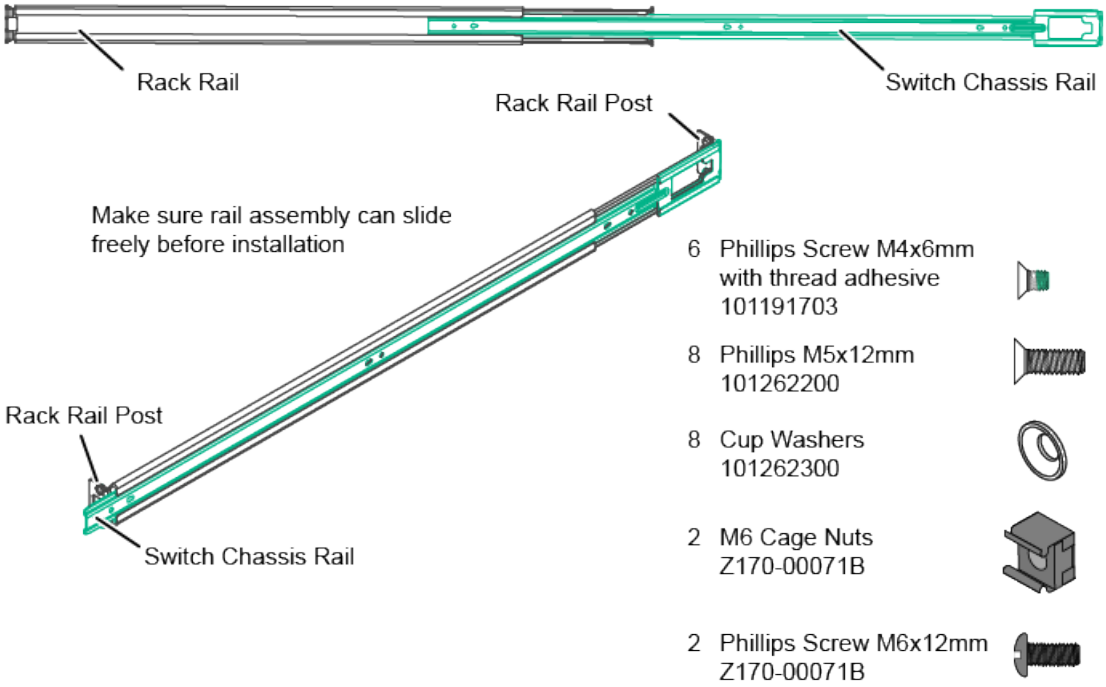


Figure 1: Rail Kit Parts

Requirements

- The racks have available PDU power outlets and cooling capacity.
- Be sure the switch chassis rails and rack rails can slide feely.
- The switch chassis rails must be installed with the power cord opening on the fan/PSU side of the switch.

Temperature

The ToR switch is air cooled supports ASHRAE A2 [15] for air temperatures.

- Maximum operating dry bulb temperature range: 5°C to 35°C
- Recommended operating dry bulb temperature range: 18°C to 25°C
- Maximum non-operating dry bulb temperature range: 5°C to 45°C

Relative Humidity

- Maximum operating relative humidity range: 8% (-12C dew point) to 85% non-condensing
- Recommended operating relative humidity range: 30% to 50% non-condensing
- Maximum non-operating relative humidity range: 8% to 80% non-condensing
- Maximum dew point: 27°C

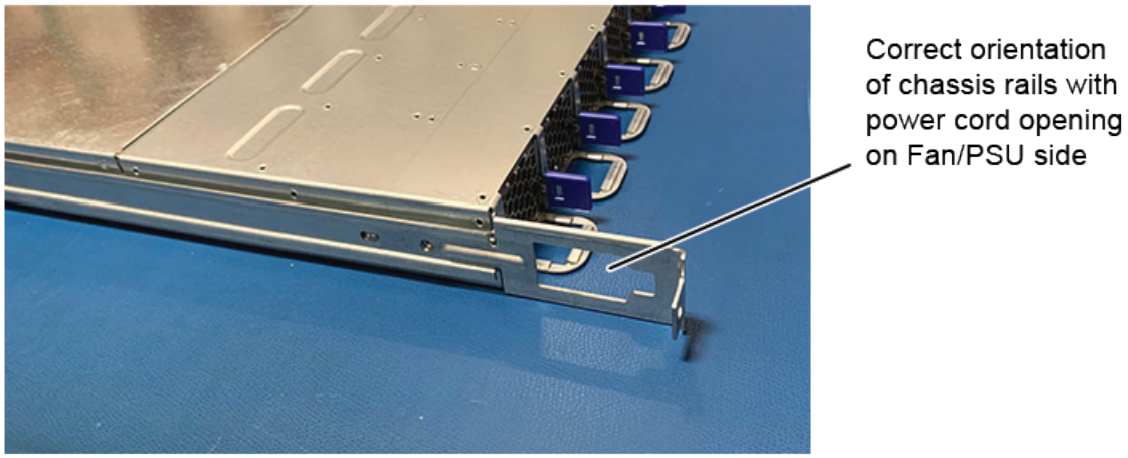


Figure 2: Rail Orientation

Altitude

- Maximum operating altitude range: 0ft to 10,000ft or 0m to 3048m
- Maximum non-operating altitude range: 0ft to 40,000ft or 0m to 12,192m
- Temperature derating with altitude: Max dry bulb must be derated by 1°C per 175m above 900m (2°F per 638ft over 2953ft)

Power

The 560W base power specification includes fan power and all VR conversion as well copper losses. It is the max input AC power to the module (without AOC power).

To calculate ToR switch power:

560W + *numAOCs* x *AOC_power*

numAOCs = number of AOCs connected to the switch

AOC_power is 12.86W

A standard cabinet can support one, two, or four, rack-mounted Slingshot ToR switches. Each switch supports a total of 64 fabric ports. 32 QSFP-DD connectors on the front panel connect 64 ports to the fabric. All front-panel connectors support either passive electrical cables (PEC) or active optical cables (AOC).

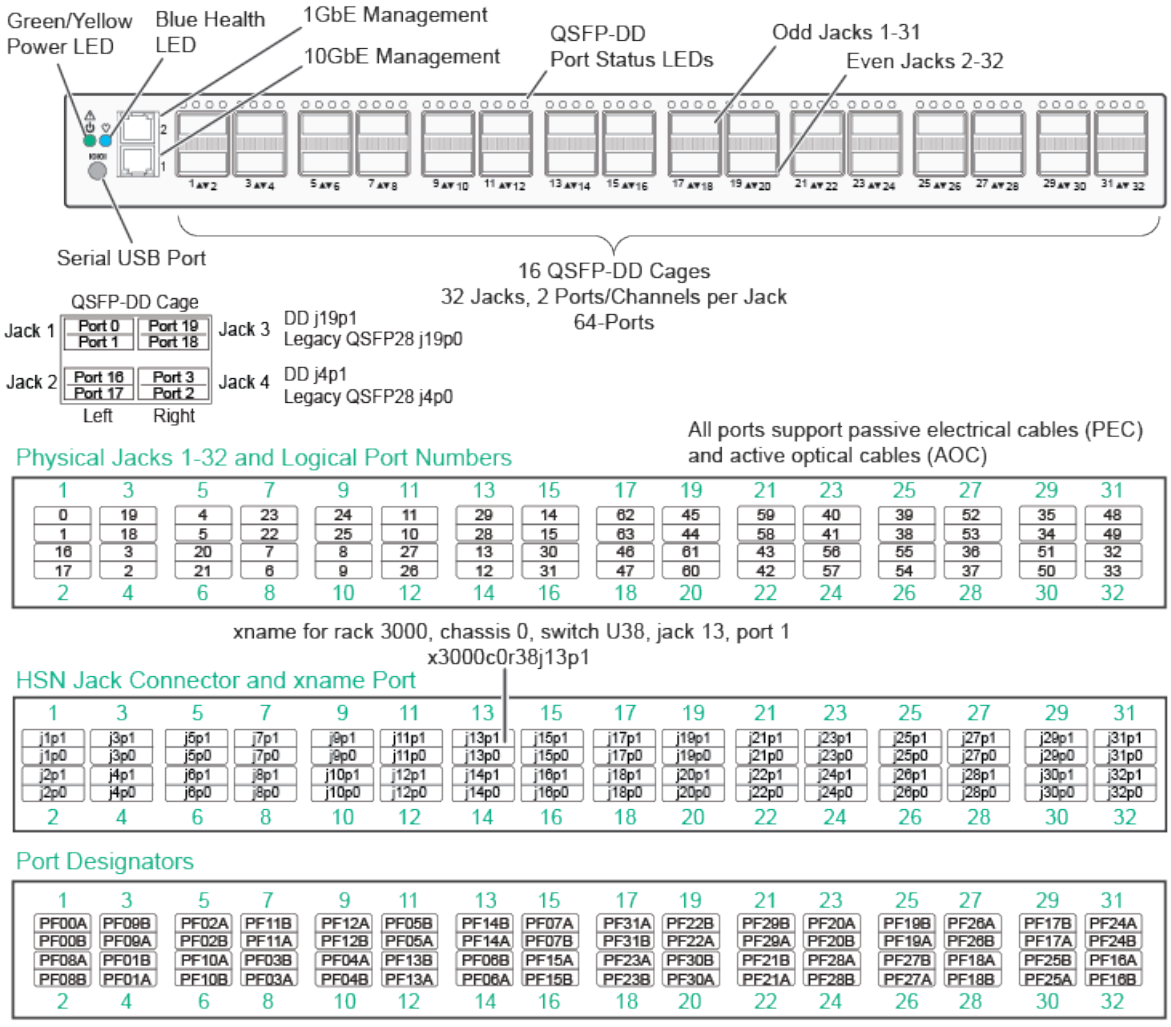


Figure 3: Switch Front Panel

1.1.1 Setup the Slingshot Switch

Slingshot switches are configured to automatically obtain an IP address for the management port.

If using static settings, modify the switch configuration settings before installing it in the rack. A label on the top of the lists the management port Mac addresses. Configure the 10Gbs management port to connect the switch to the management network. See *Configuring Static Switch Settings*.

1.1.2 Install the Switch in the Rack

1. Set the switch on an ESD-safe worksurface and determine which direction the switch should be installed in the cabinet for cabinet proper airflow.
2. Use the #1 Phillips screwdriver install the two side rails onto the switch chassis.

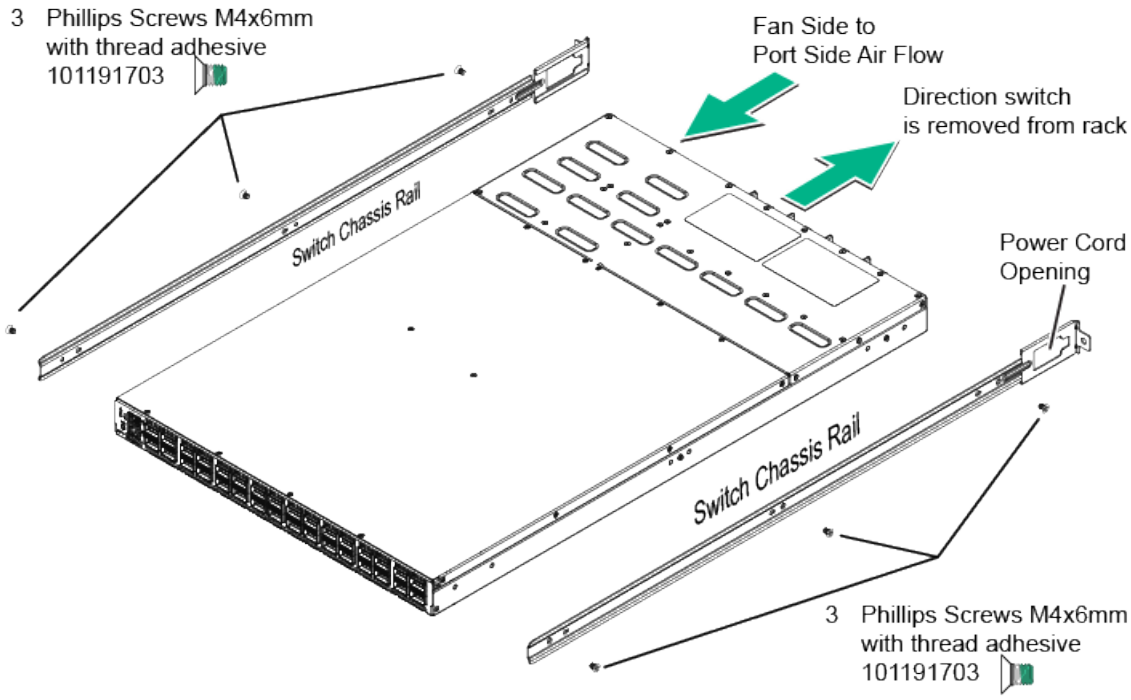


Figure 4: Install Chassis Rails

3. Position the chassis rail in the locking tabs along the side of the switch chassis and slide it to lock it in place.
4. Install 3 M4x6mm Phillips head screws with thread adhesive to secure the chassis rail.
5. Install 3 M4x6mm Phillips head screws with thread adhesive to secure the opposite side chassis rail.

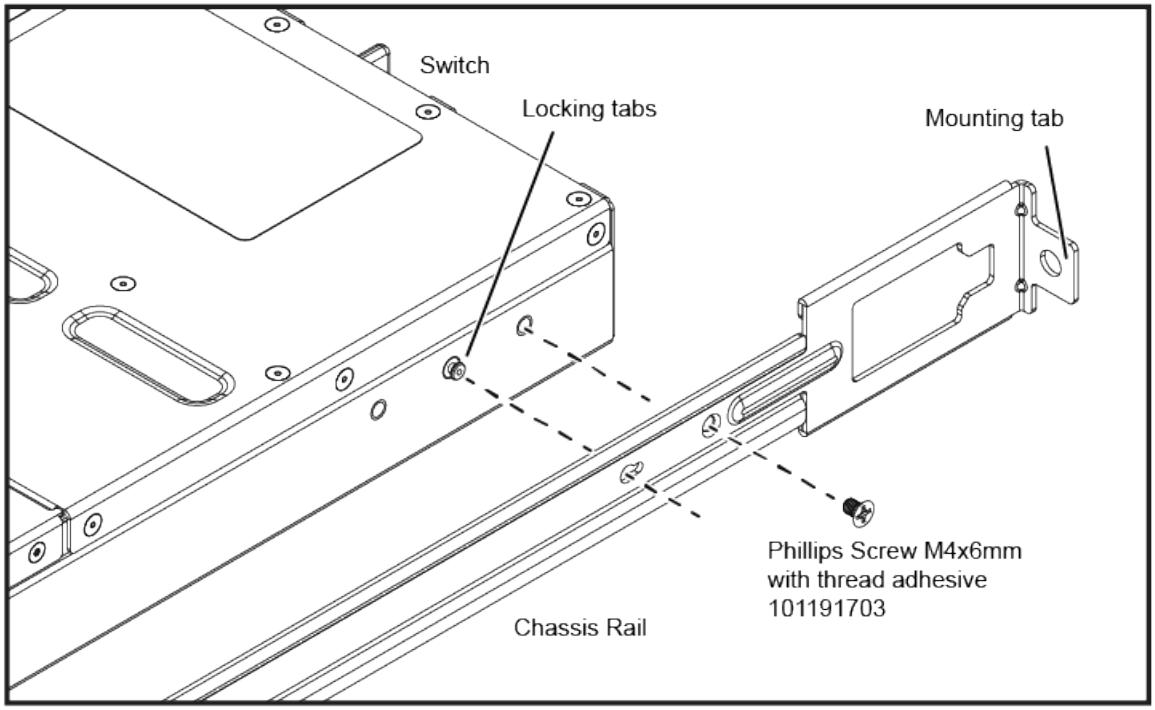


Figure 5: Rail Alignment

6. Be sure the power cord openings on the rack rails and switch rails are aligned (overlap).

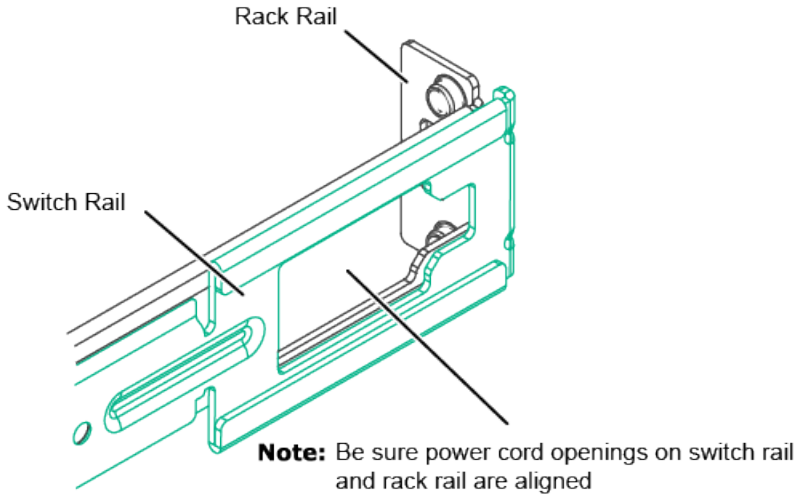


Figure 6: Align Power Cord Openings

7. Install the rails in the rack. Install two Phillips M5x12mm screws and 2 cup washers in the threaded rack rail on the opposite side of the rack where the switch will slide out.
8. Use the flathead screwdriver to install the M6 cage nut in the center post on the side of the rack where the switch will slide out.
9. Install two Phillips M5x12mm screws and 2 cup waters to secure the rail to the rack.

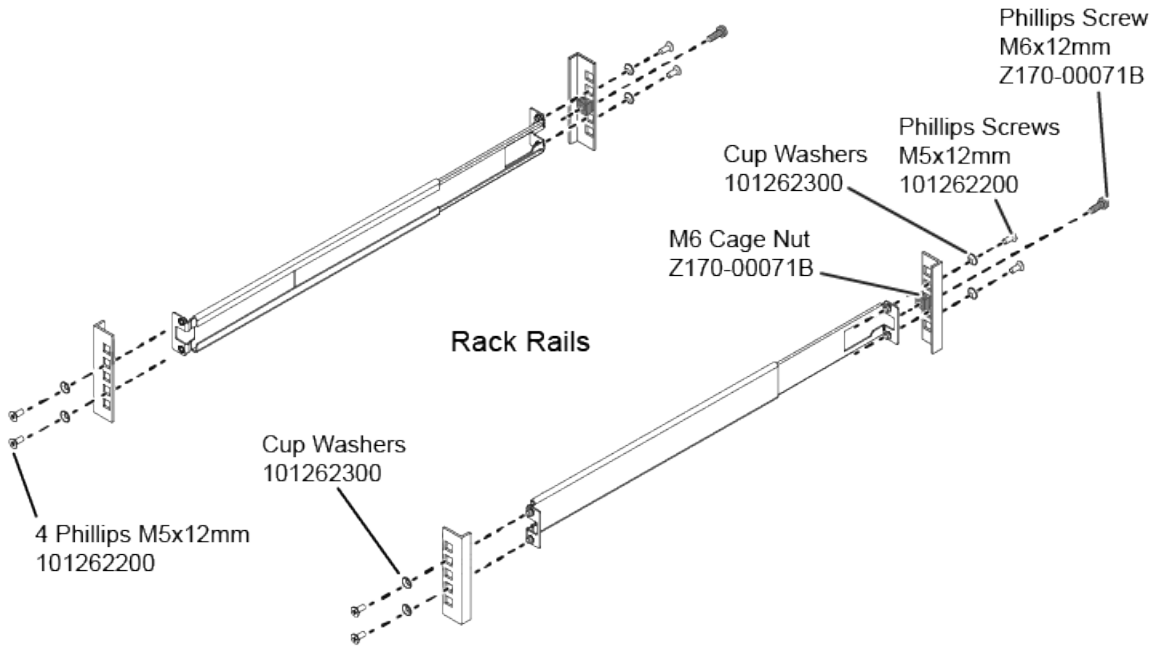


Figure 7: Rack Rails

10. Slide the switch rails into the rack rails and slide the switch completely into the rack.
11. Install two M6x12mm screws in the chassis rail tab and cage nut to secure the switch to the rack.
12. Route the power cables through the chassis rail power cord opening.
13. Connect the power cords from each PDU to the switch power supplies PSU 0 and PSU 1.
14. Power on the iPDUs and switch outlets.

1.1.3 Verify Operation

15. Verify the power supply and fan status LEDs indicate normal operation (green).
16. Verify the front panel status LEDs indicate normal operation. Slingshot ToR switch status LEDs are bicolored green/yellow and blue.

Condition	Green/Yellow LED	Blue LED
ToR powered off, sC not booted	Off	Off
sC U-Boot booted, kernel booting	Green blinking 1Hz	Off
sC kernel booted, Rosetta ASIC not powered on	Green on solid	Off
sC kernel booted, Rosetta powered	Green on solid	On solid
ToR switch warning, switch functional	Green/Yellow Blinking 2Hz	On solid
ToR switch error, switch non-functional, sC functional	Yellow on solid	Off
ToR switch location ID	N/A	On blinking 1Hz

17. Install the top air shrouds (power supply and fan cover) and bottom air shroud.

1.1.4 Troubleshooting

Verify the health of the fabric.

```
switch-fabric-manager:#  fmn_status --details
```

Refer to ***Slingshot Troubleshooting*** for detailed troubleshooting procedures.

1.2 Configuring Static Switch Settings

Slingshot switches are typically configured at the factory to use DHCP. Use the `cfgsh` tool to configure static switch settings. A custom USB cable connects a USB port to a 3.5mm stereo cable connector that connects to the switch.

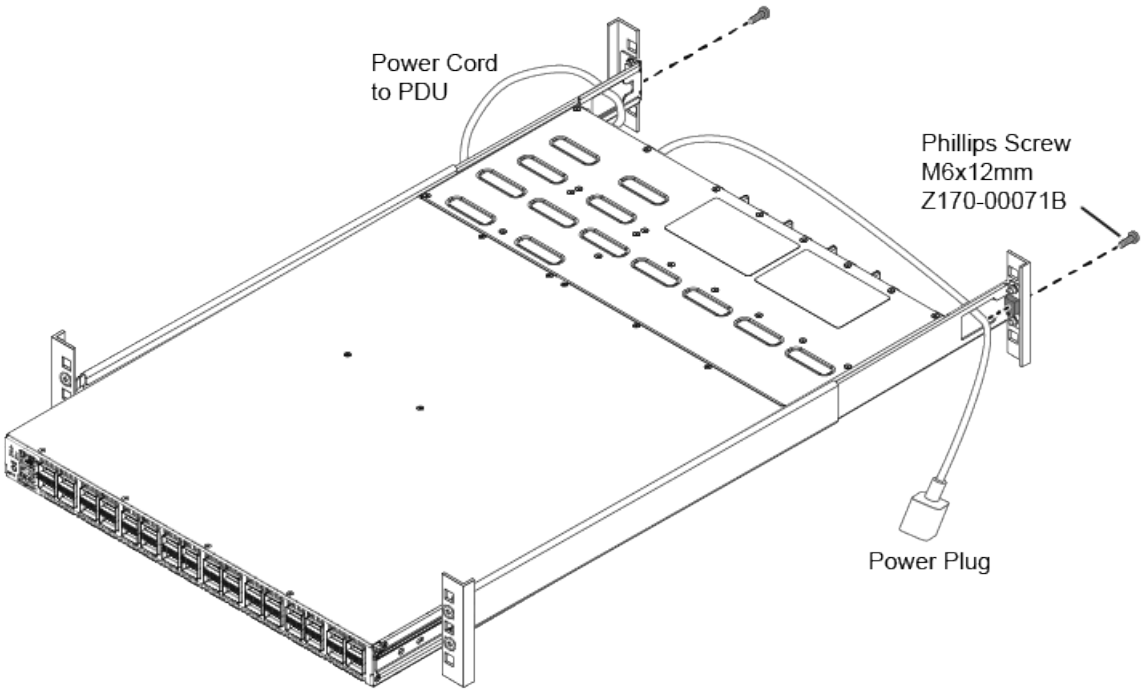


Figure 8: Switch Installed

Figure 9: Power Cord Openings

Figure 10: Switches Installed

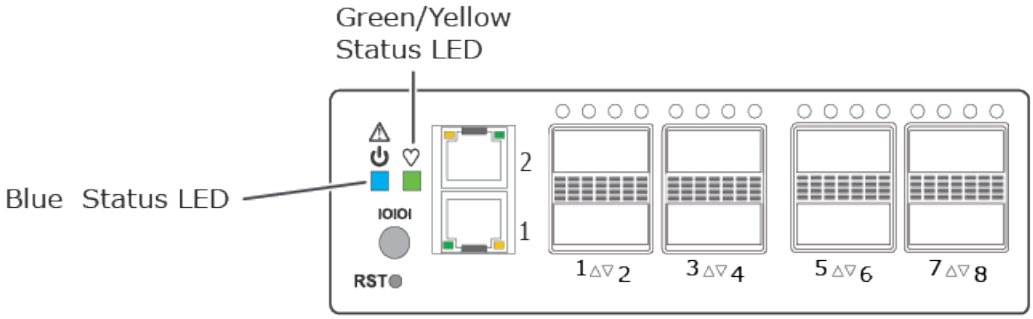


Figure 11: Status LEDs

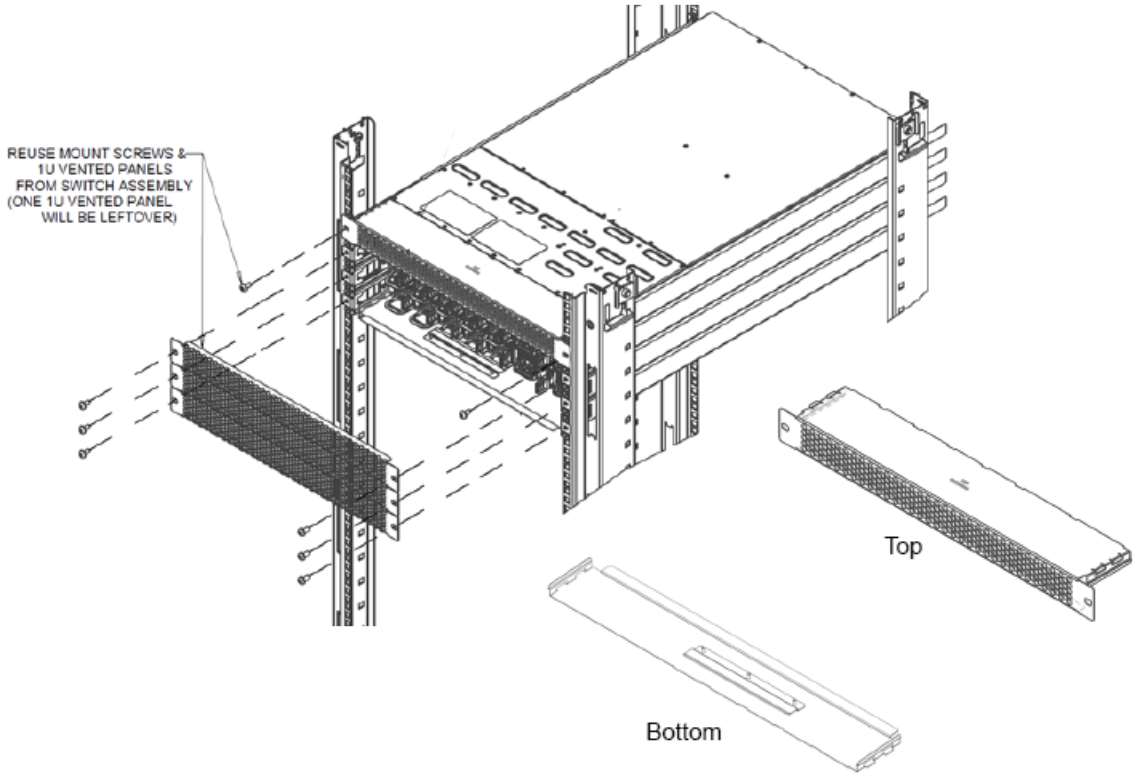


Figure 12: Air Shroud

Figure 13: ToR Switch USB Cable

2 Replacing Components

2.1 Replacing a Blade Switch

Prerequisites

This procedure describes how to replace a liquid-cooled blade switch. HPE Cray EX hardware training is required.

- Record the hostname (xname) of the switch, for example x1410c1r7b0.
- Fill the blade with liquid coolant before installation. Refer to *HPE Cray EX Fill Station User Guide H-6165* for more information.
- Refer to the *HPE Cray EX Hardware Management Administration Guide S-8015* for more information if using HPE Cray EX system management software.
- Refer to the *HPE Performance Manager Administration Guide, 007-6499-00x* for more information if using HPE Performance Cluster Manager (HPE PCM) software.

2.1.1 Remove the Switch from the Fabric

1. Identify the switch physical location (xname).

   The switch xname identifies the physical location of the failing switch in the system. For example, x1410c1r7b0 is the blade switch in cabinet 1410, chassis 1, switch slot 7.

2. From the fabric manager node, disable the switch and remove it from the switch group.

3. To locate the switch-group associated with the switch, use `fmctl` to retrieve the topology policy.

```
switch-fabric-manager:# fmctl get topology-policies/template-policy --select switchGroupLink /fabric/switch-groups/template-switches
```

4. To prevent the switch from being used for routing, exclude the switch from the switchLinks field in the switch-group. Create a file similar to:

```
cat payload.json
  {
    "switchLinks": [
      "/fabric/switches/x3000",
      "/fabric/switches/x1000"
    ]
  }
```

List all the switches that should be used for routing. An alternative is to retrieve the contents of the switch-group and remove the switches that require maintenance.

5. Replace the switch list for the switch group where represents the name of the switch-group.

```
switch-fabric-manager:# fmctl replace switch-groups/<template_switches> --file payload.json
```

2.1.2 Power off the switch chassis slot

6. Refer to the management software administration guide for component-level power on/off procedures.

- If using HPE Cray EX system management software, refer to the *HPE Cray EX Hardware Management Administration Guide S-8015*.
- If using HPE Performance Cluster Manager (HPE PCM) software, refer to the *HPE Performance Manager Administration Guide, 007-6499-00x*.

2.1.3 Remove the switch

7. Disconnect the cables.

   Slingshot cable labels include a cable ID, a source connector A, source connector B, destination connector A, and destination connector B. There are edge cables, fabric cables, and global cables in the fabric topology. Use the system hardware configuration document (SHCD) to reference the Slingshot cable connections. For example:

Cable ID	Src Conn A	Src Conn B	Dest Conn A	Dest Conn B
1410.1506.00.0001	x1410.c1.r7.j23	none	x1506.c6.r3.j19	none

Source connector A: Rack 1410, chassis 1, router 7 or switch in slot 7, jack 23. **Destination connector A**: Cabinet 1506, chassis 6, switch in slot 3, jack 19.

8. Disconnect the quick-disconnect (QD) supply and return coolant hoses promptly press both latch buttons and open the latches to unseat the blade from the connectors.

   ! Caution: Always power off the chassis slot or device before removal. The best practice is to unlatch and unseat the device while the coolant hoses are still connected, then disconnect the coolant hoses. If this is not possible, disconnect the coolant hoses, then quickly unlatch/unseat the device (within 10 seconds). Failure to do so may damage the equipment.

9. Remove the switch from the cabinet chassis.

2.1.4 Install the Replacement Switch

10. Verify that the replacement switch is filled with coolant.
11. Install the replacement switch in the chassis and connect the coolant QD connectors.
12. Connect the HSN cables to the switch.
13. Verify the status LEDs on the front panel indicate that the switch is powered on and healthy.

    After 4 minutes, the switch should be available on the management network.

14. Update the MAC address for the management port in the management system software.

    In HPE Cray EX systems, the hms-discovery service should discover and configure the replacement switch. Refer to the *HPE Cray EX Hardware Management Administration Guide S-8015*.

    Refer to the *HPE Performance Cluster Manager Administration Guide* 007-6499-011 if using HPE PCM to configure switch management port.

2.1.5 Redeploy a New Certificate and Update Firmware

15. From the fabric manager node (FMN), redeploy a new certificate on the replaced switch.

```
switch-fabric-manager:# fmn-create-certificate -n <SWITCH_XNAME>
```

16. Use `fmn_update_switch_firmware` script to update switch firmware.

```
switch-fabric-manager:# cd sc-firmware
switch-fabric-manager:# ARTIFACT=http://<webserver_ip>/controllers-<version>.itb \  fmn_update_switch_firmware UpdateFirmware <switch_xname>
```

17. Remove and replace old SSH entry for the switch in the FMN's known_hosts file.

```
switch-fabric-manager:#  ssh-keygen -R <switch_xname>
switch-fabric-manager:#  ssh-keyscan -H <switch_xname> >> ~/.ssh/known_hosts
```

2.1.6 Verify the Fabric and Switch are Healthy

18. Verify the ports are up on the replaced switch.

```
switch-fabric-manager:#  fmn_status --details
```

2.2 Replacing a ToR Switch

Prerequisites

- Record the hostname (xname) of the switch, for example x3000c0r38b0.
- Know how to update the MAC address for the switch management network on the management software. The replacement switch management port MAC address is printed on a label on the top cover of the switch. If configuring the switch management port with a static IP address, see Configuring Static Switch Settings.

The following tasks must be completed when replacing a top-of-rack (ToR) switch:

- Use the fabric manager to remove the switch from the fabric.
- Remove the switch from the rack.
- Record the MAC address for the management port from the replacement switch.
- Install the replacement switch in the rack.

- Update the the MAC address for the management port in the management software.
- Use the fabric manager to bring the switch back into the fabric.

1. Identify the switch physical location (xname).

The switch xname identifies the physical location of the failing switch in the system. For example, x3000c0r38b0 is the ToR switch in rack 3000 (chassis 0), rack U position 38. The switch BMC is designated by b0.

2. From the fabric manager node, disable the switch and remove it from the switch group.
3. To locate the switch-group associated with the switch, use `fmctl` to retrieve the topology policy.

   ```
   switch-fabric-manager:# fmctl get topology-policies/template-policy --select switchGroupLink /fabric/switch-groups/template-switches
   ```

4. To disable a switch and exclude it from being used for routing, the switch should be excluded from the switchLinks field in the switch-group. Create a file similar to:

   ```
   cat payload.json
     {
       "switchLinks": [
         "/fabric/switches/x3000",
         "/fabric/switches/x9000"
       ]
     }
   ```

List all the switches that should be used for routing. An alternative is to retrieve the contents of the switch-group and remove the switches that require maintenance.

5. Replace the switch list for the switch group where `<template_switches>` represents the name of the switch-group.

   ```
   switch-fabric-manager:# fmctl replace switch-groups/<template_switches> --file payload.json
   ```

2.2.1 Replace the Switch Hardware

6. Remove the power supply cables from the rear of the switch.

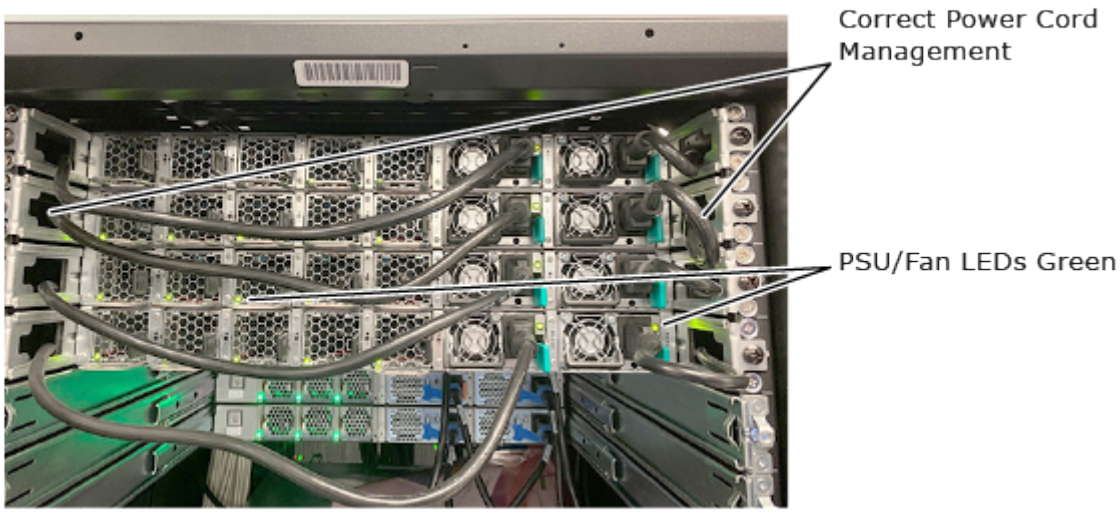


Figure 14: Power Supply Cables

7. Disconnect the management network Ethernet cable from the front panel management port.
8. Disconnect the fabric cables from the front of the switch.

   All Slingshot cables include a cable label and ID. Cables have a source connector A, source connector B, destination connector A, and destination connector B. There are edge cables, fabric cables, and global cables according to the fabric topology.

   Use the system hardware configuration document (SHCD) to reference the Slingshot cable connections. All standard rack xnames are considered to be chassis 0. For example:

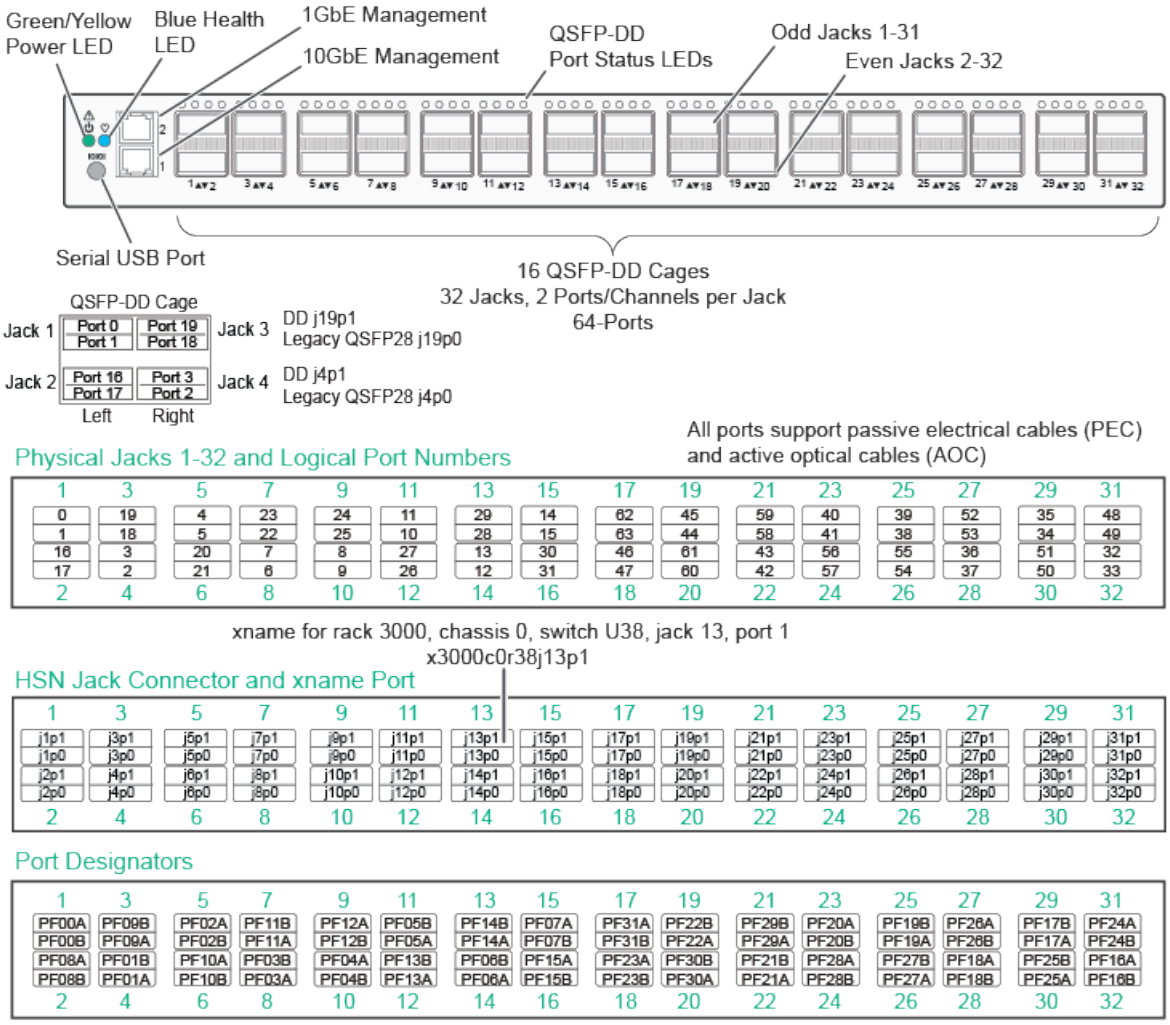


Figure 15: Front Panel

Cable ID	Src Conn A	Src Conn B	Dest Conn A	Dest Conn B
3606.3606.00.0010	x3606.c0.r46.j14	none	x3606.c0.s44.b3.n3.h3	none

Source connector A: Rack 3606, chassis 0, router 46 or switch in U position 46 (bottom), jack 14. **Destination connector A:** Rack 3606, chassis 0, U44. The b, n, and h, numbers indicate an Arista edge switch.

9. Remove two screws that secure the switch to the rack.

   ! Caution: The Slingshot ToR switch weighs 31 lbs (14 Kg). Use caution when removing the switch from the rack.

10. Slide the switch out of the rack, then press the latches on both rack rails to disengage the switch from the rails.
11. Move the rack rails from the defective switch to the replacement switch.
12. Record the MAC addresses for each management port on the sticker on top of the replacement switch.
13. Install the switch in the rack and secure with two screws.
14. Connect the hardware management network Ethernet cable to the 1Gbps management port.

    ! Important: The route to the switch via the management network must not be modified.

15. Connect the fabric management network Ethernet cable to the 10Gbps management port.
16. Update the MAC address for the management port in the management system software.

The switch settings and management port IP addresses are typically configured with DHCP. If the switch is not using DHCP, refer to *Configuring Static Switch Settings*.

Refer to the *HPE Performance Cluster Manager Administration Guide 007-6499-011* if using HPE PCM to manage the switch.

17. Connect the power cables to the switch PSUs.
18. Verify the status LEDs on the front panel and rear panel PSU/Fans indicate that the switch is powered on and healthy.

After 4 minutes, the switch should be available on the management network.

2.2.2 Redeploy a New Certificate and Update Firmware

19. From the fabric manager node (FMN), redeploy a new certificate on the replacement switch.

```
switch-fabric-manager:# fmn-create-certificate -n <SWITCH_XNAME>
```

20. Use `fmn_update_switch_firmware` script to update switch firmware.

```
switch-fabric-manager:# cd sc-firmware
switch-fabric-manager:# ARTIFACT=http://<WEBSERVER_IP>/controllers-<VERSION>.itb fmn_update_switch_firmware UpdateFirmware <SWITCH_XNAME>
```

21. Remove and replace old SSH entry for the switch in the FMN's known_hosts file.

```
switch-fabric-manager:#  ssh-keygen -R <SWITCH_XNAME>
switch-fabric-manager:#  ssh-keyscan -H <SWITCH_XNAME> >> ~/.ssh/known_hosts
```

22. Verify the ports are up on the replaced switch.

```
switch-fabric-manager:#  fmn_status --details
```

2.2.3 Replacing Components

! Caution: Do not operate the switch without a fan or power supply installed in the chassis. Operating the switch without a fan or power supply installed may cause the chassis to overheat and potentially damage the equipment.

A replacement fan or power supply unit should be ready for installation immediately after removal. ToR switch fans and power supplies provide n+1 redundancy and can be replaced during operation.

Steps

1. Remove two screws that secure the power supply/fan cover to the rack.
2. Release the latch mechanism on either the fan or power supply, and pull to unseat the unit from the switch chassis.

3. Immediately install the replacement unit.
4. Seat the unit into the chassis and secure it with the latch.
5. Connect the power cord if installing a power supply.
6. Verify the status LED indicates normal operation (green).

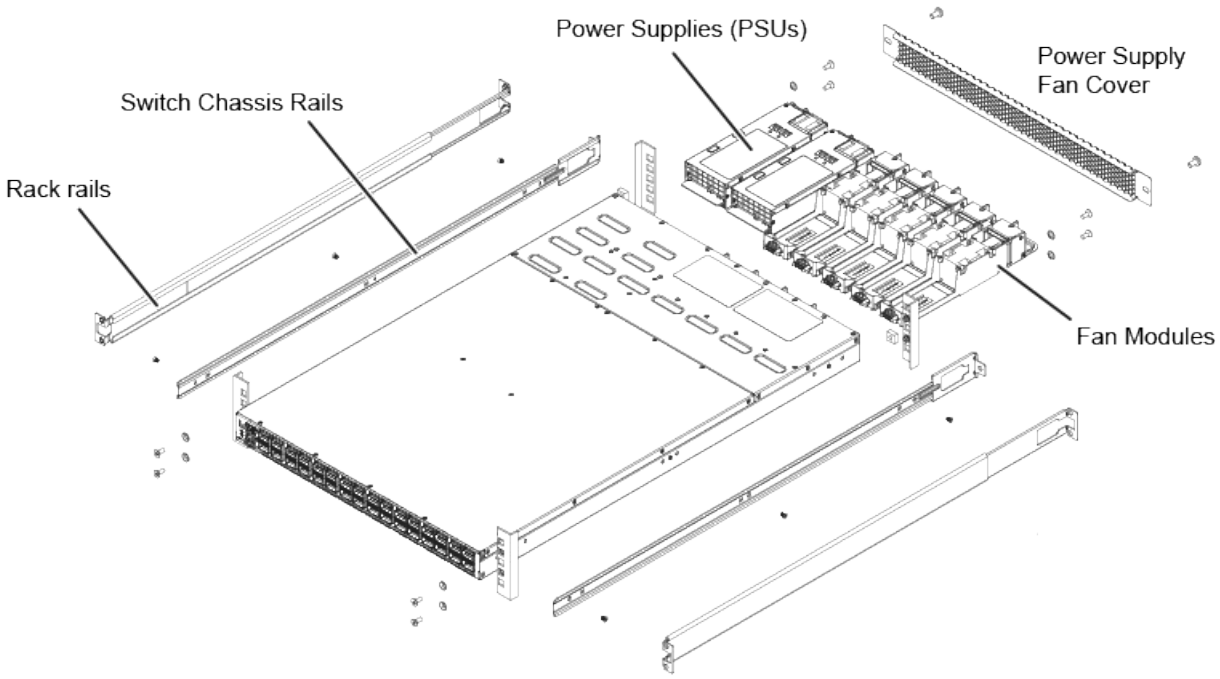


Figure 16: Slingshot ToR Switch FRUs

3 Switch Factory Reset

3.1 Rosetta Switch Firmware Soft Reset

Remove configurations

1. ssh into each switch
2. Run the following commands:

```
emmc-setup -U
rm -rf /nvram/*
emmc-setup -u
reboot
```

3.2 Rosetta Switch Firmware Hard Reset

Wipe out storage

1. Reboot the switch with a console cable connected
2. On the console, break into UBoot as the switch boots At the UBoot prompt type:

```
run nukeemmc
reset
```

   The switch will then need to tftp load the recovery image. ALL data on the switch, including all 3 boot images, will be erased.

4 Slingshot Topology Diagrams

4.1 Rack Class 0 Topology

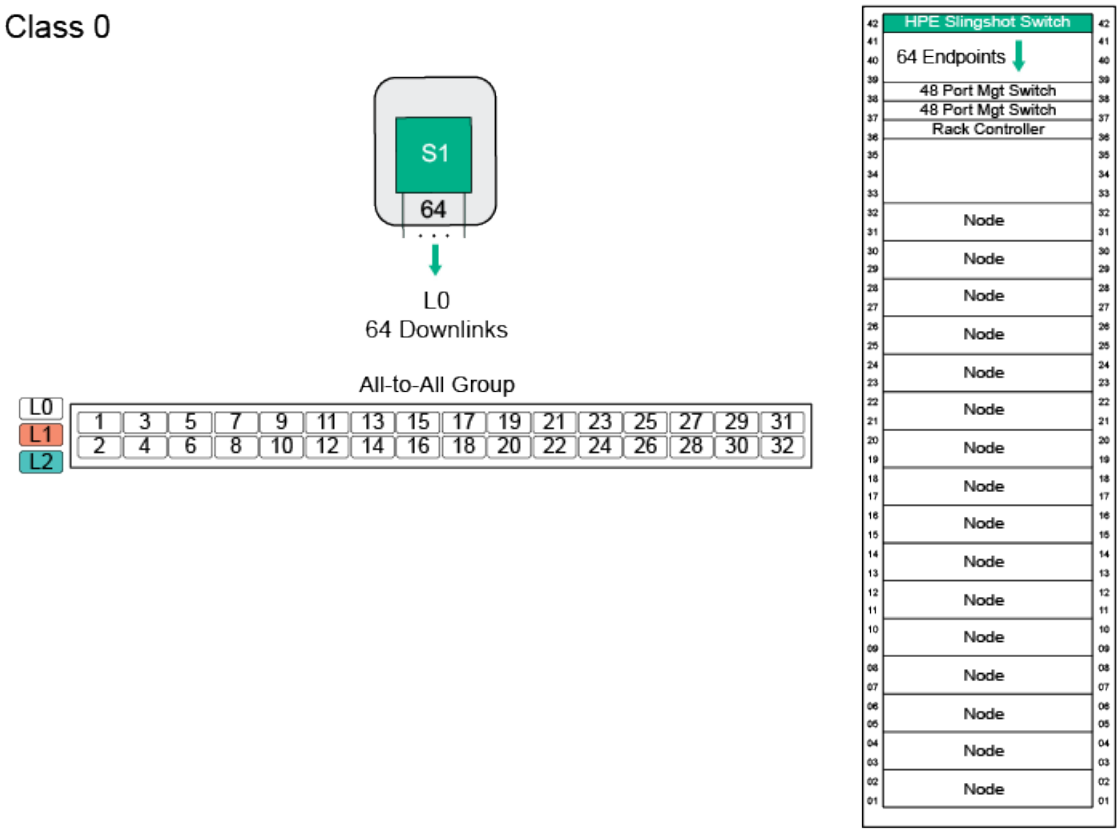


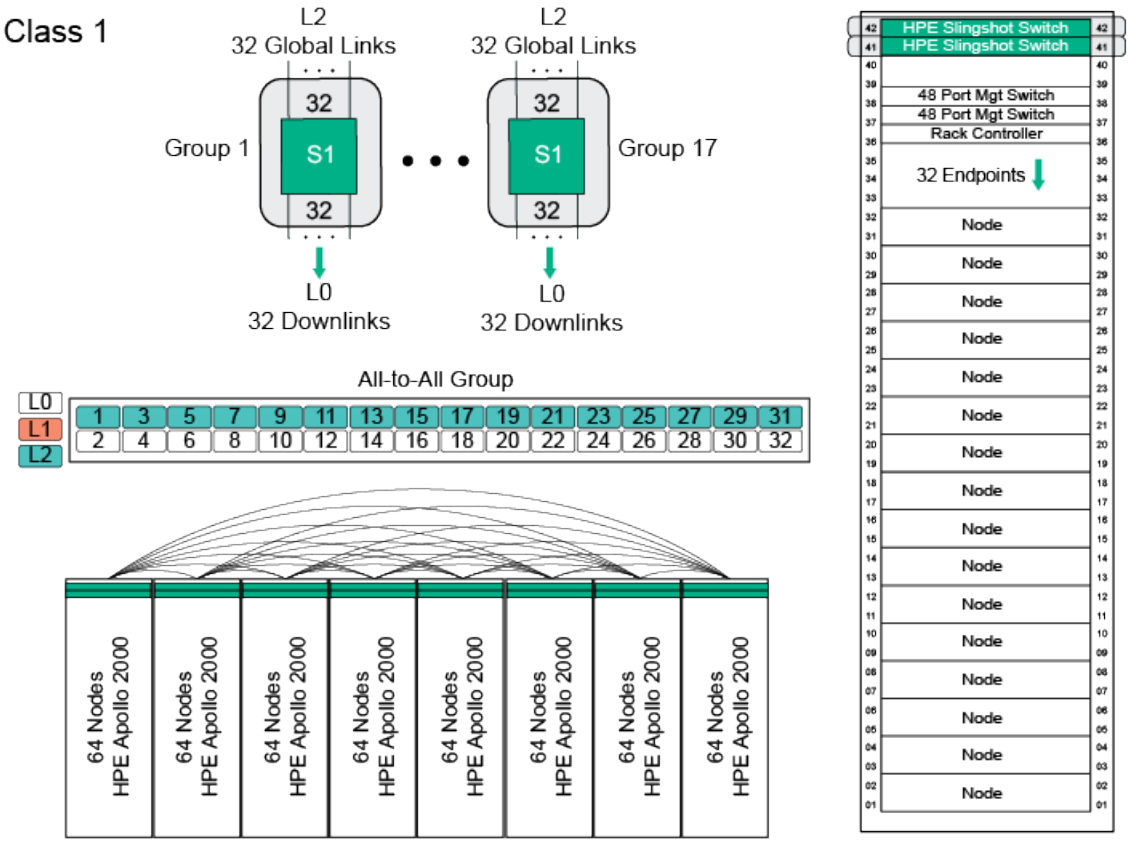
Figure 17: Rack Class 0 Topology

Slingshot class 0 network topology uses one top-of-rack (ToR) switch and supports up to 64 nodes (endpoints). This configuration supports a 42U rack fully populated with HPE Apollo 2000 nodes as a single-rack deployment, though the rack may be depopulated to make a very small system.

For less dense compute node deployments, it is possible to spread the nodes out across more than one rack; however, cabling distances may require the use of optical cables. It may be more desirable to use one of the larger group-size topologies in order to add more switches to reduce the amount of optical cabling.

Because there is no L1 or L2 connectivity, all 64 ports of the class 0 switch can be used as L0 links down to the nodes. There are no L1 or L2 ports to expand the size of the system with additional groups in this topology.

4.2 Rack Class 1 Topology



In the class 1 topology, each switch is effectively its own "group" and can scale up to 17 switches. In this topology, each switch can support up to 32 endpoint connections, twice as many as the larger group configurations can support. A system can be built entirely out of class 1 groups in an "all-to-all" topology. That means that the global links wire all of the switches together into a single hop network.

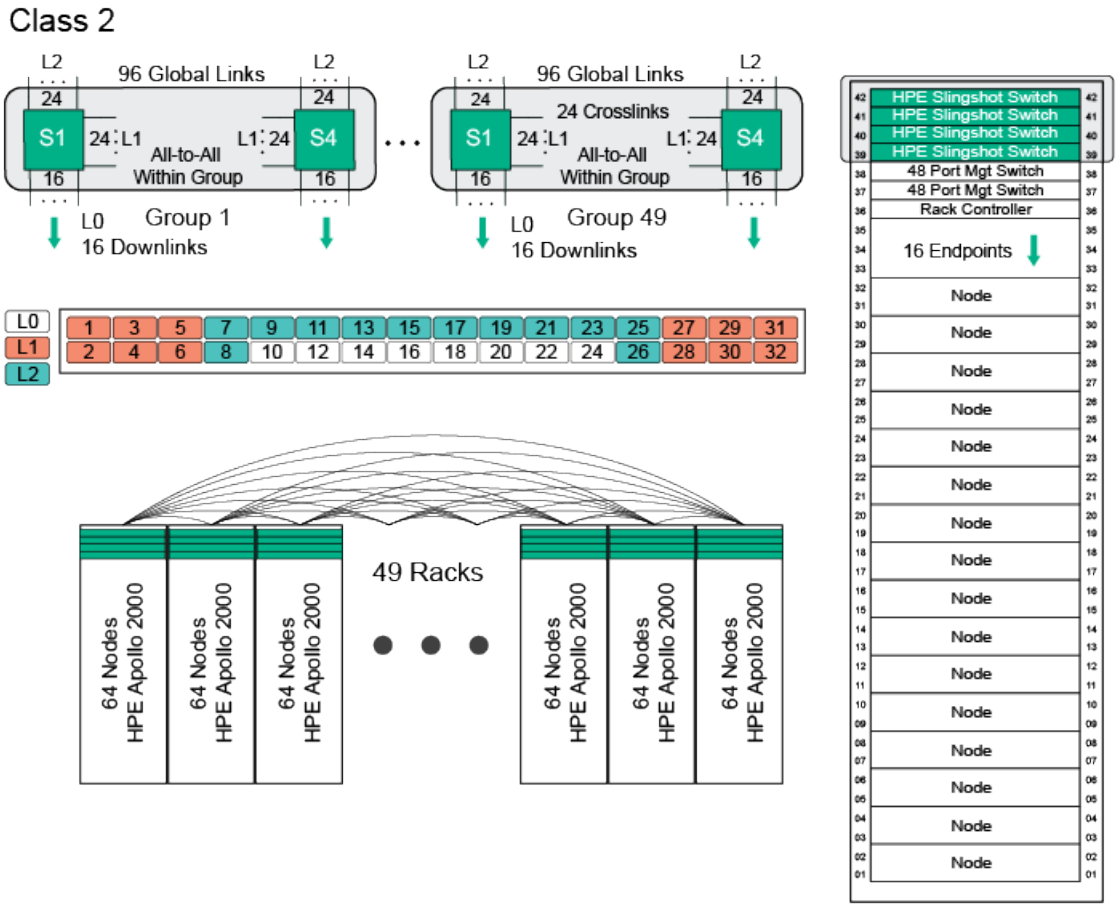
In the standard 42U rack, this class 1 topology uses one or two Slingshot switches per rack. Each rack can contain up to 64 nodes and the system can scale up to 17 total switches. A class 1 topology is likely used for a service node group, or for system configurations that will not scale beyond 544 endpoints.

In addition to the 42U rack dense node configuration, a class 1 group can also be configured as a single switch per rack for systems that are less densely populated.

There are 32 L0 ports from each switch down to the nodes. The remaining 32 ports (16 cables) are available as Dragonfly global links to form the all-to-all connections between switches providing a single hop network. The number of cable ports used and L2 bundle size are a function of overall system size.

The global connectivity between the switches are with straight QSFP-DD cables. These may be copper (QSFP-DD DAC) cables or active optic cables (QSFP-DD AOC) depending on the distance. Note that there are are no L1 links for the single switch group.

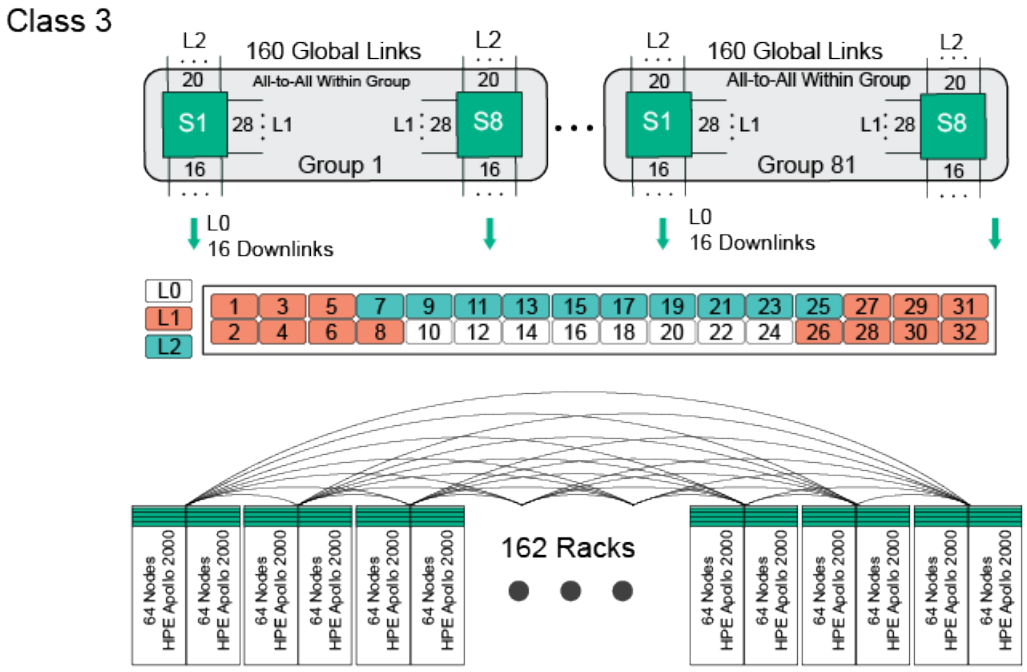
4.3 Rack Class 2 Topology



A class 2 topology uses four HPE Slingshot ToR switches to create a group. Each group can support up to 64 endpoints (L0) from compute or service nodes. A class 2 topology is typically used for a service or storage partition that connects to a larger compute partition. The four switches can be distributed across four racks allowing for a less dense configuration. This reduces the number of optical L0 cables while still providing robust L2 connectivity to the compute node partition(s).

In a dense compute node configuration a class 2 topology can be a single rack. In this topology, there are 16 downlinks to compute node endpoints, 24 cross-links to the other switches in the group, and up to 24 global L2 links for connections to the other groups. Because the groups are connected in an all-to-all fashion, this topology can scale up to 49 groups or 49 fully populated racks.

4.4 Rack Class 3 Topology

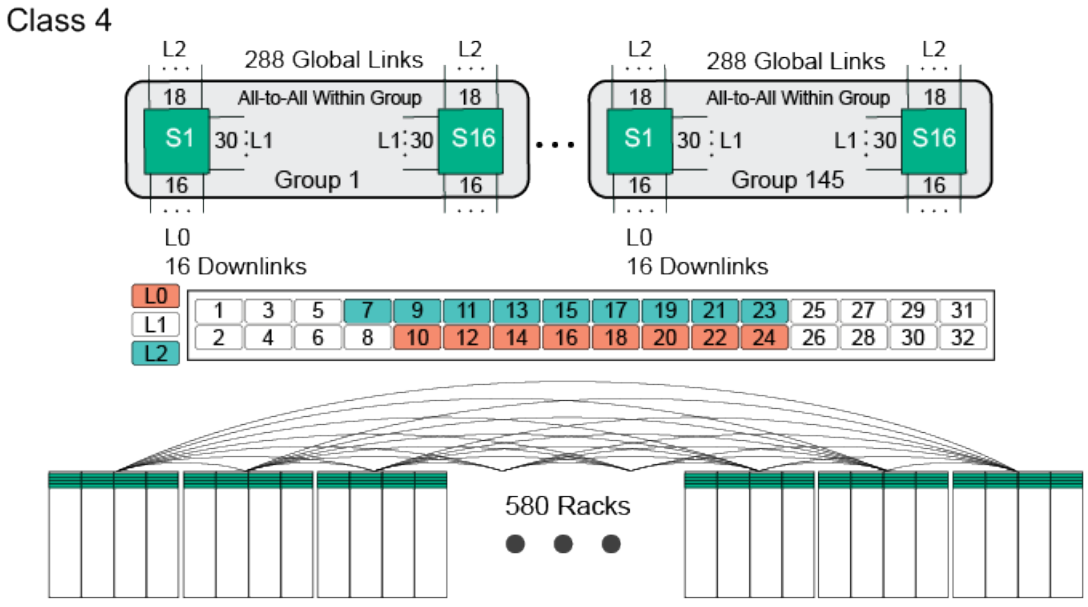


The class 3 topology creates an eight-switch group typically across two or four racks (either two or four HPE Slingshot ToR switches per rack). Each switch has 16 downlinks (eight Y cables) to endpoints that can support up to 128 nodes.

28 links (14 QSFP-DD cables) per switch are used to connect all of the switches in the group. Up to 20 links (10 QSFP-DD cables) per switch are available for L2 bundles.

With full global bandwidth, a class 3 system can scale up to 81 groups (162 racks) as a standalone system or as a group attached to a HPE Cray EX liquid-cooled cabinet. There are 80 physical L2 global ports (160 200Gbps links) available in each eight-switch group.

4.5 Rack Class 4 Topology



The class 4 topology creates a 16-switch group. In the standard 42U rack configuration there are four ToR switches per rack connected into a group across four racks. Each group is logically the same as a single HPE Cray EX liquid-cooled

cabinet in a single-injection point CPU blade configuration.

Because the topology is distributed across four racks, up to half of the group links require AOC cables. This topology supports a large number of global links such as an I/O group that requires enough L2 links to connect to many groups of compute nodes, or for very large standard rack compute systems.

Eight of the switch cable ports are L0 links (eight Y cables connect to 16 compute nodes) and 15 of the ports are used for L1 connectivity. One cable connects each switch to from the all-to-all configuration. With 16 switches in a group, a total of 144 cable ports are available for global L2 connections.

	Class 0	Class 1	Class 2	Class 3	Class 4
Switches per group	1	1	4	8	16
Switches per rack (fully populated 42U)	1	2	4	4	4
Maximum endpoints per switch	64	32	16	16	16
Maximum number of groups (with no global bandwidth tapering)	1	16	49	81	145
Largest system size (endpoints)	64	512	3,136	10,368	37,120
Largest system size (42U dense racks)	1	8	49	162	580
Global links from each group	0	Up to 32	Up to 96	Up to 160	Up to 288

4.6 HPE Cray EX Class 4 Topology

Single Injection

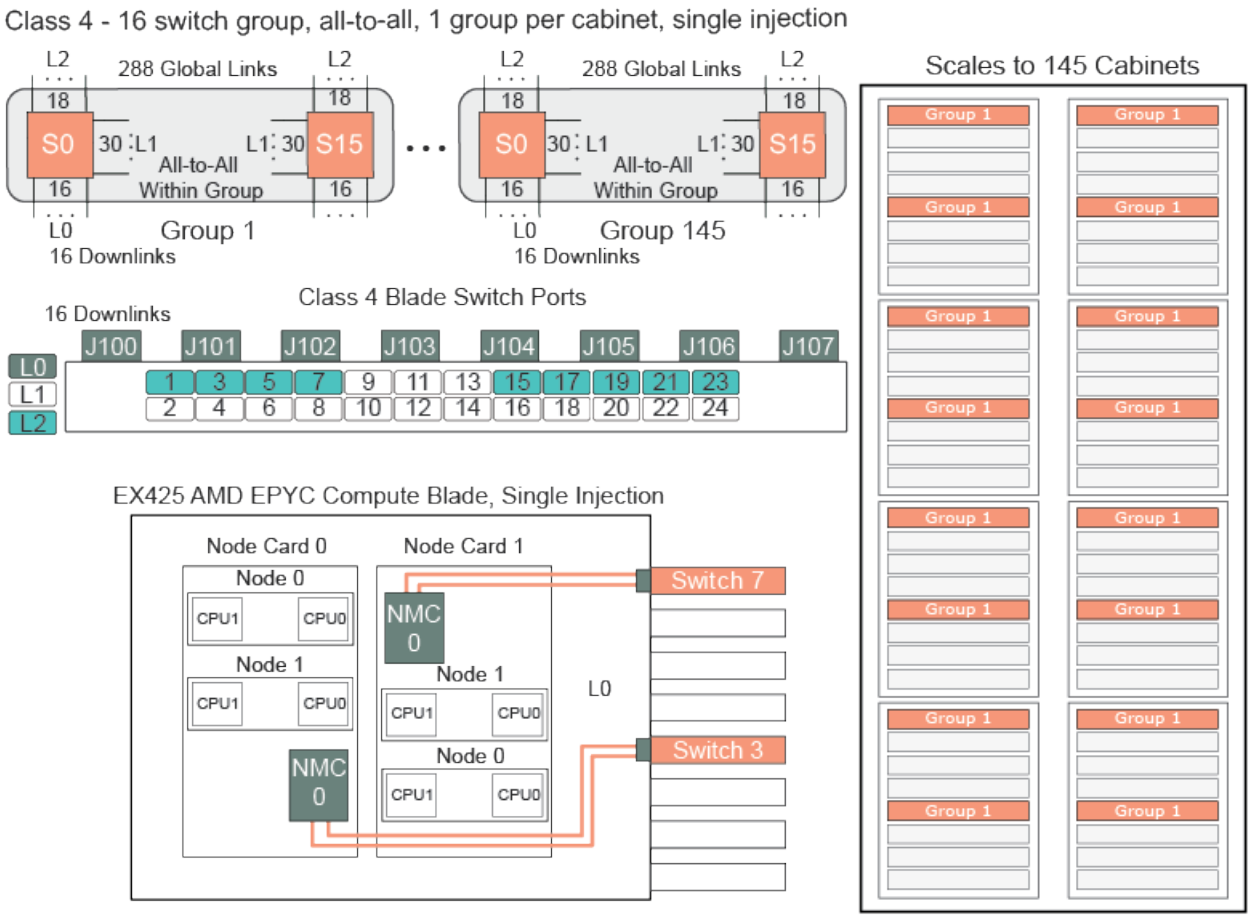


Figure 18: Class 4 Topology Single Injection

A single-injection configuration provides 1 Slingshot port for each compute node. HPE Cray EX NIC mezzanine cards (NMC) and the Mellanox PCIe NIC also provides two Slingshot ports (two 200 Gbps NICs).

An HPE Cray EX class 4 topology uses 16 Slingshot blade switches per group, 1 or 2 groups per cabinet, and can support up to 256 NIC connections to compute nodes. A class 4 system can scale up to 145 groups or 145 cabinets in this configuration.

Sixteen of the switch ports are available for L0 downlinks to the compute blade NICs.

Thirty of the ports (15 cables) are used for L1 connectivity so that 1 cable connects each switch in an all-to-all configuration (dragonfly). The connectivity between the switches (L1) are with straight QSFP-DD passive-electrical cables (PEC) and active optical cables (AOC).

The remaining 18 ports (9 cables) are used for L2 connectivity. With 16 switches in a group, a total of 288 ports (144 cables) are available for global L2 connections.

Dual Injection

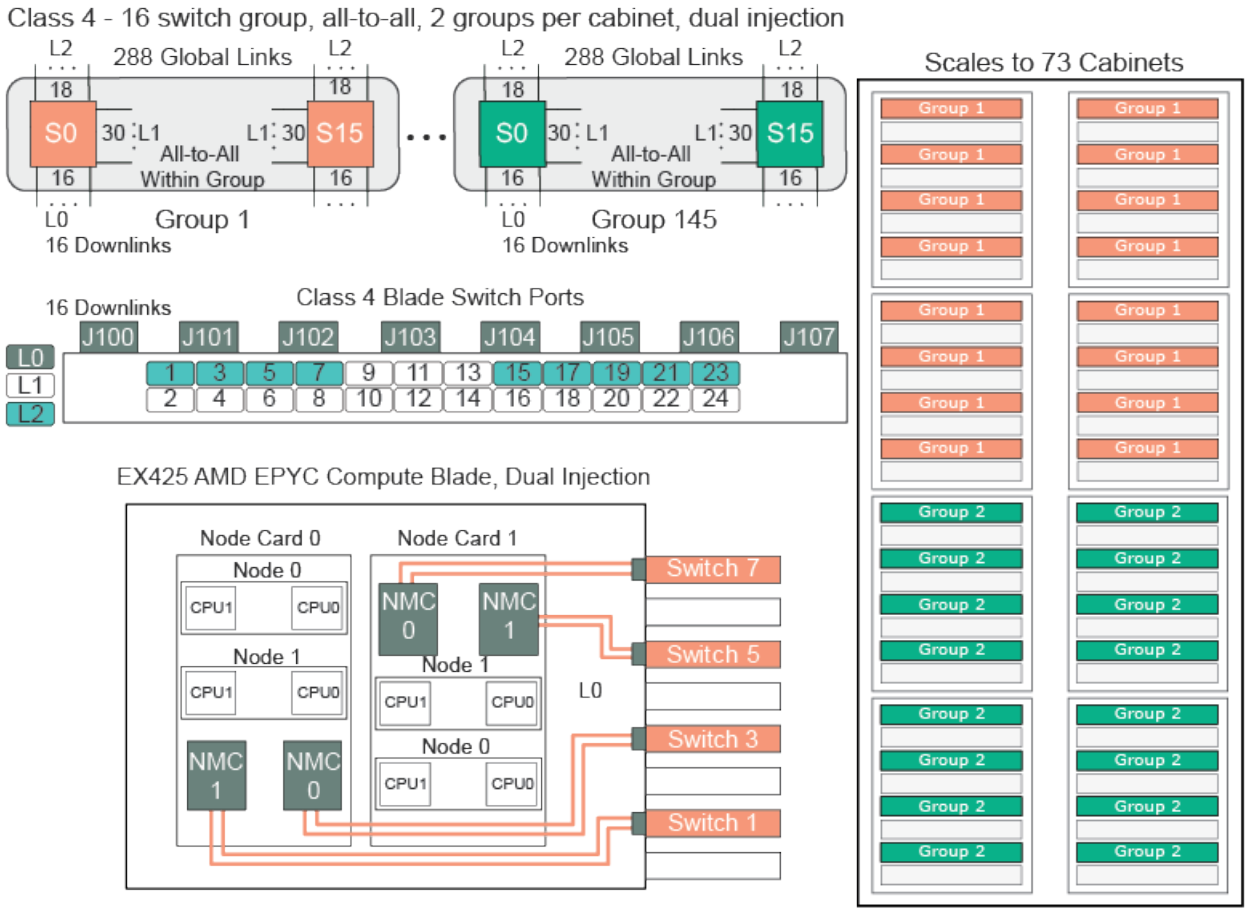


Figure 19: Class 4 Topology Dual Injection

4.7 HPE Cray EX Class 5 Topology

Dual Injection

A dual-injection configuration provides 2 Slingshot ports for each compute node. The HPE Cray EX NIC mezzanine card (NMC) supports two Slingshot ports (two 200 Gbps NICs).

A class 5 topology uses 32 Slingshot blade switches per group, 1 or 2 groups per cabinet, and can support up to 512 NIC connections to compute nodes. A class 5 system scales to 257 groups or 257 cabinets in this configuration.

Sixteen switch ports are available for L0 downlinks to compute blades.

Thirty-two blade switches are connected all-to-all using 1 port. To achieve the full connectivity the dual-port QSFP-DD

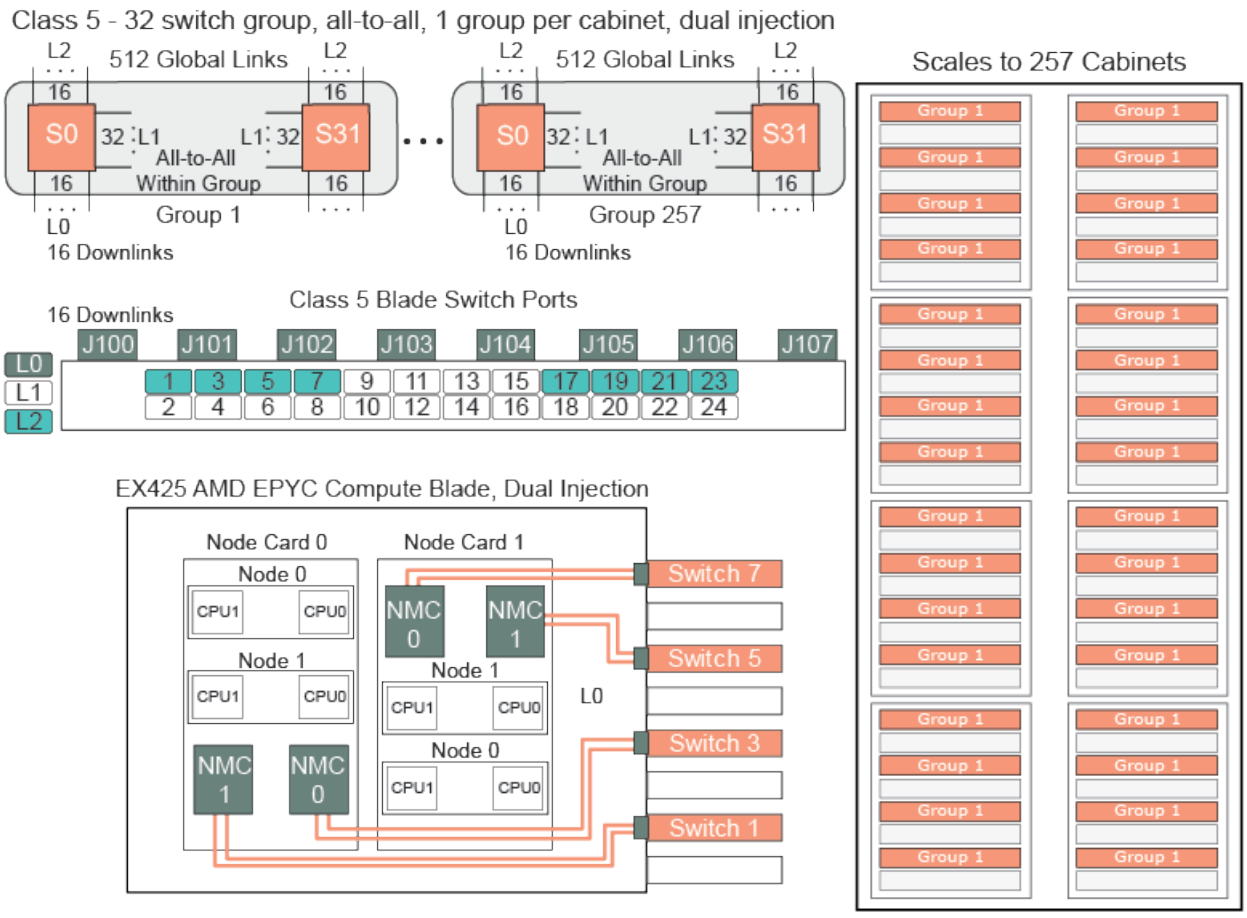


Figure 20: Class 5 Topology Dual Injection

connections require a bifurcated cable. Each global connection is 1 port of a 4 port bifurcated cable. Sixteen global connections are used per switch.

The remaining 16 ports (8 cables) are used for L2 connectivity.

Quad Injection

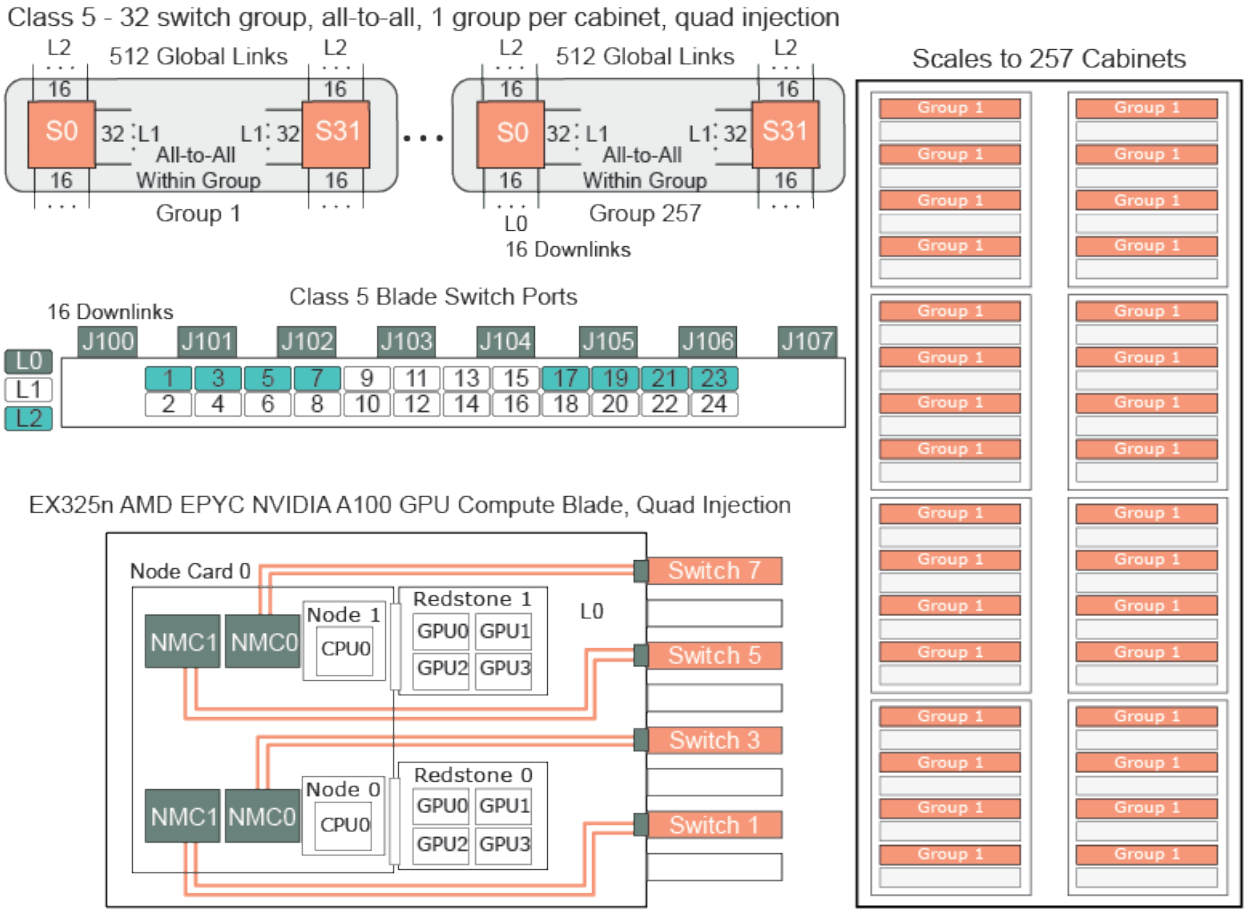


Figure 21: Class 5 Topology Quad Injection

Class 5, Two Groups per Cabinet

A class 5 topology that uses 32 Slingshot blade switches per group and 2 groups per cabinet can support up to 512 NIC connections to compute nodes. A class 5 system with 2 groups per cabinet scales to 128 cabinets in this configuration.

5 Cabling

5.1 Cable Labels

Racks, server, and switch numbers are used to create a point-to-point cabling configuration for the system. The cable labels begin with a rack number, followed by a the device's lowest U position in the rack, then more specific slot and port information.

`x3115.r40.j6`

- Standard rack numbers typically start at 3000
- HPE Cray EX liquid-cooled cabinets typically start at 1000
- HPE Cray EX TDS cabinet numbers typically starting at 9000

Note: Standard rack systems are always designated as chassis 0 (`c0`) and server nodes are identified by the server BMC (`b0`). Therefore, cable labels for standard rack systems omit the chassis and node designations on the cable label to make

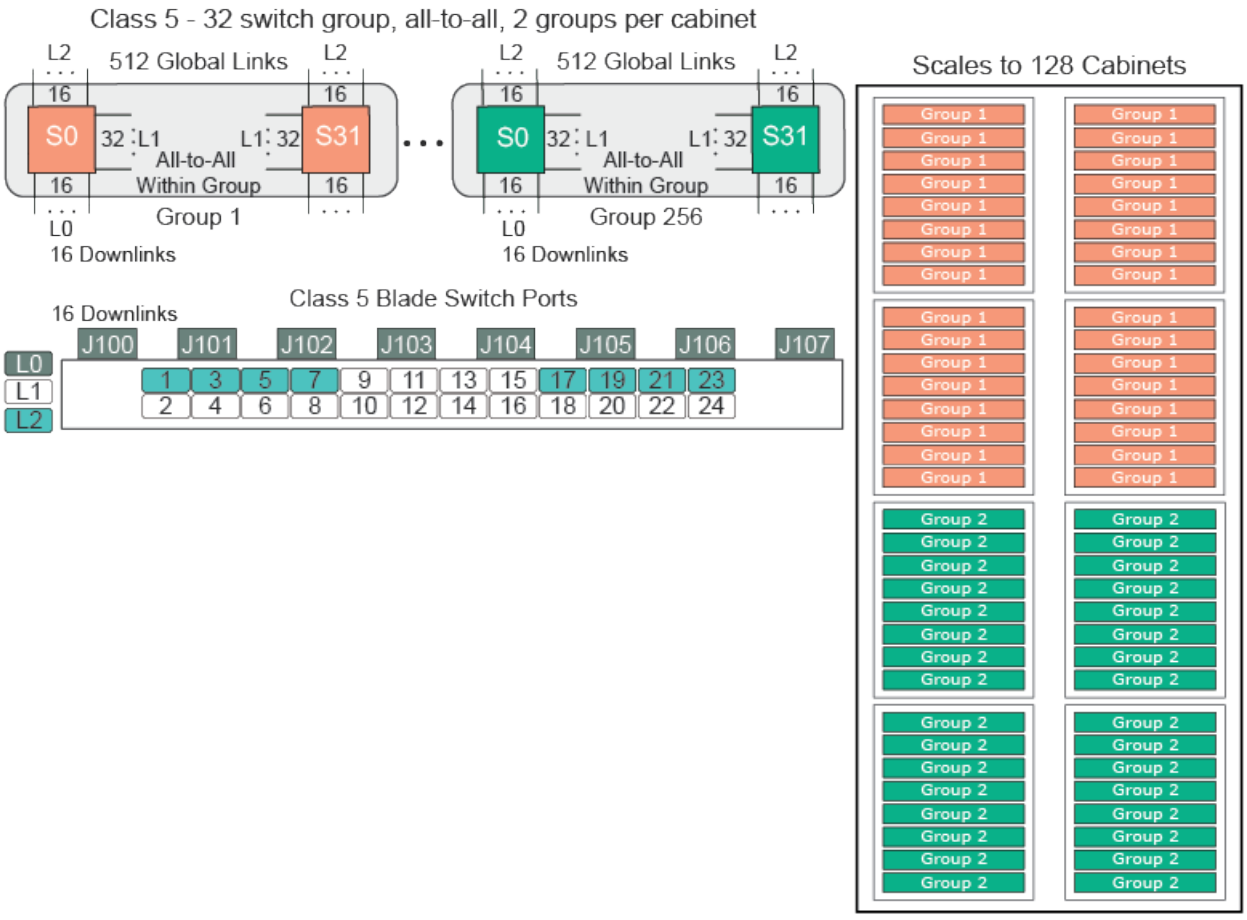


Figure 22: Class 5 Topology Two Groups Per Cabinet

them easier to read. Note that the point-to-point cabling file or command line output may include the chassis 0 or node 0 designations in the source or designation connector.

The server port numbering assigned by the different server and PCI card vendors is disregarded in cable labeling.

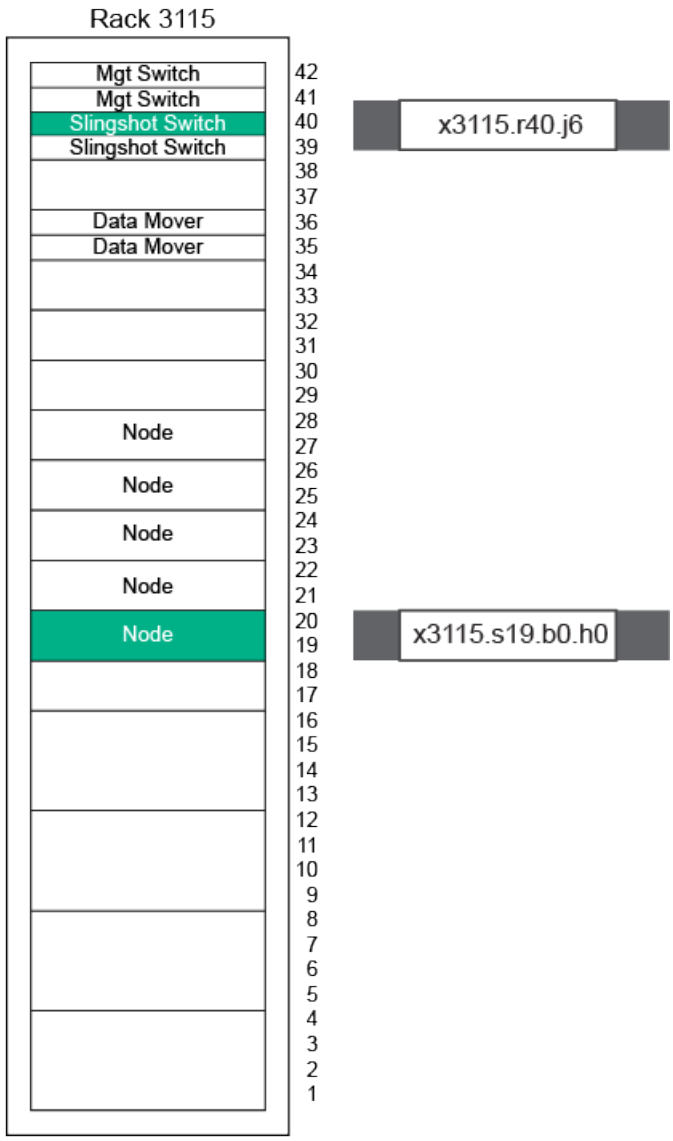


Figure 23: Rack Numbering

Point-to-Point File

A point-to-point cabling configuration file describes all the high-speed network connections for the fabric. Slingshot cables have 4 endpoints, `src_conn_a`, `src_conn_b`, `dest_conn_a`, and `dest_conn_b`.

Straight Cables

The global connectivity between the switches are with straight QSFP-DD cables. These may be copper (QSFP-DD DAC) cables or active optic cables (QSFP-DD AOC) depending on the distance. An "A Green" label is applied at the factory and designates `src_conn_a` in the point-to-point file. A "B Blue" label designates `dest_connector_b`.

Y-Cables

Y-cables are used to connect a single 200Gpbs Slingshot jack (QSFP-DD) into two 100Gpbs ports (QSFP-56). A "B Blue" label designates `dest_connector_b` and a "C Red" label designates `dest_conn_a`.

Slingshot ToR Switch Connections

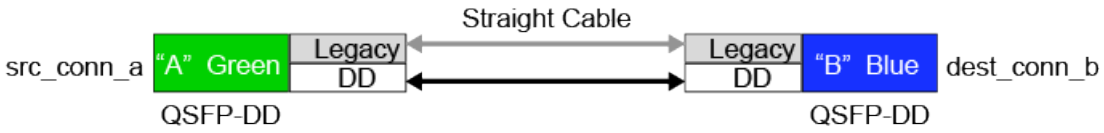


Figure 24: Rack Numbering

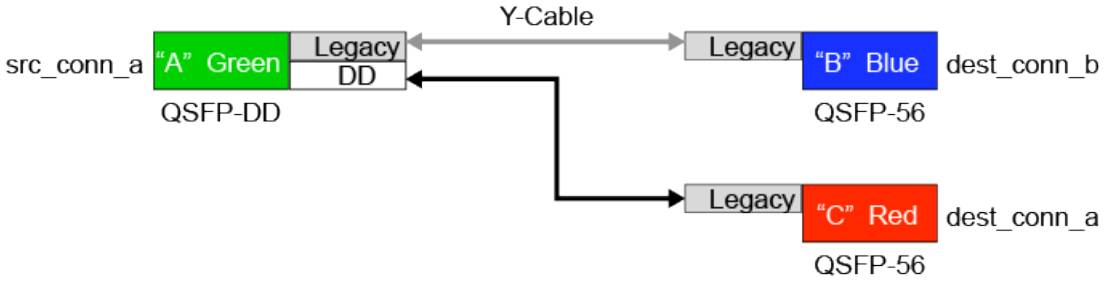


Figure 25: Rack Numbering

Slingshot ToR switches provide 32 jacks on the front panel:

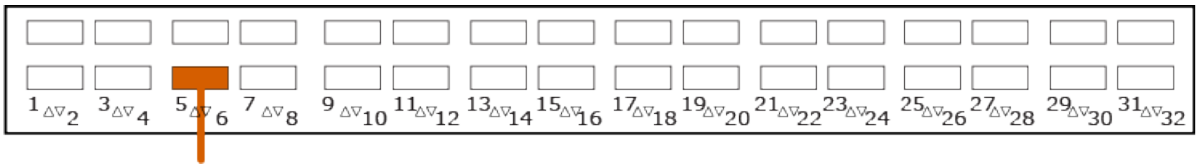


Figure 26: Slingshot TOR Switch Jack 10

A straight cable that connects to Jack 6 of Slingshot switch in rack 3115, U40, is labeled as shown:

Network Interface Controller (NIC) Cards

Network interface cards are identified by rack number and lowest server U position (`x3115.s15`), followed by`b0.n0.h0` fields which designate server BMC, node, and HSN NIC or port number.

- Multiple NICs on the same node increment the `h` field
- Single-port NIC cards are always designated as port `h0`
- Dual-port NIC cards are designated ports `h0` and `h1`

Single-node Server Connections

A single-node server is always designated as `b0`:

- `x3115.s15.b0.h0` BMC 0, node 0, first NIC
- `x3115.s15.b0.h1` - BMC 0, node 0, second NIC

Multi-node Servers

In dense quad-node servers, each node BMC is designated as `b1`, `b2`, `b3`, and `b4`. A dual-node server (single motherboard) BMC designated as `b1`. Current dense server designs support only a single node in each chassis slot, therefore, the node number is always `n0` for quad-node servers and is omitted from the cable label.

- `b3.h0` - BMC 3, node 0, first HSN NIC
- `b2.h1` - BMC 2, node 0, second HSN NIC

This example from the point-to-point file shows a Y-cable that connects jack 10 from a Slingshot switch to two separate NICs. Y-cables are used only for local connections to nodes.

src_conn_a	src_conn_b	dest_conn_a	dest_conn_b
x3115.c0.r40.j10	none	x3115.c0.s15.b3.n0.h0	x3115.c0.s15.b2.n0.h1

The figure shows a Y-cable connection to a ClusterStor storage system.

ClusterStor SSU-D

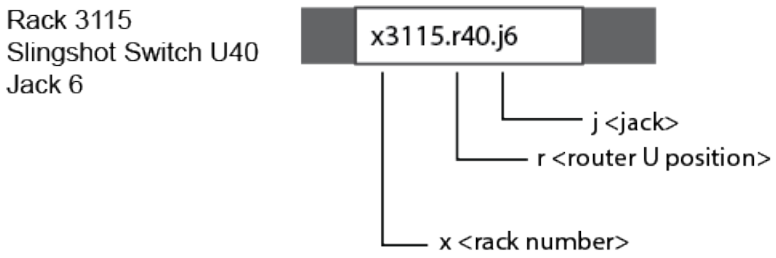


Figure 27: x3115.r40.j6

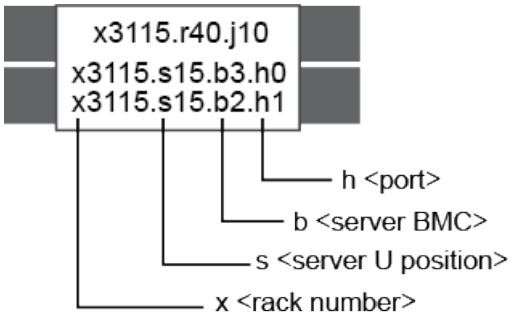


Figure 28: Cable Labeling Server in U15

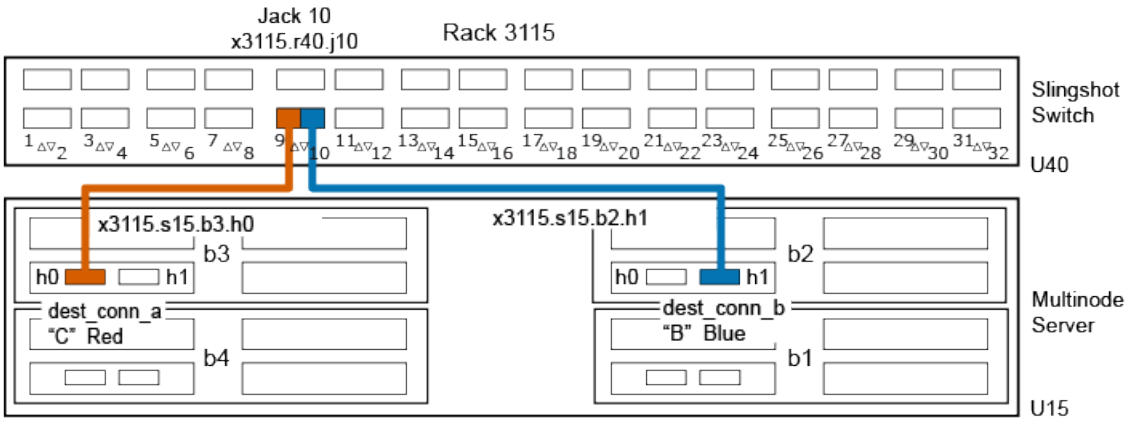


Figure 29: Multi-node Server Cabling

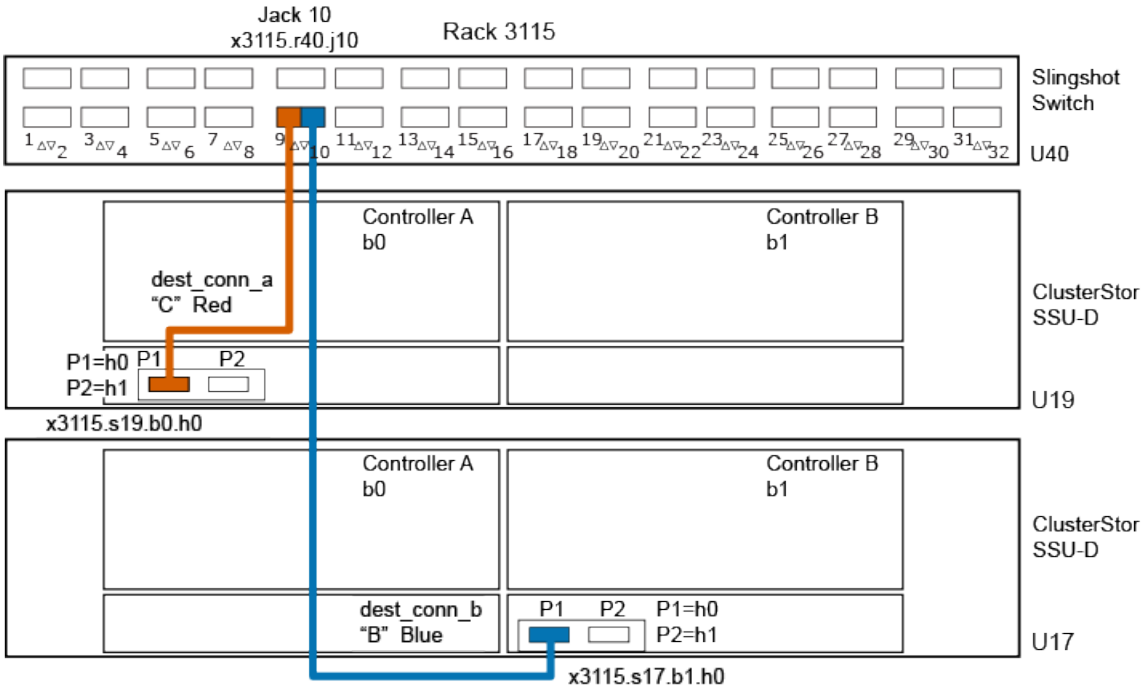


Figure 30: Slingshot to ClusterStor SSU-D Cabling

Slingshot: 1.7.3-77

Doc git hash: 765943227d33c02605d202d8bad1b87a34c5a512

Generated: Fri Jun 24 2022