Hewlett Packard
Enterprise

HPE Moonshot Networking Cookbook

Abstract

This provides overview, setup, configuration, examples and troubleshooting for HPE Moonshot networking. This document is intended for Hewlett Packard Enterprise Sales, support engineers, professional partners, system administrators, and others responsible for the design and deployment of Moonshot into any environment that requires network setup.

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Notices

Contents

Navigation tips

Navigating in the HTML document

To navigate through the documentation sequentially:

- Click the Next arrow (➔) for the next topic.
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Navigating using the Internet browser toolbar:

- To return to the last page you viewed, click**Back** on the browser toolbar.
- To return to one of the last nine pages you viewed in this session, click the down arrow to the side of the **Back** or **Forward** button on the browser toolbar, and then click the page you want from the list.

Navigating to documentation on the Hewlett Packard Enterprise website

- From the URLs in this guide, you may need to make several selections to get to your specific documentation.
- For online access to technical documentation, self-help resources, live chat assistance, community forums of IT experts, technical knowledge base, remote monitoring and diagnostic tools, go to **http://www.hpe.com/support/hpesc**.
- For the latest versions of selected technical documentation, go to **http://www.hpe.com/support/hpesc**.

Quick start

Quick start introduction

To ensure success in your Moonshot network setup, use the following two sections, "**Planning the connections**" and "**Steps for connecting**," to get up and running. The step-by-step instructions include links to other helpful areas in this guide.

Planning the connections

Before the Moonshot chassis arrives, plan the cable routing and adapters required for the configuration. Because Moonshot integrates network switches into the chassis, you must have a plan for connecting the uplink ports into the rest of the network.

Moonshot offers two different types of uplink modules; one based around QSFP+ connections and one based on SFP+ connections. Both can support direct-attached cables or fiber cables with transceivers. Depending on what networking infrastructure you are connecting the Moonshot chassis to, you must select the appropriate connection.

The following information indicates the requirements for connecting the uplinks, either 40GbE or 10GbE, to a Hewlett Packard Enterprise switch or third-party switch.

Hewlett Packard Enterprise switch

Hewlett Packard Enterprise recommends using either copper or fiber connections.

Connection	Required items
40GbE to 40GbE fiber	• 2 HPE BLc 40G QSFP+ MPO SR4 Transceiver • 1 HPE Premier Flex MPO/MPO OM4 8f 10m Cable
40GbE to 40GbE copper	1 HPE X240 40G QSFP+ QSFP+ Xm DAC Cable (X = 1, 3, or 5)
40GbE to a single 10GbE fiber	• 1 HPE BLc 10G SFP+ SR Transceiver • 1 HPE QSFP/SFP+ Adapter Kit • 1 HPE Xm Multi-mode OM3 LC/LC FC Cable (X = 1, 2, or 5) • 1 transceiver for the other switch
40GbE to single 10GbE copper	1 HPE X240 QSFP+ 4x10G SFP+ Xm DAC Cable (X = 1, 3, or 5)

Third-party switch

Hewlett Packard Enterprise recommends using fiber connections.

Connection	Required items
40GbE to 40GbE	• 2 BLc 40G QSFP+ MPO SR4 Transceiver • Premier Flex MPO/MPO OM4 8f 10m Cable
40GbE to a single 10GbE	• 1 BLc 10G SFP+ SR Transceiver • 1 QSFP/SFP+ Adapter Kit • 1 Xm Multi-mode OM3 LC/LC FC Cable (X = 1, 2, or 5) • 1 transceiver for the other switch

For more information, see "**Adapters, cables, and splitters**."

Steps for connecting

Step	Notes
1. Configure serial access.	Use either the physical serial port or the virtual serial port through the Chassis Manager. See "**Network management**."
2. Ensure the firmware is up-to-date.	See "**Identifying your hardware and firmware**."
3. Configure the uplink ports.	Due to the variety of ways to connect to external networking equipment, some setup might be required prior to connecting the cables. If you are not using 40GbEthernet for the QSFP+ module or 10GbEthernet for the SFP+ module, you must perform additional configuration steps. See "**Configuring uplinks**."
4. Configure existing network equipment.	Depending on what you are connecting the Moonshot chassis to, you might need to perform additional steps to configure your specific connection. Contact your local Network Administrator for more details. **CAUTION:** : Before connecting the Moonshot switch to your existing network environment, be sure to avoid network loops. See "**Network loops**."

Table Continued

Step	Notes
5. Connect equipment and verify the switch uplink connection.	With everything configured correctly, you should be able to safely connect the physical cables that connect the pieces of network equipment. If setup properly, the uplink module link LED illuminates green. You can verify the link is established using the switch CLI. To determine the status of the uplinks, see "**Port commands**."
6. Verify the cartridge-to-switch downlink connections.	If the uplink to the network is working, verify that the downlinks are connected. Use the switch CLI to verify the switch downlink status. For more information, see "**Port commands**." Verify the link status of the cartridge from the cartridge OS.

After the uplink and downlinks are established, you can begin using the Moonshot cartridges and proceed with OS deployment or configure more advanced switch features. If you have followed the previous steps and the uplinks and downlinks are established, but you are unable to access network services, it is usually a software configuration issue. For more information on advanced switch features and OS deployment, see the supporting documents and videos or the following sections in this document:

- **Spanning Tree Protocol**
- **VLANs**
- **Port mirroring on a Moonshot switch**
- **High availability networking**
- **Switch stacking and IRF fabrics**

Introduction

Purpose

The purpose of this HPE Moonshot Networking Cookbook is to provide users of the HPE Moonshot System with a better understanding of the concepts and steps required when connecting and setting up the Moonshot System into an existing network, as well as some practical tips and examples in using the Moonshot network.

The scenarios in this Cookbook are intended to create building blocks to using the Moonshot network solution. More complex topics will be addressed in white papers or single topic papers.

This document is not meant to be a complete or detailed guide to Moonshot or Moonshot networking, but is intended to provide the reader with valid examples of how Moonshot networking can be set up and used in data centers or other networking environments.

Organization

This document is organized as follows:

- **Quick start** —Get started with your Moonshot System right away.
- **Introduction** —Basic information about this document.
- **System overview** —Description of the system components relative to networking. Basic connectivity, external ports, cartridges, part numbers, documentation locations, and how to tell what you have.
- **Network management** —Connecting to and setting up the management features of your Moonshot System networking. A brief look at the management on Moonshot network switches, physical management ports versus virtual serial ports.
- **Adapters, cables, and splitters** —Connecting your Moonshot to the external world. This section defines what equipment is needed to connect Moonshot networking, how to find the equipment, and some tips and troubleshooting items.
- **Connectivity and port setup (production network)** —Port naming conventions and how to connect your Moonshot externally.
- **Network loops** —Understanding network loops and how to avoid them within the Moonshot System.
- **Network installation** —The basics of setting up your Moonshot in a PXE environment.
- **Spanning Tree Protocol** —What is STP and how to setup your Moonshot in your network environment.
- **VLANs** —Setting up and using VLANs with Moonshot.
- **Port mirroring on a Moonshot switch** —Port mirroring setup, tips, and examples with Moonshot.
- **High availability networking** —Creating Static and Dynamic LAGs in your Moonshot System with server and switch examples.
- **Switch stacking and IRF fabrics** —The basics of setting up stacking with Moonshot.

Naming conventions

- Moonshot-45G/180G: The "G" refers to the Hyperscale Family.
- Moonshot-6SFP: The number refers to the number of uplink ports. The type of connector follows.
- Moonshot-4QSFP+: The number refers to the number of uplink ports. The type of connector follows.
- Moonshot-45Gc/45XGc/180XGc: The "Gc" refers to Hyperscale+Enterprise Family.
- Moonshot-45XGc/180XGc: The "X" refers to 10 Gb connections to server nodes.

Examples

The examples in this document are notated throughout this document and will be titled with "Example:" in the heading. Commands may be different due to multiple firmware stacks and many types of switches. In these

cases, they are notated as such. These cookbook examples are written by the Hewlett Packard Enterprise development team for Moonshot and are often notated with special comments, tips, and so on.

Examples are meant to be building blocks to help you get the most common networking issues resolved.

Each example may contain the following information:

- Title that begins with "Example:"
- Description/tips: Description of the example, helpful tips, warnings, and notes from the author.
- `Prompts in monospace type`
- **User entries in blue**
- Comments and directions in standard type
- Other resources and references for this topic

Related documentation

The following table shows related documentation links for the Moonshot System.

Document	Description	Location
Product QuickSpecs	Moonshot System QuickSpecs	**Hewlett Packard Enterprise website**
Moonshot Documentation Library	All Moonshot System public documents in the Hewlett Packard Enterprise Information Library	**Hewlett Packard Enterprise website**
Moonshot networking documents	All Moonshot System networking documents	**Hewlett Packard Enterprise website**
Moonshot videos	Videos related to the setup of the Moonshot system	**Hewlett Packard Enterprise website**

System overview

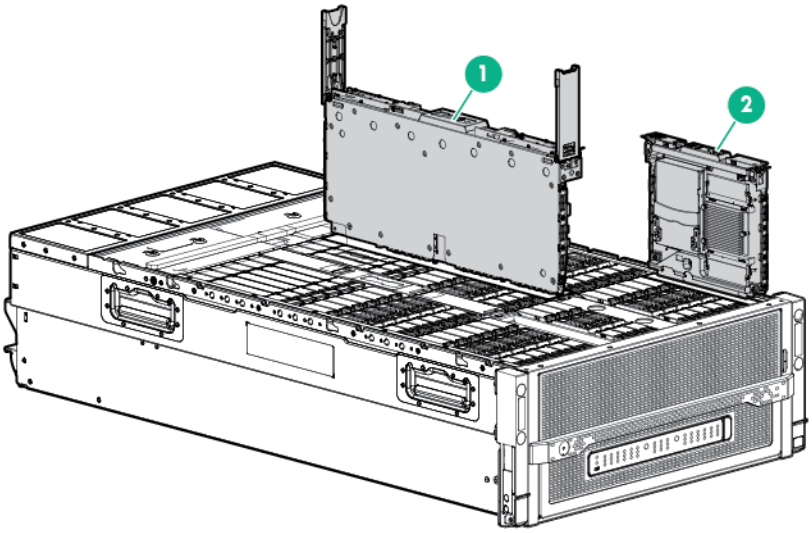
System overview

This section helps you identify the components in your Moonshot system related to networking, as well as a comprehensive way to identify your switches, uplink modules, and their features. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

HPE Moonshot System

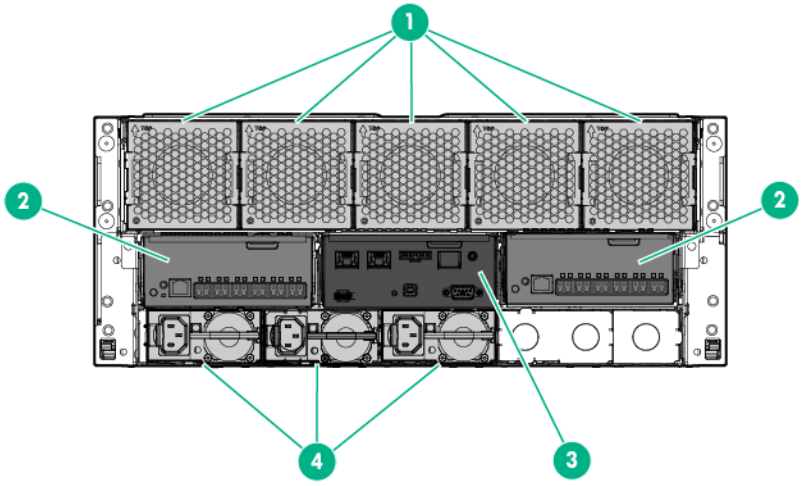
The Moonshot System components are identified below. The Moonshot networking is integrated into the chassis. Each cartridge SOC has dual-port NICs that interface to the switches. The switches interface to the uplink modules. The uplink modules pass the traffic out of the chassis. The system can have 1 or 2 switches.

Internal components



Item	Description
1	2x Low-latency switch module
2	45x Hot-plug cartridge

Rear chassis components



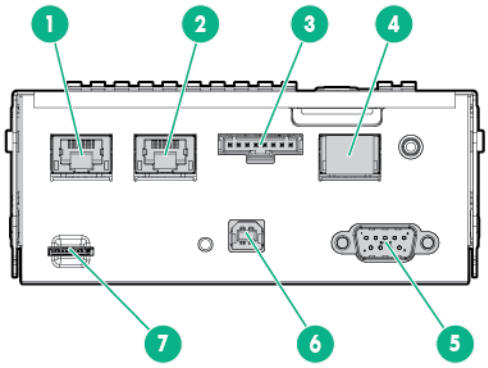
Item	Description
1	Serviceable, redundant, dual-rotor, hot-plug fan modules
2	Network uplink modules
3	Moonshot 1500 Chassis Management Module
4	Common-Slot Power Supplies

This document does not cover the full setup and maintenance of the Moonshot System. For more information on the Moonshot System, see the **Hewlett Packard Enterprise website**.

External connectivity

The following figures and tables show the external ports on the Moonshot System.

External connectivity

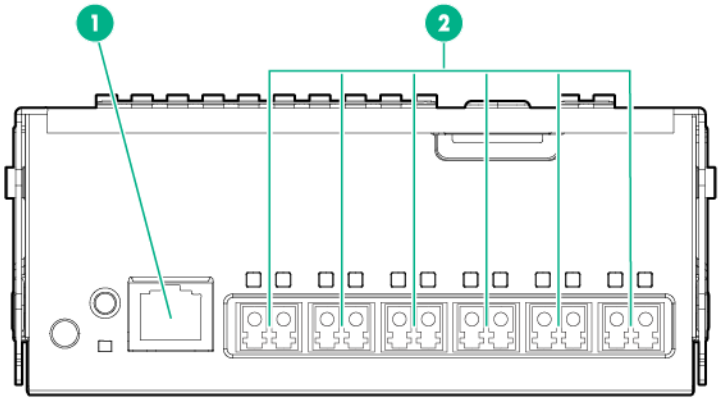


Item	Description	Label
1	iLO CM management port (Ethernet)	iLO/MGMT
2	iLO CM link port (disabled by default)	LINK
3	HPE Moonshot 1500 CM module HPE APM port	RCM
4	Moonshot 1500 CM module diagnostic port	DEBUG
5	iLO CM management serial port	—
6	Moonshot 1500 CM module USB connector	—
7	Moonshot 1500 CM module microSD slot	—

For more information on the Moonshot 1500 Chassis management module:

- See the chassis documentation on the **Hewlett Packard Enterprise website**.
- See the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Network uplink module external connectivity



Item	Description
1	Serial console port (RJ-45)
2	SFP+ ports X1 – X6*

[1]

For more information on the network uplink module:

[1] * The amount and type of uplink ports varies depending on the model.

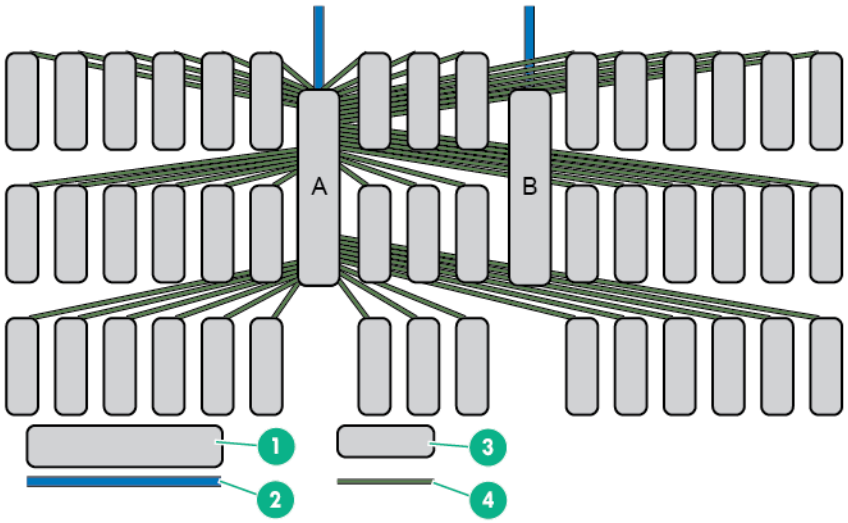
- See the chassis user and maintenance guide on the **Hewlett Packard Enterprise website**.
- See the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Internal connectivity

The following diagram illustrates how Switch Module A and Switch Module B are oriented in the Moonshot enclosure and how they connect to the cartridges.

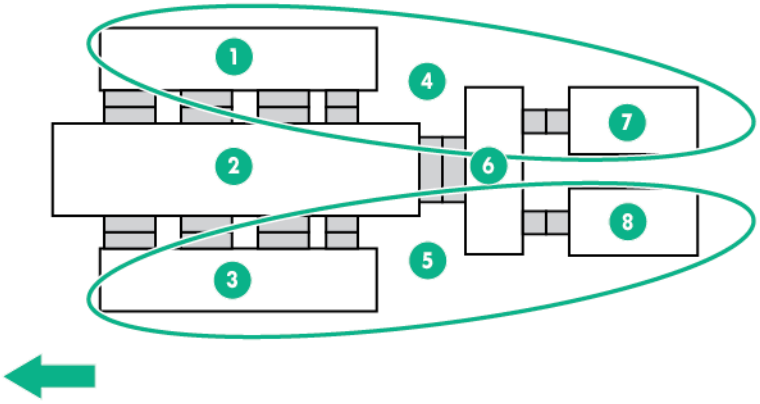
The uplink modules take the outside server connections, routed through an uplink module (A or B), and then to their corresponding switch.

The following illustration shows connectivity from the cartridges to one of the network switches. Each green line represents up to four NIC connections (one NIC per SOC) per cartridge. Another set of four NIC connections (one NIC per SOC) per cartridge goes to the other network switch. In total, there are eight NIC connections per cartridge with four going to each switch. The second NIC port from each cartridge connects to the other network switch.



Item	Description
1	Network switches
2	16x 10GbE lanes to uplink ports
3	Moonshot cartridges
4	4x 1GbE/10GbE lanes to cartridge ports

The relationship of the NIC ports to the switches and uplink modules is shown in the following figure. The arrow indicates the front of the chassis.

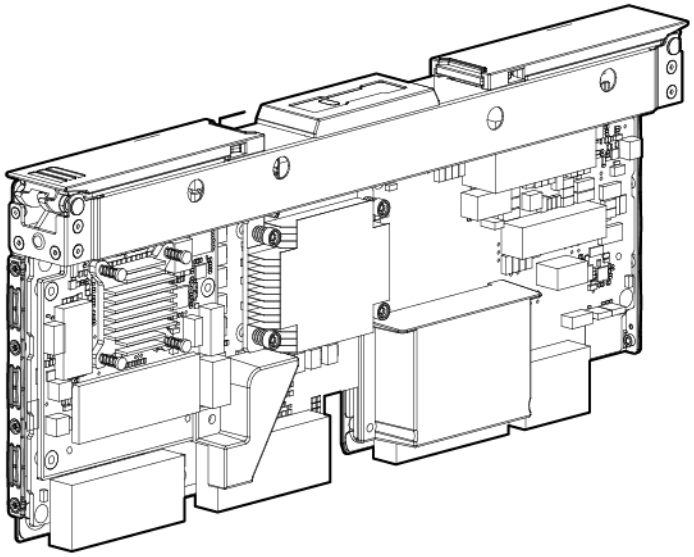


Item	Description
1	Switch module A
2	System backplane
3	Switch module B
4	eth0
5	eth1
6	Midplane assembly
7	Uplink module A
8	Uplink module B

Switch and uplink modules

The Moonshot System supports multiple switch modules and uplink modules. This section provides information about each supported switch module and uplink module.

HPE Moonshot-45G Switch Module

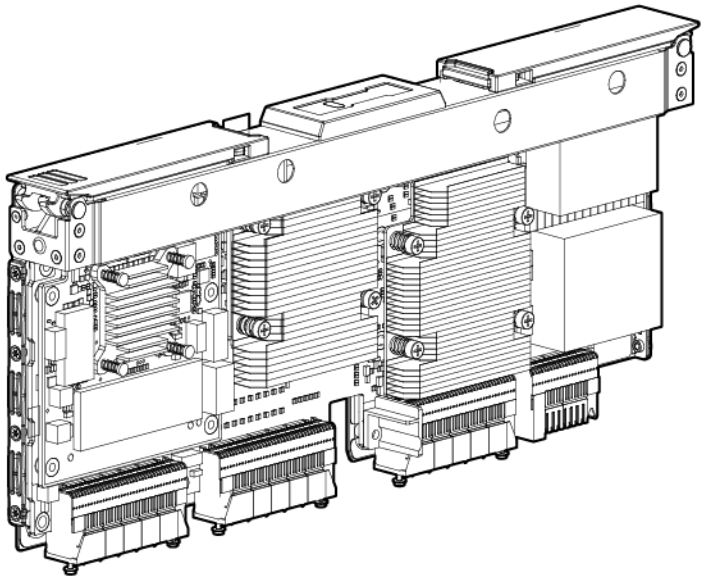


Part numbers for this component are as follows:

- HPE Moonshot-45G Switch Module part number 704644-B21
- Spare part number 712675-001

For more information about the Moonshot-45G Switch Module, see the **Hewlett Packard Enterprise website**.

HPE Moonshot-180G Switch Module

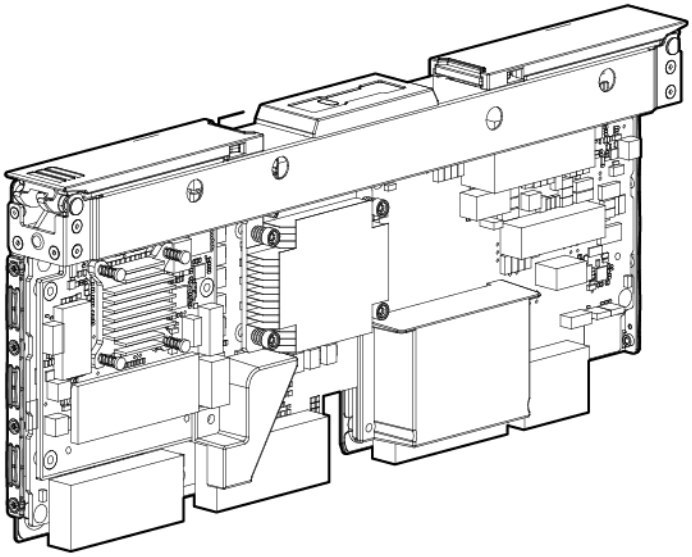


Part numbers for this component are as follows:

- HPE Moonshot-180G Switch Module part number 704642-B21
- Spare part number 712692-001

For more information about the Moonshot-180G Switch Module, see the **Hewlett Packard Enterprise website**.

HPE Moonshot-45Gc Switch Module

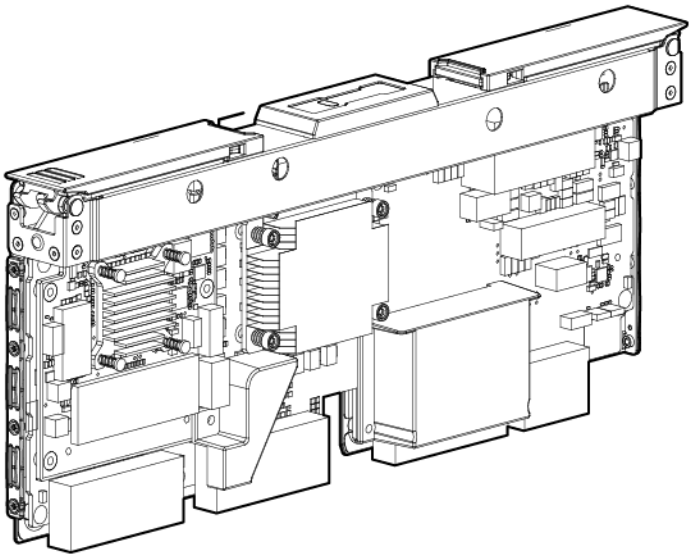


Part numbers for this component are as follows:

- HPE Moonshot-45Gc Switch Module part number 786617-B21
- Spare part number 816239-001

For more information about the Moonshot-45Gc Switch Module, see the **Hewlett Packard Enterprise website**.

HPE Moonshot-45XGc Switch Module

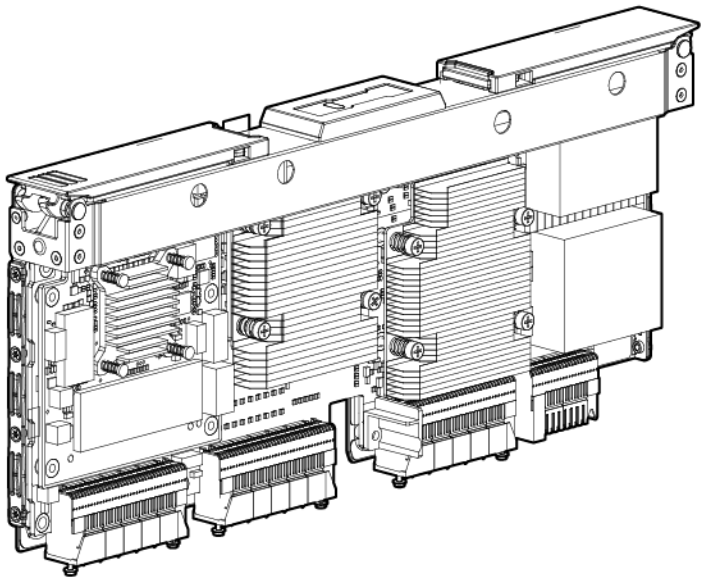


Part numbers for this component are as follows:

- HPE Moonshot-45XGc Switch Module part number 704654-B21
- Spare part number 712695-001

For more information about the Moonshot-45XGc Switch Module, see the **Hewlett Packard Enterprise website**.

HPE Moonshot-180XGc Switch Module

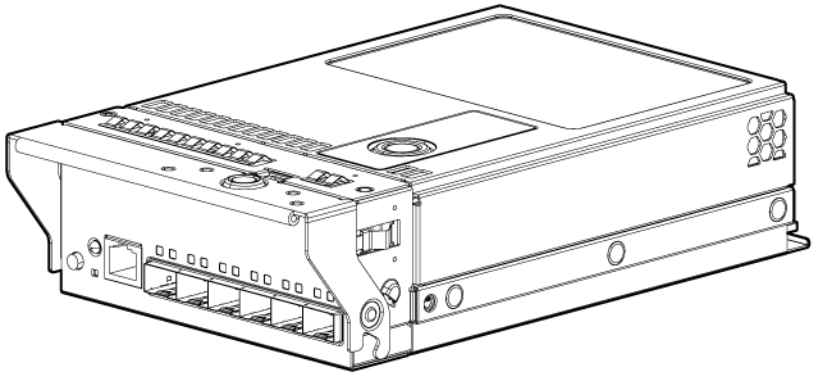


Part numbers for this component are as follows:

- HPE Moonshot-180XGc Switch Module part number 786619-B21
- Spare part number 816239-001

For more information about the Moonshot-180XGc Switch Module, see the **Hewlett Packard Enterprise website**.

HPE Moonshot-6SFP Uplink Module

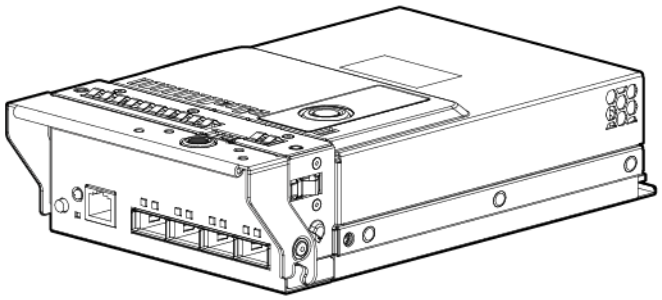


Part numbers for this component are as follows:

- HPE Moonshot-6SFP Uplink Module part number 704646-B21
- Spare part number 712676-001

For more information about the Moonshot-6SFP Uplink Module, see the **Hewlett Packard Enterprise website**.

HP Moonshot-4QSFP+ Uplink Module

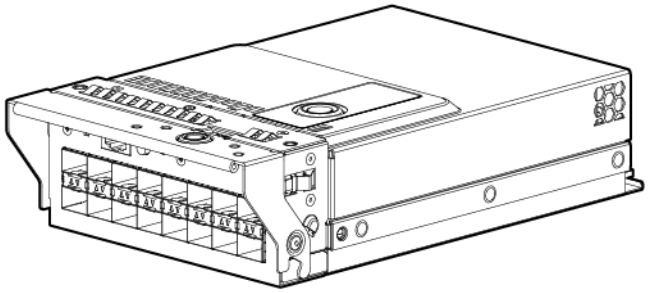


Part numbers for this component are as follows:

- HPE Moonshot-4QSFP+ Uplink Module part number 704652-B21
- Spare part number 712694-001

For more information about the Moonshot-4QSFP+ Uplink Module, see the **Hewlett Packard Enterprise website**.

HP Moonshot-16SFP+ Uplink Module



Part numbers for this component are as follows:

- HPE Moonshot-16SFP+ Uplink Module part number 783263-B21
- Spare part number 784973-001

For more information about the Moonshot-16SFP+ Uplink Module, see the **Hewlett Packard Enterprise website**.

Switch feature comparison table

The following table provides a high-level comparison of the Moonshot switches.

Feature	Hyperscale Moonshot-45G Switch	Hyperscale Moonshot -180G Switch	Hyperscale+ Enterprise Moonshot -45Gc Switch	Hyperscale+ Enterprise Moonshot -45XGc Switch	Hyperscale+ Enterprise Moonshot -180XGc Switch
Uplink ports	6 x 10 GbE	4 x 40 GbE or 16 x 10 GbE	6 x 10 GbE	4 x 40 GbE or 16 x 10 GbE	4 x 40 GbE or 16 x 10 GbE
Downlink ports	45 x 1 GbE	180 x 1 GbE	45 x 1 GbE	45 x 1/10 GbE	180 x 1/10 GbE
Uplink bandwidth	60 Gbps	160 Gbps	60 Gbps	160 Gbps	160 Gbps
Oversubscription	No	1.1:1	No	2.8:1	11.3:1
Memory, flash	2 GB, 128 MB	2 GB, 512 MB	2 GB, 512 MB	2 GB, 512 MB	2 GB, 512 MB
Feature summary	Layer 2, Layer 3, Routing, QoS, Stacking, Management (CLI, SNMP, sFlow)	Layer 2, Layer 3, Routing, QoS, Stacking, Management (CLI, SNMP, sFlow)	Layer 2, Layer 3, Routing, QoS, IPv6, OpenFlow 1.3, Precision Time Protocol, IRF stacking, Management (CLI, SNMP, sFlow)	Layer 2, Layer 3, Routing, QoS, IPv6, OpenFlow 1.3, Precision Time Protocol, IRF stacking, Management (CLI, SNMP, sFlow)	Layer 2, Layer 3, Routing, QoS, IPv6, OpenFlow 1.3, Precision Time Protocol, IRF stacking, Management (CLI, SNMP, sFlow)
Stackable	Yes: 4	Yes: 2	Yes: 8 members IRF	Yes: 8 members IRF	Yes: 8 members IRF
License keys	None	None	None	None	None
Power (includes uplink module)	50 W Max	210 W Max	50 W Max	73 W Max	210 W
MAC, VLANs	128 K, 4 K	128 K, 4 K	128 K, 4 K	128 K, 4 K	128 K, 4 K
IP routing table	12 K	12 K	12 K	16 K	16 K
Packet buffer	9 MB	22 MB	9 MB	9 MB	22 MB
TRILL, FCoE, EVB, OpenFlow	No, No, No, No*	No, No, No, No*	Yes, Yes, Yes, Yes	Yes, Yes, Yes, Yes	Yes, Yes, Yes, Yes
Full Layer 3, Full IPv6	No, No*	No, No*	Yes, Yes	Yes, Yes	Yes, Yes

[2]

[2] *Enterprise market

Hardware compatibility

Network component support varies depending on the other components installed in the system. For more information, see the *Moonshot System Configuration and Compatibility Guide* in the **Hewlett Packard Enterprise Information Library**.

Support matrix for switches and uplinks

The following table identifies compatibility for Moonshot System switches and uplinks.

Switches	Moonshot-6SFP Uplink 6 x SFP/SFP+ 704646-B21	Moonshot-4QSFP+ Uplink 4x QSFP+ 704652-B21	Moonshot 16SFP+ Uplink 16x SFP+ 783263-B21
Moonshot-45G Switch 45 Port 1G 704644-B21	Supported	Not supported	Not supported
Moonshot-180G Switch 180 Port 1G 704642-B21	Not supported	Supported	Supported
Moonshot-45Gc Switch 45 Port 1G 786617-B21	Supported	Not supported	Not supported
Moonshot-45XGc Switch 45 Port 1/10G 704654-B21	Not supported	Supported	Supported
Moonshot-180XGc Switch 180 Port 1/10G 786619-B21	Not supported	Supported	Supported

Support matrix for cartridges and switches

The following table identifies compatibility for Moonshot System cartridges and network switch modules.

- Supported indicates a shipping configuration.
- Not supported indicates a non-shipping configuration.

Switch	1P[1] cartridge 1 GbE Ex: ProLiant m300 server cartridge	1P[1]cartridge 10 GbE Ex: ProLiant m710 or m400 server cartridge	4P[2] cartridge 1 GbE Ex: ProLiant m350, m700, or m800 server cartridge
Moonshot-45 G Switch 45 Port 1G 704644-B21	Supported	Supported[3]	Not supported
Moonshot-180G Switch 180 Port 1G 704642-B21	Supported	Supported[3]	Supported
Moonshot-45 Gc Switch 45 Port 1G 786617-B21	Supported	Supported[3]	Not supported
Moonshot-45 XGc Switch 45 Port 1/10G 704654-B21	Supported	Supported	Not supported
Moonshot-180XGc Switch 180 Port 1/10G 786619-B21	Supported	Supported[4]	Supported

3

4

5

6

Identifying your hardware and firmware

The Chassis Manager can identify the hardware and firmware revisions of your network elements. The following example includes useful commands that can assist with identification.

[3] 1. 1P = 1 processor
[4] 2. 4P = 4 processors
[5] 3. The port will run at 1 G.
[6] 4. To get maximum 10 Gb cartridge support, populate front only or rear only of the chassis with 10 Gb cartridges.

Example: Identify the network hardware and firmware via the chassis manager

This example identifies how to get network hardware, firmware and management IP information from the Chassis Manager. This information is useful for a review of switch-related items before a firmware update or addition of cartridges into the system. `ALL` returns all switch information. `SA` returns just switch A. `SB` returns just switch B. For more information on the `show` command, see the HPE Moonshot iLO Chassis Management CLI User Guide.

```
hpiLO-> show switch info all
Switch A:
   Product ID: 704642-B21
   UUID: 322F1A5F-85F0-571E-9003-6928C7B7D892
   Serial Number: 7C5338000R
   Switch Firmware: 2.0.1.2
   Cartridge Satellite Firmware: 11/11/2013
   Management Status: Cartridge OK.
   Power: On
   Status: OK
   UID State: Off
   Remote Management Interface:
      IPv4: 16.91.23.10
      IPv6: N/A
      MAC: 2c:44:fd:e8:2d:2b
Uplink Module A:
      Product Name: HP Moonshot-4QSFP Uplink Module
      Product ID: 704652-B21
      Serial Number: KDDVFAXQV4
Switch B:
   Product Name: HP Moonshot-180G Switch Module
   Product ID: 704642-B21
   UUID: 946FC94C-A5AA-5704-B469-620B2A3A493F
   Serial Number: 7C5338000D
   Switch Firmware: 2.0.1.2
   Cartridge Satellite Firmware: 11/11/2013
   Management Status: Cartridge OK.
   Power: On
   Status: OK
   UID State: Off
   Remote Management Interface:
   IPv4: 16.91.23.102
   IPv6: N/A
   MAC: 2c:44:fd:e9:6c:34
   Uplink Module B:
      Product Name: HP Moonshot-16SFP+ Uplink Module
      Product ID: 783263-B21
      Serial Number: 7C547J001B
hpiLO-> show switch info sa
Switch A:
```

```
Product Name: HP Moonshot-180G Switch Module
Product ID: 704642-B21
UUID: 322F1A5F-85F0-571E-9003-6928C7B7D892
Serial Number: 7C5338000R
Switch Firmware: 2.0.1.2
Cartridge Satellite Firmware: 11/11/2013
Management Status: Cartridge OK.
Power: On
Status: OK
UID State: Off
Remote Management Interface:
IPv4: 16.91.23.101
IPv6: N/A
MAC: 2c:44:fd:e8:2d:2b

Uplink Module A:

   Product Name: HP Moonshot-4QSFP Uplink Module
   Product ID: 704652-B21
        Serial Number: KDDVFAXQV4
```

For more information, see the *Moonshot iLO Chassis Management CLI User Guide* on the **Hewlett Packard Enterprise website**.

Switch Command Line Interfaces

The Hyperscale family of switches, Moonshot-45G and Moonshot-180G, have different network operating systems than the Hyperscale+Enterprise switches, Moonshot-45Gc and Moonshot-45XGc, and Moonshot-180XGc. As such, the command line interface is different between the two.

Common command comparison

Following is a comparison of the most common commands between Cisco IOS switches, Moonshot-45G/180G switches, and Moonshot-45Gc/45XGc/180XGc switches.

For the full set of Moonshot Network switch commands, see the *HPE Moonshot-45G/180G Switch Module CLI Command Reference Guide* and the *HPE Moonshot-45XGc Switch Fundamentals Command Reference* on the **Hewlett Packard Enterprise website**.

Common commands

Cisco IOS	Moonshot-45G/180G	Moonshot-45Gc/45XGc/180XGc
enable	enable	system-view
show flash	dir	dir
show version	show version	display version
show run	show running-config	display current-configuration
show start	—	display saved-configuration
show history	—	display history-command

Table Continued

Cisco IOS	Moonshot-45G/180G	Moonshot-45Gc/45XGc/180XGc
show interfaces	show port all	display interfaces brief
erase start	erase startup-config	reset saved-configuration
more flash:/<	__	more <filename>
reload	reload	reboot
write memory	write memory	save
show tech-support	show tech-support	display diagnostic-information
show	show	display
no	no	undo
end	end	return
exit	exit	quit
erase	erase	delete
copy	copy	copy

Users and user interface

Cisco IOS	Moonshot-45G/180G	Moonshot-45Gc/45XGc/180XGc
username	username	local-user
username <name> privilege <level> password	username <name> level <level> password	local-user <name> class <role>
username <name> password	username <name> password	**[HP]** local-user <name> **[HP-luser-X-name]** password
line console 0	line console	user-interface console 0

File and firmware management

Cisco IOS	Moonshot-45G/180G	Moonshot-45Gc/45XGc/180XGc
show flash	dir	dir
show bootvar	show bootvar	display boot
show version	show version	display version

Table Continued

Cisco IOS	Moonshot-45G/180G	Moonshot-45Gc/45XGc/180XGc
`copy tftp://<address>/ <file> <location>`	`copy tftp://<address>/ <file> <location>`	`tftp <address> get <file> <local-file>`
`copy <location> tftp:// <address>/<file>`	`copy <location> tftp:// <address>/<file>`	`tftp <address> put <file>`

General troubleshooting tips

The following tips help you to avoid the most common errors when setting up and using the Moonshot hardware in a networking environment:

- Verify that your firmware is up to date. For more information, see the HPE Moonshot Component Pack documentation on the **Hewlett Packard Enterprise website**.

  IMPORTANT:
  The firmware for the Moonshot-45Gc/45XGc/180XGc switches cannot be updated using the Chassis Manager.

- Check the **hardware compatibility**. For more information, see the *HPE Moonshot System Configuration and Compatibility Guide* on the **Hewlett Packard Enterprise website**.
- Use the `show all` command when preparing for help or to request service. This command is extremely useful for providing detailed information at the time of request.

Network management

Network management overview

This section helps you to connect your management subsystem with the Moonshot network switches. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

The switch management CLI can be accessed in four ways:

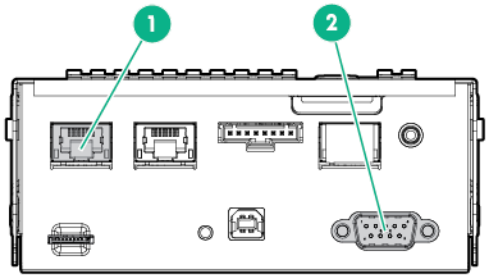
- Directly through the switch serial console port:
  - The switch console port is a physical RJ-45 serial port on the uplink module.
  - The Moonshot-45G/180G/45Gc/45XGc/180XGc switches connect to the serial port when configured to 115200 baud rate, 8 data bits, no parity, 1 stop bit, and no flow control.
- Through a Chassis Manager VSP session:
  - The Chassis Manager allows access to the switch serial port using VSP.
- Through the Chassis Manager management network (out-of-band remote management):
  - The switch service port has a dedicated Ethernet port connected to the Chassis Manager management network. An IP address can be either statically or dynamically assigned, and SSH/Telnet can be enabled.
  - This is the default setting for remote management and is also the Hewlett Packard Enterprise recommended method for remote management.
- Through the switch production network (in-band remote management):
  - Access through a connection to any uplink port.
  - An IP address can be either statically or dynamically assigned, and SSH/Telnet can be enabled.

Physical management ports

The following illustrations identify the physical management ports. You can manage the Moonshot switches through Chassis Manager, the uplink module connection, or both.

HPE Moonshot 1500 Chassis Management Module physical management ports

When examples note "connected to chassis manager," connect to the iLO CM management port (MGMT) or the iLO CM management serial port. The iLO CM management serial port requires a DB9 female connection.



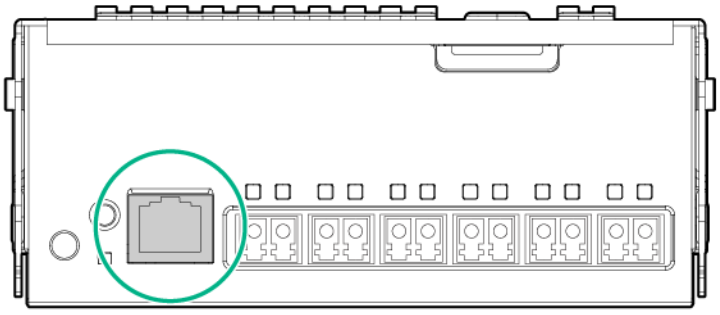
Item	Description
1	iLO CM management port (iLO/MGMT)
2	iLO CM management serial port

For more information on the chassis management module:

- See the user and maintenance guide on the **Hewlett Packard Enterprise website**.
- See the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Network uplink module serial console port (RJ-45) physical management ports

When examples note "connected to switch serial port," this indicates a serial connection through the serial console port. Connection through the serial console port requires an RJ-45 connection.



For more information on the network uplink module:

- See the chassis documentation on the **Hewlett Packard Enterprise website**.
- See the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Management cables

The following cables are needed to connect to the Chassis Manager serial port and switch serial console port:

- Chassis Manager serial port:
  - DB9 null modem cable, female-to-female connector
- Switch serial console port:
  - Serial console cable, DB9 RS232 serial to RJ-45
    - Hewlett Packard Enterprise part number 797918-B21

Virtual serial ports

The Chassis Manager allows you to connect the VSP to the switch and perform configuration commands. The VSP is achieved from the Chassis Manager communicating over Ethernet to the management controller on the switch management. To manage VSP through Moonshot, use the Chassis Manager Management Link. After determining the iLO management IP address from the Chassis Manager Serial Port, you can remote into Chassis Manager, and then connect to the switch via VSP to the switch management controller.

IMPORTANT:
The Moonshot-45G/180G Switch can only have one serial port active at a time. The console port is active by default. If VSP is enabled, then the console port is disabled.

Example: Setting up a switch VSP session (Moonshot-45G/180G Switch)

The Chassis Manager allows you to connect the VSP to the switch and perform configuration commands. The VSP session is achieved when the Chassis Manager communicates with the management control on the switch management. "`all`" indicates all network items. "`sa`" indicates switch A. "`sb`" indicates Switch B.

`hpiLO->` **show switch info all**

`hpiLO->` **set switch vsp on all**

`hpiLO->` **set switch power off all**

`hpiLO->` **set switch power on all**

`hpiLO->` **connect switch vsp sa**

Virtual Serial Port Active: SA

Starting virtual serial port.

Press 'ESC (' to return to the CLI Session.

`(routing)->`

For more information, see the *HPE Moonshot iLO Chassis Management CLI User Guide* and *Moonshot-45G/180G Switch User and Maintenance Guide* on the **Hewlett Packard Enterprise website**.

Example: Setting up a switch VSP session (Moonshot-45Gc/45XGc/180XGc Switch)

The Chassis Manager allows you to connect the VSP to the switch and perform configuration commands. The VSP is achieved via the Chassis Manager communicating to the management control on the switch management. "`all`" indicates all network items. "`sa`" indicates switch A. "`sb`" indicates Switch B.

```
hpiLO-> show switch info all

hpiLO-> connect switch vsp sa

Virtual Serial Port Active: SA

Starting virtual serial port.

Press 'ESC ' to return to the CLI Session.

<HP>
```

For more information, see the *HPE Moonshot iLO Chassis Management CLI User Guide* and the *Moonshot-45XGc Switch User and Maintenance Guide* on the **Hewlett Packard Enterprise website**.

Example: VSP to a cartridge and remote SSH to chassis manager IP

VSP is a remote access point to manage cartridge and switch systems within the Moonshot System. When editing Linux text files, it is best to use an SSH instead of a VSP.

```
hpiLO-> set node power on c2n1

    c2: #Cartridge 2
        c2n1: #Node 1 Power on requested

hpiLO-> connect node vsp c2n1

    Virtual Serial Port Active: C2N1
    Starting virtual serial port.
    Press 'ESC (' to return to the CLI Session.

Telnet/SSH

[root@<server> ~]# ssh Administrator@<your.CM.IP.address>

Administrator@<your.CM.IP.address>'s password:

User: Administrator logged-in to <client>.<your
domain>.<exmpl>(<your.CM.IP.address>) at 14:01 Sep 18 2014

iLO Chassis Manager v1.30

CLI Version: 2.2
```

For more information, see the *Moonshot iLO Chassis Management CLI User Guide* on the **Hewlett Packard Enterprise website**.

Switch management IP

The management IP address is changed using the following methods.

Example: Changing the management IP address

On Moonshot-45G/180G Switches, the default for the management IP address is set to DHCP. See the example below to set up static IP addressing using Chassis Manager. Note the PXE requirement.

```
(Routing) >enable

(routing) #serviceport protocol none

Changing protocol mode will reset ip configuration.

Are you sure you want to continue? (y/n)y

(Routing) #serviceport ip xxx.xxx.xxx.xxx 255.255.255.0 xxx.xxx.xxx.254
```

```
(routing) #show serviceport
Interface Status.............................. Up
IP Address.................................... xxx.xxx.xxx.xxx
Subnet Mask................................... 255.255.255.0
Default Gateway............................... xxx.xxx.xxx.254
IPv6 Administrative Mode...................... Disabled
Configured IPv4 Protocol...................... None
Configured IPv6 Protocol...................... None
IPv6 AutoConfig Mode.......................... Disabled
Burned In MAC Address......................... 00:24:81:D0:62:1F
```

On Moonshot- 45G/180G Switches, the default for the management IP address is set to DHCP. See the example below for setting up dynamic (DHCP) IP addressing using Chassis Manager. Note the PXE requirement.

```
(Routing) >enable
(Routing) #serviceport protocol dhcp

Changing protocol mode will reset ip configuration.
Are you sure you want to continue? (y/n)y

(Routing) #show serviceport
Interface Status.............................. Up
IP Address.................................... xxx.xxx.xxx.xxx
Interface Status.............................. Up
IP Address.................................... xxx.xxx.xxx.xxx
Subnet Mask................................... 255.255.255.0
Default Gateway............................... xxx.xxx.xxx.xxx
IPv6 Administrative Mode...................... Disabled
Configured IPv4 Protocol...................... DHCP
Configured IPv6 Protocol...................... None
IPv6 AutoConfig Mode.......................... Disabled
Burned In MAC Address......................... 00:24:81:D0:62:1F
```

See the example below for setting up dynamic (DHCP) IP addressing and static IP addressing on the Moonshot-45Gc/45XGc/180XGc switch.

```
<HP>system-view
[HP] interface m0/0/0

[HP-M-GigabitEthernet0/0/0] ip address 10.10.10.100 255.255.0.0  (Static IP addressing)

[HP] ip route-static 0.0.0.0 0.0.0.0 10.10.10.1 (Default Gateway IP address is 10.10.10.1)
[HP-M-GigabitEthernet0/0/0] ip address dhcp-alloc  (Dynamic IP addressing)
[HP]save
```

```
The current configuration will be written to the device. Are you sure? [Y/N]: y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
[HP] quit
```

In the case of dhcp , the ip can be obtained by

```
<HP>display interface m0/0/0 brief
Brief information on interface(s) under route mode:
Link: ADM - administratively down; Stby – standby
Protocol: (s) – spoofing
Interface Link Protocol Main IP Description
M-GE0/0/0 UP UP 15.215.17.133
```

For more information, see the *HPE Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* and *HPE Moonshot-45G/180G Switch Module Administrator's Guide* on the **Hewlett Packard Enterprise website**.

Telnet/SSH

The SSH protocol specifies how clients securely connect to SSH servers, and the resulting encrypted link between them. Each SSH session creates a secure channel to send and receive data. SSH is a Telnet-like program for logging into and executing commands on a remote machine, which includes security with authentication, encryption, and data integrity features. After SSH is connected and authenticated, the command line interface becomes available.

CAUTION:
Before setting up Telnet/SSH, an authentication mode needs to be configured for VTY login users:

- For Moonshot-45G/180G Switches, see "Section 6: Configuring Security Features" in the HPE Moonshot-45G/180G Switch Module Administrator’s Guide.
- For Moonshot-45Gc/45XGc/180XGc Switches, see "Login overview" in the HPE Moonshot-45XGc Switch Fundamentals Configuration Guide.

CAUTION:
The following examples are for reference only. Keep network security in mind when using these commands and choosing passwords for Telnet/SSH.

Example: Enabling Telnet server over management interface (Moonshot-45G/180G Switches)

```
User:admin
Password:
(Routing) >enable
(Routing) #ip telnet server enable
(Routing) #configure
```

```
(Routing)(config) #aaa authentication enable MYLIST none
(Routing)(config) #line telnet
(Routing)(config-telnet) #enable authentication MYLIST
(Routing)(config-telnet) #exit
(Routing)(configure) #exit
(Routing) #write memory
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* and the *Moonshot-45G/180G Switch Module Administrator's Guide* on the **Hewlett Packard Enterprise website**.

Example: Enabling Telnet server over management interface (Moonshot-45Gc/45XGc/180XGc Switch)

```
<HP>system-view
```

System View: return to User View with Ctrl+Z.

```
[HP]telnet server enable
[HP]line vty 0
[HP-line-vty0]authentication-mode none
[HP-line-vty0]user-role network-admin
[HP-line-vty0]quit
[HP]quit
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/tuned_startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/tuned_startup.cfg exists, overwrite? [Y/N]: y
```

Validating file. Please wait...

```
Saved the current configuration to mainboard device successfully.
```

For more information, see the *HPE Moonshot-45XGc Switch Module CLI Command Reference Guide* and the *HPE Moonshot-45XGc Switch Module Administrator's Guide* on the **Hewlett Packard Enterprise website**.

Example: Setup SSH server over management interface (Moonshot-45G/180G Switches)

```
(Routing) #ip ssh server enable
(Routing) #configure
(Routing) (Config) #aaa authentication enable MYLIST enable
(Routing) (Config) #line ssh
(Routing) (Config-ssh) #enable authentication MYLIST
(Routing) (Config-ssh) #exit
(Routing) (Config) #exit
(Routing) #write mem
```

This operation may take a few minutes.

Management interfaces will not be available during this time.

```
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* and the *Moonshot-45G/180G Switch Module Administrator's Guide* on the **Hewlett Packard Enterprise website**.

Example: Setup SSH server over management interface (Moonshot-45Gc/45XGc/180XGc Switch)

```
<HP>system-view
System View: return to User View with Ctrl+Z.
[HP]ssh server enable
[HP]public-key local create rsa
The range of public key modulus is (512 ~ 2048).
If the key modulus is greater than 512, it will take a few minutes.
Press CTRL+C to abort.
Input the modulus length [default = 1024]:
Generating Keys...
.....................++++++
.....................................++++++
.................++++++++
...++++++++
Create the key pair successfully.
[HP]user-interface vty 0 15
[HP-line-vty0-15]authentication-mode scheme
[HP-line-vty0-15]protocol inbound ssh
[HP-line-vty0-15]quit
[HP]local-user admin
New local user added.
[HP-luser-manage-admin]password simple password
[HP-luser-manage-admin]service-type ssh
[HP-luser-manage-admin]authorization-attribute user-role network-admin
[HP-luser-manage-admin]quit
[HP]quit
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
```

```
Validating file. Please wait...

Saved the current configuration to mainboard device successfully.
```

For more information, see the *HPE Moonshot-45XGc Switch Fundamentals Guide* on the **Hewlett Packard Enterprise website**.

Updating the firmware

All switches have specific switch firmware:

- Satellite Controller—The management interface on the switches and cartridges
- Cartridge Data—Tells the Chassis Manager which switch is installed and its features.

The cartridges and Chassis Manager have similar firmware bits that can be updated with the switches through the Moonshot Component Pack. Periodically, new component packs that might introduce new features will be released. Be sure to check back to see if there are any updates or added features that might be applicable to your product.

You can access released firmware from the **Hewlett Packard Enterprise website**.

There are different ways to update the switch firmware:

- Chassis Manager has the ability to flash the Moonshot-45G Switch and Moonshot-180G Switch firmware by either storing the flash image from a Web server or directly from the Web server.
- To update firmware using the Chassis Manager, you need an HTTP/HTTPS Web server accessible to the iLO Chassis Manager MGMT port on the Chassis Manager. You can either upload the firmware to the Chassis Manager internal storage and then deploy it to the switches or you can deploy it directly from the Web server. You can update the switches individually ("SA" or "SB") or both sequentially ("SA-B"). The firmware image is a binary file with a .bin file extension.

The Moonshot–45Gc/45XGc/180XGc Switches must be updated using either a tftp, scp, or ftp/sftp server through the switch management interface. The firmware image is a binary file with a .jpe file extension. Confirm the type of switch you have installed. See "**Identifying your hardware and firmware**."

If a switch is part of an IRF or is stacked, be sure to review the following guidelines:

- Stacked switch configurations — Be sure to update the firmware on the switch assigned as the master.
- IRF switch configurations — Be sure to update the firmware for all switches by using "all" in the command instead of "slot 1." To update firmware, use the commands as follows:
  - All switches: `boot-loader file flash:/Switch_FW_180XGc_T2421.ipe all main`
  - A single switch (slot 1): `boot-loader file flash:/Switch_FW_180XGc_T2421.ipe slot 1 main`

  For more information, see "**Example: Moonshot-45Gc/45XGc/180XGc switch firmware update**."

For more firmware update information for the Moonshot-45G/180G Switches, see the **Hewlett Packard Enterprise website**.

Example: Moonshot-45G/180G switch firmware update

To update firmware using the chassis manager, an HTTP/HTTPS Web server accessible to the iLO Chassis Manager MGMT port on the chassis manager is required. The firmware can be uploaded to the chassis manager internal storage and then deployed to the switches, or the firmware can be deployed it directly from the Web server. Switches can be updated individually ("SA" or "SB") or both sequentially ("SA-B").

Repository method

```
hpiLO-> add firmware file http://myserver/path/to/firmware.file
Upload complete: Firmware_File_Header_Name
hpiLO-> update firmware Firmware_File_Header_Name sa
Reading file from iLO Chassis Manager repository
```

```
Switch A
     Updating Firmware File Header Name
     Update Status: 100% complete
     Update Complete
```

Web server method

```
hpiLO->update firmware http://myserver/path/to/firmware.file sa
Reading file from network
Switch A
     Updating Firmware File Header Name
     Update Status: 100% complete
```

To complete the switch FW update, the boot code and the CPLD images need to be updated. Using the switch CLI, the CPLD update checks to see if an update needs to be performed. Log into the switch and use the information below as an example for updating the boot code and CPLD images:

```
    (Routing) #update bootcode
    Updating boot code, please wait a few seconds... Success!
    (Routing) #
```

Always save any configuration changes before the update CPLD command is executed. When the CPLD firmware is updated, the switch automatically reboots so that the new CPLD firmware is used. The following example shows the output of the `update CPLD` command:

```
    (Routing) #update cpld
    The CPLD update takes about 10 minutes and the switch will automatically
power cycle.
    Do you want to continue? (y/n) y
    Device #2 Silicon ID is ALTERA04(01)
    Device #1 Silicon ID is ALTERA04(00)
    erasing MAXII device(s)...
    erasing MAXII UFM block...
    erasing MAXII CFM block...
    programming CFM block...
    programming UFM block...
    verifying CFM block...
    verifying UFM block...
    DONE
```

Please wait for the switch to power cycle for the updates to take effect. The following example shows the output of the update CPLD command if no CPLD firmware needs to be updated:

```
    (Routing) #update cpld
    No CPLD update found!
    (Routing) #
```

The command shown in the example below displays information about the currently installed CPLD firmware code versions as well as the versions available for installation by using the update CPLD command.

```
    (Routing) #show cpld versions
    Management Module  Installed CPLD: 0x23   Available CPLD: 0x23
    Fabric Module  Installed CPLD: 0x0e   Available CPLD: 0x0e
    Faceplate Module  Installed CPLD: 0x09   Available CPLD: 0x0a
```

For more information, see the *Moonshot iLO Chassis Management CLI User Guide* on the **Hewlett Packard Enterprise website**.

Example: Moonshot-45Gc/45XGc/180XGc switch firmware download - TFTP, SCP, FTP/SFTP

To update the firmware, you will need an FTP server.

TFTP – tftp <Server IP> get <Remote Filename> <Local Filename>

<HP> **tftp 127.0.0.1 get Switch_FW_45Gc_45XGc_E2421.ipe local_ Switch_FW_45Gc_45XGc_E2421.ipe**

Press CTRL+C to abort.

% Total % Received % Xferd Average Speed Time Time Time Current

Dload Upload Total Spent Left Speed

38 59.7M 38 22.8M 0 0 187k 0 0:05:25 0:02:04 0:03:21 193k

SCP – scp <Server IP> get <Remote Filename> <Local Filename>

<HP> **scp serv.<your.domain>.<exmpl> get Switch_FW_45Gc_45XGc_E2421.ipe**

Username: username

Connecting to 16.84.189.36 port 22.

The server is not authenticated. Continue? [Y/N]: **y**

Do you want to save the server public key? [Y/N]: **y**

user@192.168.1.36's password: **password** <this field is hidden>

Switch_FW_45Gc_45XGc_E2421.ipe 100% 60MB 711.1KB/s 01:26

FTP/SFTP – ftp <FTP Server Address> / sftp <FTP Server Address>

This server uses standard POSIX FTP client syntax. For more information on how to use the FTP client, see this helpful **website**.

<HP> **ftp your.ftpserver.domain.net**

Press CTRL+C to abort.

Connected to fserv.<Your.Domain>.<exmpl> (192.168.1.36).

220 (vsFTPd 2.3.5)

User (serv.net:(none)): **username**

331 Please specify the password.

Password: **password** <this field is hidden>

230 Login successful.

Remote system type is UNIX.

Using binary mode to transfer files.

ftp> **dir**

227 Entering Passive Mode (192,168,1,36,153,245).

150 Here comes the directory listing.

-rw-r--r-- 1 0 0 62619648 Feb 10 16:51 Switch_FW_45XGc_7.1.045.E2407.ipe

226 Directory send OK.

ftp> **get Switch_FW_45Gc_45XGc_E2421.ipe**

Switch_FW_45XGc_7.1.045.E2407.ipe already exists. Overwrite it? [Y/N]: y

227 Entering Passive Mode (192,168,1,36,218,185).

150 Opening BINARY mode data connection for Switch_FW_45XGc_7.1.045.E2407.ipe (62619648 bytes).

226 Transfer complete.

62619648 bytes received in 65.4 seconds (935.4 kbyte/s)

ftp> **quit**

221 Goodbye.

Example: Moonshot-45Gc/45XGc/180XGc switch firmware update

IMPORTANT:
When updating the firmware for switches within an IRF, be sure to update all switches in the IRF instead of a single switch. To update all switches, replace "slot 1" with "all" in the following command: `boot-loader file flash:/Switch_FW_180XGc_T2421.ipe all main`

After downloading the Comware image file to the switch internal flash memory, install the file using the bootloader command for a single switch. To update all switches in an IRF, replace "slot 1" with "all" in the command below.

<HP> **boot-loader file flash:/Switch_FW_45Gc_45XGc_E2421.ipe slot 1 main**

Verifying the file flash: /switch_fw_45gc_45xgc_e2421.ipe on slot 1....Done.

HP Moonshot-45XGc Switch images in IPE:

NOTE:

In the previous example, the final statement will read Moonshot-45Gc Switch when a Moonshot-45Gc switch is installed.

moonshot-45xgc-cmw710-boot-e2421.bin

moonshot-45xgc-cmw710-system-e2421.bin

This command will set the main startup software images. Continue? [Y/N]:y

Add images to slot 1.

Decompressing file moonshot-45xgc-cmw710-boot-e2421.bin to flash:/
moonshot-45xgc-cmw710-boot-e2421.bin.......Done.

Decompressing file moonshot-45xgc-cmw710-system-e2421.bin to flash:/
moonshot-45xgc-cmw710-system-
e2421.bin.....Done.

Decompression completed.

You are recommended to delete the .ipe file after you set startup software images for all slots.

Do you want to delete flash:/switch_fw_45gc_45xgc_e2421.ipe now? [Y/N]:**y**

The images that have passed all examinations will be used as the main startup software images at the next reboot on slot 1.

```
<HP> reboot
Start to check configuration with next startup configuration file, please
wait.........DONE!
Current configuration may be lost after the reboot, save current configuration?
[Y/N]: y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
The file name is invalid(does not end with .cfg)!
This command will reboot the device. Continue? [Y/N]: y
Now rebooting, please wait...
%Feb 11 01:13:02:180 2014 HP DEV/5/SYSTEM_REBOOT: System is rebooting now.
```

Always save any configuration changes before the `cpld update` command is executed. When the CPLD firmware is updated, the switch automatically reboots so that the new CPLD firmware is used. The following example shows the output of the `cpld update` command:

```
<HP>cpld update
CPLD update start .....................
Management module CPLD update: Succeeded!
.............
Fabric and uplink module CPLD update: Succeeded!
Switch is being automatically power cycled!
<HP>
```

Please wait for the switch to power cycle for the updates to take effect. The following example shows the output of the `cpld update` command if no CPLD firmware needs to be updated:

```
<HP>cpld update
CPLD update start ...
Management module CPLD update: Not required and skipped!
.
Fabric and uplink module CPLD update: Not required and skipped!
<HP>
```

For more information, see the *Moonshot-45XGc Switch Fundamentals Command Reference* on the **Hewlett Packard Enterprise website**.

Moonshot-45Gc/45XGc/180XGc switch firmware update via iLO CM

To update firmware using the chassis manager, an HTTP web server accessible to the iLO Chassis Manager MGMT port on the chassis manager is required.

NOTE:

The iLO CM must be running firmware version 1.53 or later. Both the A and B switches must be updated, unless they are part of the same IRF, as described later in this section.

The switch firmware files with the IPE and corresponding BIN extensions must be copied to the web server. Either file can be specified in the iLO CM command that updates the switch firmware. The iLO CM validates the BIN file and instructs the switch firmware to retrieve the IPE payload file from the web server. The

following example command shows how to update switch SA by specifying the BIN file located in the specified directory:

```
hpiLO-> update firmware http://myserver/path/MOONSHOT_SWITCH_FW-CMW710-
R2432P02.signed.bin sa
Reading file from network
The switch firmware will be updated now but the new firmware will not activate
until the switch is rebooted. Please save any configuration changes.
Updating Moonshot Switch Firmware Ver 7.1.045, Release 2432P02
```

After the firmware is updated, save the switch configuration, if needed, and use the iLO CM Virtual Serial Port to reboot the switch from its command line interface using the **`reboot`** command to activate the new firmware. The new firmware will not be active until the switch is rebooted.

NOTE:

Powering down the switch with a CM **`power`** or **`reset`** command is not recommended as doing so will power-cycle a single switch instead of an IRF. In addition, any unsaved configuration changes will be lost.

If there is not enough flash memory, the firmware update will fail with a message indicating that condition. Free up room as described in **How to free up flash space on a Moonshot 45Gc/45XGc/180XGc switch**.

When updating an IRF cluster of switches, only update the master. If the current running firmware version is F2428, updating a subordinate IRF member will result in failure. When the IRF cluster is rebooted from the switch console using the **reboot** command, all members will reboot, and the master will update the remaining switches to the new firmware at that time. If the current running firmware is R2432P02 or later, any one of the IRF members can be updated, which will cause all IRF members to be updated to the new firmware. It is not necessary to update more than one IRF member since the IRF master will ensure that all members are running the same code

If necessary, updating the CPLDs must be done separately using the **cpld update** command.

How to free up flash space on a Moonshot 45Gc/45XGc/180XGc switch

A firmware upgrade may fail if there is insufficient space to store the image file in the flash directory of the switch. To free up room, delete old firmware versions, including .bin and .ipe files. Files with the ipe extension may be deleted after they are unpacked to the .bin files of that firmware version.

The **delete filename** command moves a file to the recycle bin and does not free up flash space. The recycle bin is a folder named .trash in the root directory of the switch. To view files in a recycle bin, use the command **dir .trash** in the root flash directory of the switch.

To empty the recycle bin, use the command **reset recycle-bin**.

To delete a file permanently without sending it to the recycle bin, use the command **delete /unreserved filename**.

To restore a file from the recycle bin, use the command **undelete filename**.

IRF

When IRF is configured, the above commands will only work on the master, regardless of which switch the user is logged into.

To look at the directory on a particular IRF member, use the command `cd slot1#flash:`, `cd slot2#flash:`, and so on. A `dir` command will then show the files in that member with the slot number at the top. Deleting files and the recycle bin can be accomplished on each member as described above after the directory is changed.

Troubleshooting IP address setup

The examples in this section can help with network troubleshooting and remote access for Moonshot manageability.

Example: Moonshot-45G/180G PING test

Follow these steps to use IP PING test from the switch management CLI to verify connectivity to the Chassis Manager IP address.

```
(Routing) #ping 192.168.2.102
Pinging 192.168.2.102 with 0 bytes of data:

Reply From 192.168.2.102: icmp_seg = 0. time = 898 usec.
Reply From 192.168.2.102: icmp_seg = 1. time = 350 usec.
Reply From 192.168.2.102: icmp_seg = 2. time = 239 usec.

----192.168.2.102 PING statistics----
3 packets transmitted, 3 packets received, 0% packet loss
round-trip (msec) min/avg/max - 0/1/2

(Routing) #
```

Example: Moonshot-45Gc/45XGc/180XGc PING test

Perform the following to use IP PING test from the switch management CLI to verify connectivity to the Chassis Manager IP address:

```
<HP>ping 192.168.2.102
Ping 192.168.2.102 (192.168.2.102): 56 data bytes, press CTRL C to break
56 bytes from 192.168.2.102: icmp_seg = 0 ttl=255 time = 1.257 ms
56 bytes from 192.168.2.102: icmp_seg = 1 ttl=255 time = 1.594 ms
56 bytes from 192.168.2.102: icmp_seg = 2 ttl=255 time = 1.619 ms
56 bytes from 192.168.2.102: icmp_seg = 3 ttl=255 time = 1.637 ms
56 bytes from 192.168.2.102: icmp_seg = 4 ttl=255 time = 1.621 ms

----Ping statistics for 192.168.2.102----
5 packet(s) transmitted, 5 packet(s) received, 0.0% packet loss
round-trip min/avg/max/std-dev = 1.257/1.546/1.637/0.145 ms
```

Example: Chassis Manager PING test

Following are a few common steps that can help with network troubleshooting and remote access for Moonshot manageability.

When configuring a static IP address for the Chassis Manager Management access, set the Subnet Mask and gateway. When connecting an SSH session, ensure that both systems are on the same gateway.

```
hpiLO-> show chassis info
```

```
Chassis Information:

iLO Chassis Manager: 1.20
  CLI Version: 2.2
  Chassis Name: ILOCN63170FET
  Chassis Manager (switch A-B):
         IP: 192.168.2.102 / 255.255.255.0
         MAC: a4:5d:36:b7:bc:58
  Asset Tag:
  Product Name: HP Moonshot 1500 Chassis
Serial Number: USE349M311
Product ID: 747049-B21
UUID: D161FF86-2E9C-5048-8B86-4B59DC367030
Switch A Remote Management Interface:
     IPv4: 192.168.2.110
     IPv6: Unavailable
     MAC:  2c:44:fd:e9:44:ce
Switch B Remote Management Interface:
     IPv4: 192.168.2.108
     IPv6: Unavailable
     MAC:  2c:44:fd:e9:46:01

[root@bemingus ~]# ping 192.168.2.102
PING 192.168.2.102 (192.168.2.102) 56(84) bytes of data.
64 bytes from 192.168.2.102: icmp_seq=1 ttl=255 time=0.934 ms
64 bytes from 192.168.2.102: icmp_seq=2 ttl=255 time=0.297 ms
64 bytes from 192.168.2.102: icmp_seq=3 ttl=255 time=0.253 ms
64 bytes from 192.168.2.102: icmp_seq=4 ttl=255 time=0.318 ms
64 bytes from 192.168.2.102: icmp_seq=5 ttl=255 time=0.328 ms
64 bytes from 192.168.2.102: icmp_seq=6 ttl=255 time=0.368 ms
64 bytes from 192.168.2.102: icmp_seq=7 ttl=255 time=0.309 ms
^C
--- 192.168.2.102 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6356ms
rtt min/avg/max/mdev = 0.253/0.401/0.934/0.219 ms

[root@bemingus ~]# ssh Administrator@192.168.2.102
Administrator@192.168.2.102's password:
User: Administrator logged-in to ILOCN63170FET.(192.168.2.102) at 15:00 Sep 18
2014
iLO Chassis Manager v1.20
CLI Version: 2.1

Type 'HELP' to display a list of valid commands.
Type 'HELP ALL' to display all commands in a tree format.
Type 'HELP <command>' to display detailed information about a specific command.
Type 'HELP HELP' to display more detailed information about the help system.
```

Adapters, cables, and splitters

Adapters, cables, and splitters overview

This section helps you understand, identify, and order the required components to connect your Moonshot networking to your infrastructure. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

Adapter types and their uses

The following table identifies what types of adapters there are and when to use them.

Adapter	Type	Media	Pros	Cons
SFP 1 GbE	1000BASE-T	CAT 5/5e/6/7 RJ-45 Connector	• Inexpensive • Common	Short Range
SFP 1 GbE	1000BASE-SX	OM 1/2/3/4 LC Connector	• Longer Range • Multi-vendor support	• More Expensive • Static Lengths
SFP+ 10 GbE	10GBASE-SR	OM 1/2/3/4 LC Connector	• Common • Multi-vendor support	Expensive
SFP+ 10 GbE	10GBASE-T	CAT 5e/6/7 RJ-45 Connector	Uses existing twisted pair networks	Not Yet Available
SFP+ 10 GbE	10 G DAC	Integrated	Lower Cost	• Short Range • Not multi-vendor compatible
SFP+ 10 GbE	10 G AOC	Integrated	Longer Range than DACs	Expensive
QSFP+ 40 GbE	40 G BASE-SR4	OM3/4 MPO Connector	Multi-vendor support	Expensive
QSFP+ 40 GbE	40 G DAC	Integrated	Lower Cost	• Short Range • Not multi-vendor compatible
QSFP+ 40 GbE	40 G AOC	Integrated	Longer Range than DACs	• Expensive • Not multi-vendor compatible

Table Continued

Adapter	Type	Media	Pros	Cons
QSFP+ 40 GbE	4 x 10 G to 40 G DAC	Integrated	• Can connect to SFP+ ports • Lower Cost	• Short Range • Not multi-vendor compatible
QSFP+ 40 GbE	4 x 10 G to 40 G AOC	Integrated	• Can connect to SFP+ ports • Longer Range than DACs	• Expensive • Not multi-vendor compatible

Port options for SFP/SFP+ uplink modules

This section includes common transceivers, adapters, and cables. To identify the components that are supported for each uplink module and output type, see the QuickSpecs for each module on the **Hewlett Packard Enterprise website**.

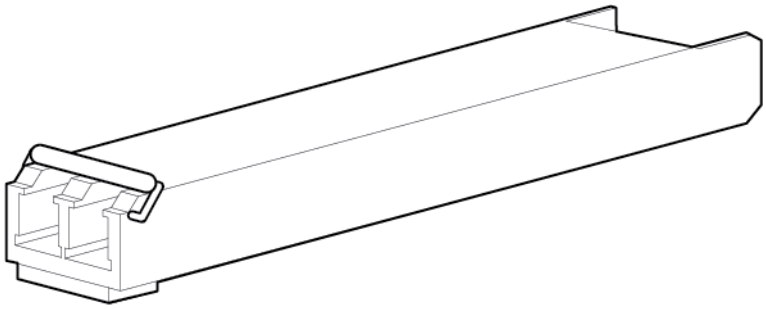
The transceivers and cables provided in this section are qualified and certified to work with this product. Transceiver and DAC cables from any manufacturer can be used, but have not been tested with the product.

- **SFP to 1000 Base SX Transceiver**

  SFP to LC

  HPE 1000Base-SX SFP (mini-GBIC) Module - 1 x 1000Base-SX

  Hewlett Packard Enterprise part number 453151-B21

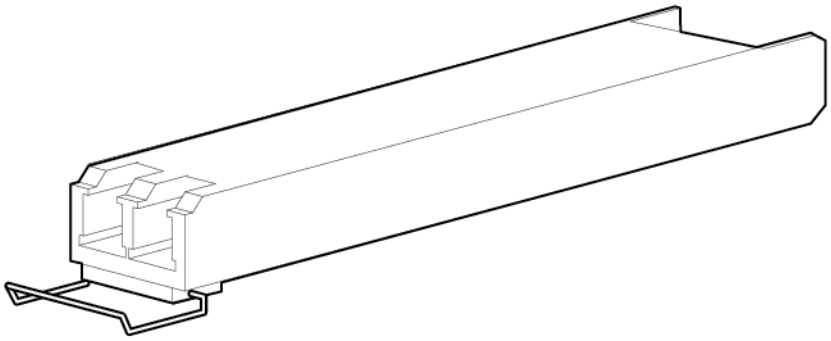


- **SFP to 1000 Base T Transceiver**

  SFP to RJ-45

  HPE 1000BaseT SFP (mini-GBIC) Module - 1 x 1000Base-T

  Hewlett Packard Enterprise part number 453154-B21

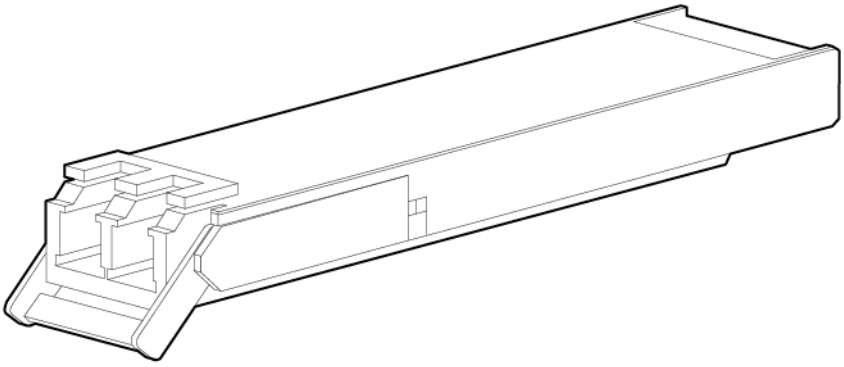


- **SFP+ to SR Transceiver**

  SFP+ to SR

  A 10-Gigabit transceiver in SFP+ form-factor for single-mode or multi-mode fibers

  Hewlett Packard Enterprise part number 455883-B21

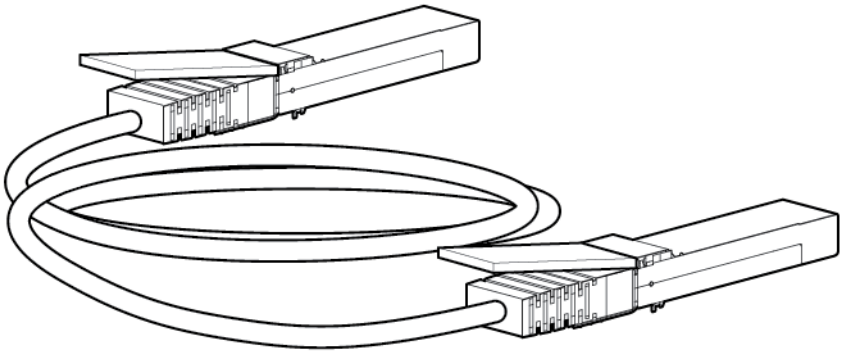


- **10GbE SFP+ to SFP+ Direct Attach Copper Cable**

  SFP+ to SFP+ in multiple lengths.

  Hewlett Packard Enterprise part numbers:

  - J9281B – 1m
  - J9283B – 3m
  - J9285B – 7m



For the latest information, see the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Port options for QSFP+ uplink modules

This section includes common transceivers, adapters, and cables. To identify the components that are supported for each uplink module and output type, see the QuickSpecs for each module on the **Hewlett Packard Enterprise website**.

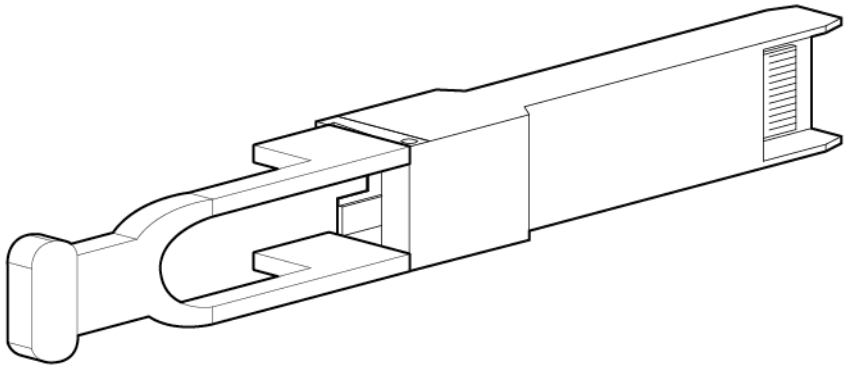
The transceivers and cables listed are qualified and certified to work with this product. Transceiver and DAC cables from any manufacturer can be used, but they have not been tested with the product.

- **40GBASE-SR4 Transceiver**

  QSFP to MPO

  Hewlett Packard Enterprise part number JG325B

  Comments: Requires 40 GB MPO fiber for this transceiver for use.

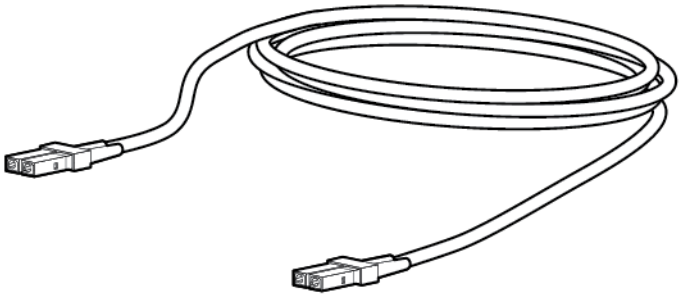


- Fiber Optic Cable used with the QSFP/MPO Transceiver.

  HPE Premier Flex MPO/MPO Multi-mode OM4 8 Fiber 50m Cable

  Hewlett Packard Enterprise part number QK731A

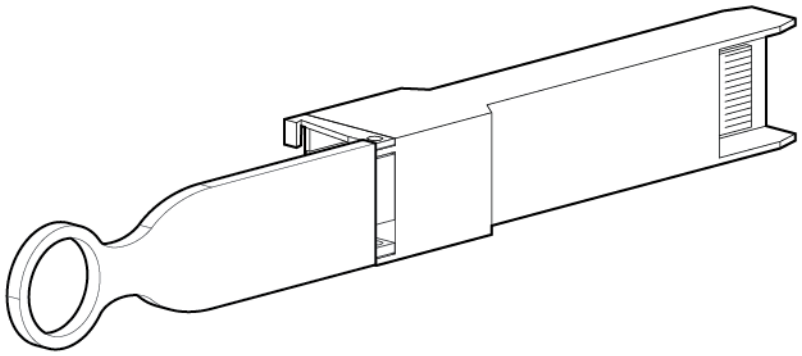
  Comments: Fragile cable. Use extra precaution when installing and or removing from infrastructure.



- **40GBASE – SFP+ Adapter**

  Hewlett Packard Enterprise part number 655874-B21

Comments: This turns one 40Gb QSFP+ port into one 10Gb SFP+ port and requires 1 SFP+ Module to connect. This is just the housing. See above. This 40Gb port must be configured to 4x10Gb mode. See "**Configuring uplinks**."



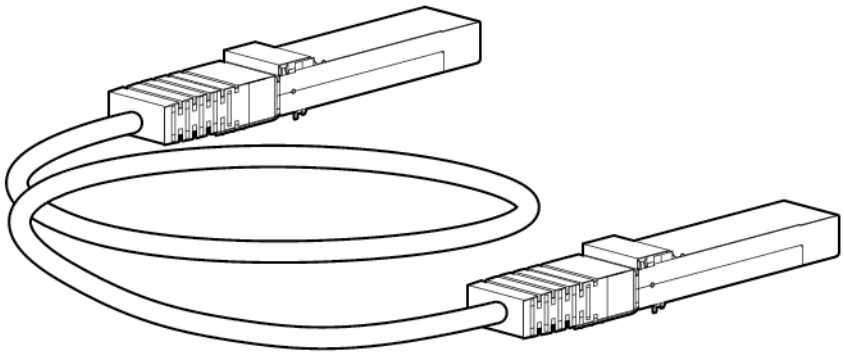
- **40GbE QSFP+ to QSFP+ Direct Attach Copper Cable**

  QSFP+ to QSFP+ in multiple lengths.

  part numbers:

  - JG326A – 1m
  - JG327A – 3m
  - JG328A – 5m

  Comments: Bulky cable



- **40GbE QSFP+ to 4x10G SFP+ Splitter Cable**

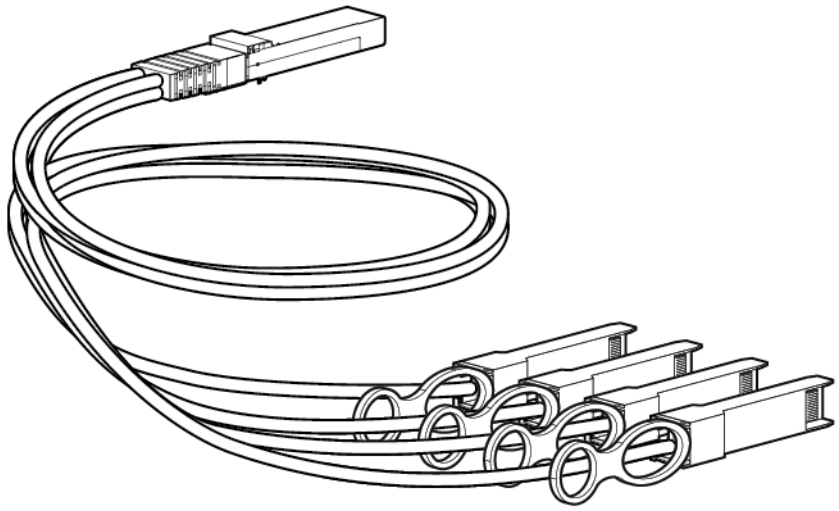
  QSFP+ to 4x SFP+ in multiple lengths.

  Does not require the SFP modules.

  part numbers:

  - JG329A – 1m
  - JG330A – 3m
  - JG331A – 5m

CAUTION:
: Avoid network loops. See, "**Network loops**."



For the latest information, see the product QuickSpecs on the **Hewlett Packard Enterprise website**.

Troubleshooting adapters, cables, and splitters

Following are some tips to help you avoid the most common errors when setting up and using the adapters, splitters, and so on when networking.

- Avoid network storms. When using the 4x10GbE splitter, be aware of your configuration to avoid network loops. For more information, see "**Network loops**."
- When using the 40GBase to SFP+ adapter, you must also order the SFP/SFP+ module.
- When using the 40GBase to SFP+ adapter, only one of the ports is available. That is, you will have 10G bandwidth and not 40G because it disconnects the other 3.
- The fiber cable is fragile. Handle with care.
- Use static bags and proper ESD protection when using these devices.
- The Hewlett Packard Enterprise devices listed in this document have been verified to work. Other devices can be used but warnings might occur and functionality is not verified.

Connectivity and port setup (production network)

Connectivity and port setup overview

This section helps you connect your Moonshot ports to external networks. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

The Ethernet Switches are top-loaded like the cartridges. These are considered the downlink modules. The uplinks are in the back of the chassis on each side of the Chassis Manager and above the power supply units. The switch does not completely boot-up until the uplink modules are installed with the downlink switch. If there is a mismatch between the Switch Downlink and Uplink Modules, the switch will power on, but it will not be able to connect. Standing at the rear of the chassis, the uplink module for Switch A is on the right of the chassis, while Switch B is on the left.

Each node on a cartridge has at least two NICs ports, eth0 for Switch A and eth1 for Switch B. The switches can either be placed into redundant mode or stacked. For more information, see "**Switch stacking and IRF fabrics**," which shows the simplified network connectivity to each switch from a single and quad node cartridge.

Port naming conventions

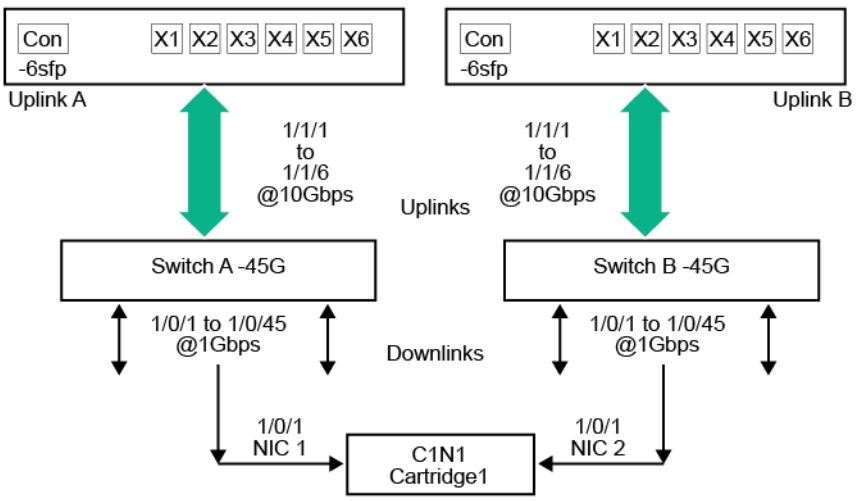
This section includes diagrams to illustrate port naming conventions for Moonshot Switch configurations.

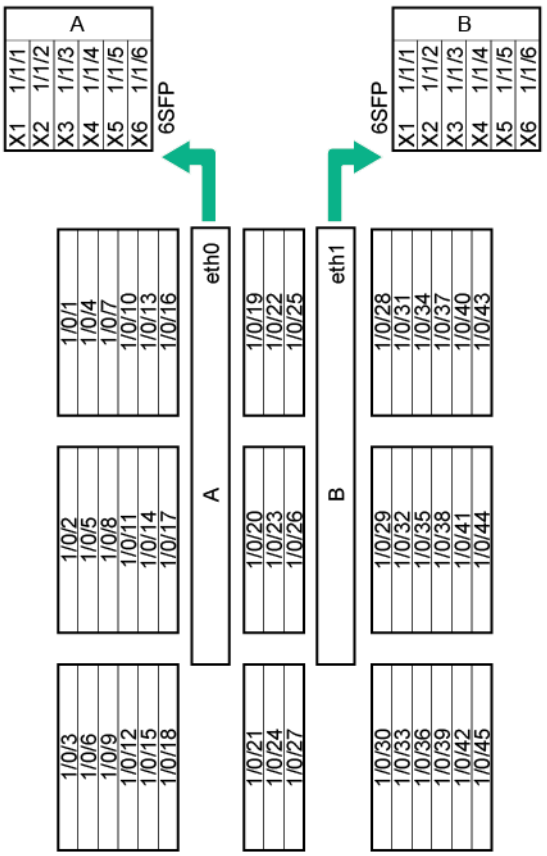
45G and 45Gc port naming convention with -6SFP uplink module

The following diagram illustrates how the 45 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-6SFP uplink module, has 6 uplink ports of 10 Gbps (1/1/1 to 1/1/6) in the backend and 45 downlink ports (1/0/1 to 1/0/45) at 1 Gbps internally to cartridges.

This uplink module can use any of the following:

- 10 Gb SFP+ to SFP+ DAC cable
- SFP+ to SR transceiver
- SFP to 1000Base-T transceiver
- SFP to 1000Base-SX transceiver



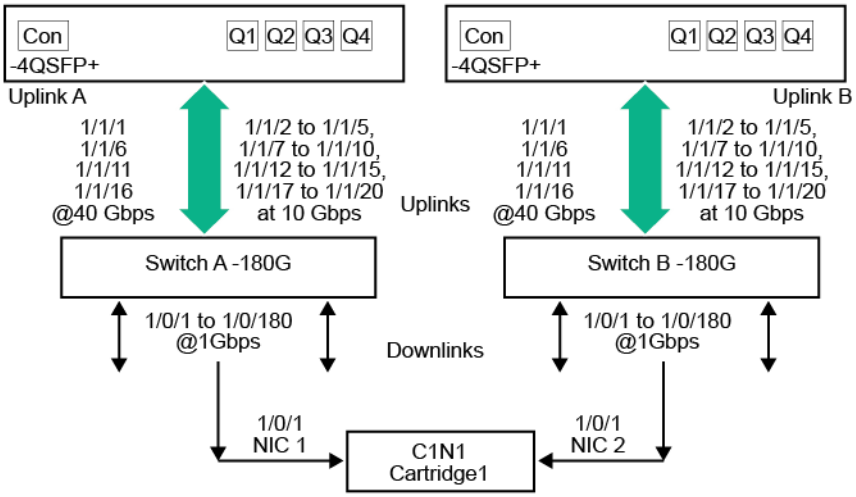


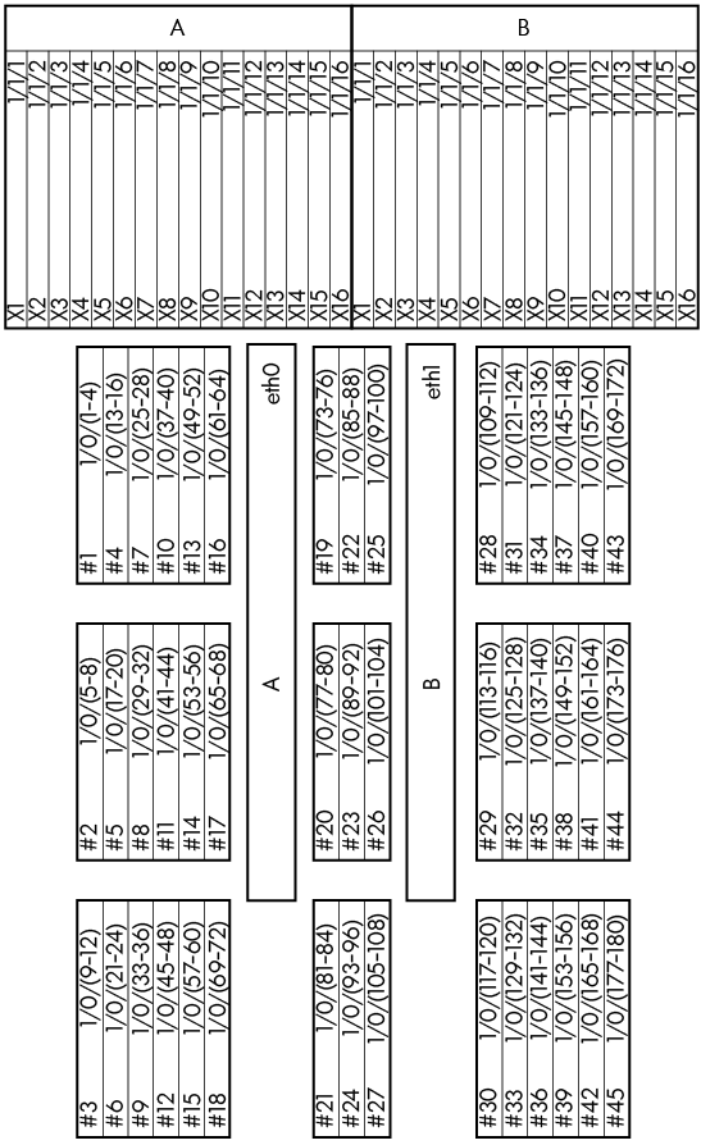
180G port naming convention with -4QSFP+ uplink module

The following diagram illustrates how the 180 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-4QSFP+ uplink module, has 4 uplink ports of 40 Gbps (1/1/1, 1/1/6, 1/1/11, 1/1/16) in the backend and 180 downlink ports (1/0/1 to 1/0/180) at 1 Gbps internally to cartridges. Each of these four QSFP+ ports can also be configured into 4 x 10 Gb ports.

This uplink module can use any of the following:

- 40 Gb QSFP+ cable
- Splitter cable (QSFP+ to SFP+ 4 x 10 Gb)
- 40 Gb to 10 Gb adapter


Con
-4QSFP+
Q1 Q2 Q3 Q4
Uplink A
1/1/1
1/1/6
1/1/11
1/1/16
@40 Gbps
1/1/2 to 1/1/5,
1/1/7 to 1/1/10,
1/1/12 to 1/1/15,
1/1/17 to 1/1/20
at 10 Gbps
Uplinks
Uplink B
Switch A -180G
Switch B -180G
1/0/1 to 1/0/180
@1Gbps
Downlinks
1/0/1
NIC 1
1/0/1
NIC 2
C1N1
Cartridge1

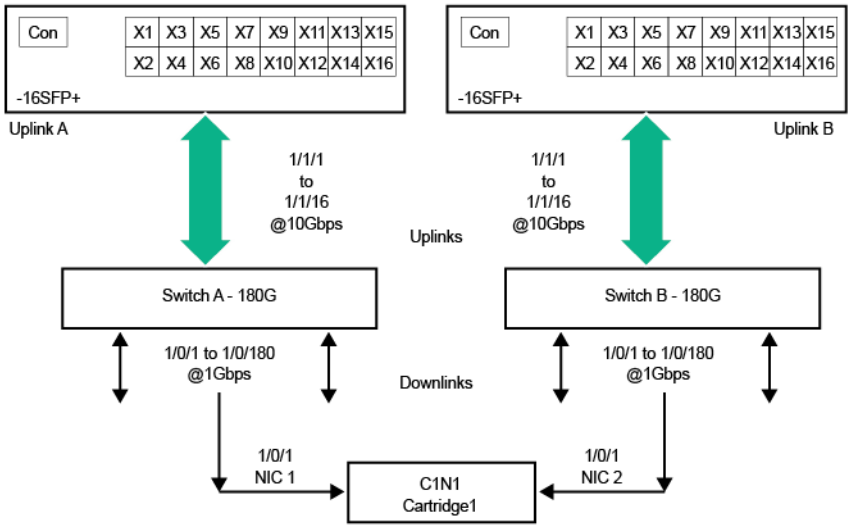

A
B
X1 1/1/1
X2 1/1/2
X3 1/1/3
X4 1/1/4
X5 1/1/5
X6 1/1/6
X7 1/1/7
X8 1/1/8
X9 1/1/9
X10 1/1/10
X11 1/1/11
X12 1/1/12
X13 1/1/13
X14 1/1/14
X15 1/1/15
X16 1/1/16
eth0
A
eth1
B
#1 1/0/(1-4)
#4 1/0/(13-16)
#7 1/0/(25-28)
#10 1/0/(37-40)
#13 1/0/(49-52)
#16 1/0/(61-64)
#19 1/0/(73-76)
#22 1/0/(85-88)
#25 1/0/(97-100)
#28 1/0/(109-112)
#31 1/0/(121-124)
#34 1/0/(133-136)
#37 1/0/(145-148)
#40 1/0/(157-160)
#43 1/0/(169-172)
#2 1/0/(5-8)
#5 1/0/(17-20)
#8 1/0/(29-32)
#11 1/0/(41-44)
#14 1/0/(53-56)
#17 1/0/(65-68)
#20 1/0/(77-80)
#23 1/0/(89-92)
#26 1/0/(101-104)
#29 1/0/(113-116)
#32 1/0/(125-128)
#35 1/0/(137-140)
#38 1/0/(149-152)
#41 1/0/(161-164)
#44 1/0/(173-176)
#3 1/0/(9-12)
#6 1/0/(21-24)
#9 1/0/(33-36)
#12 1/0/(45-48)
#15 1/0/(57-60)
#18 1/0/(69-72)
#21 1/0/(81-84)
#24 1/0/(93-96)
#27 1/0/(105-108)
#30 1/0/(117-120)
#33 1/0/(129-132)
#36 1/0/(141-144)
#39 1/0/(153-156)
#42 1/0/(165-168)
#45 1/0/(177-180)

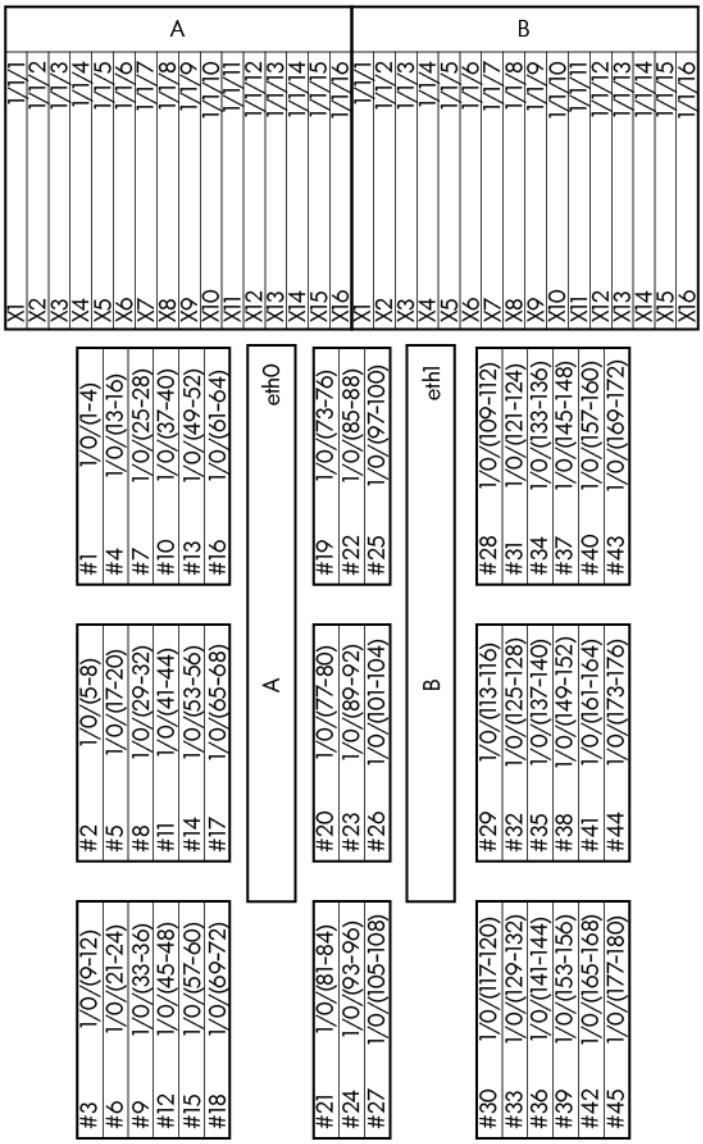
180G port naming convention with -16SFP+ uplink module

The following diagram illustrates how the 180 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-16SFP+ uplink module, has 16 uplink ports of 10 Gbps (1/1/1 to 1/1/16) in the backend and 180 downlink ports (1/0/1 to 1/0/180) at 1 Gbps internally to cartridges.

This uplink module can use any of the following:

- 10 Gb SFP+ to SFP+ DAC cable
- SFP+ to SR transceiver
- SFP to 1000Base-T transceiver
- SFP to 1000Base-SX transceiver



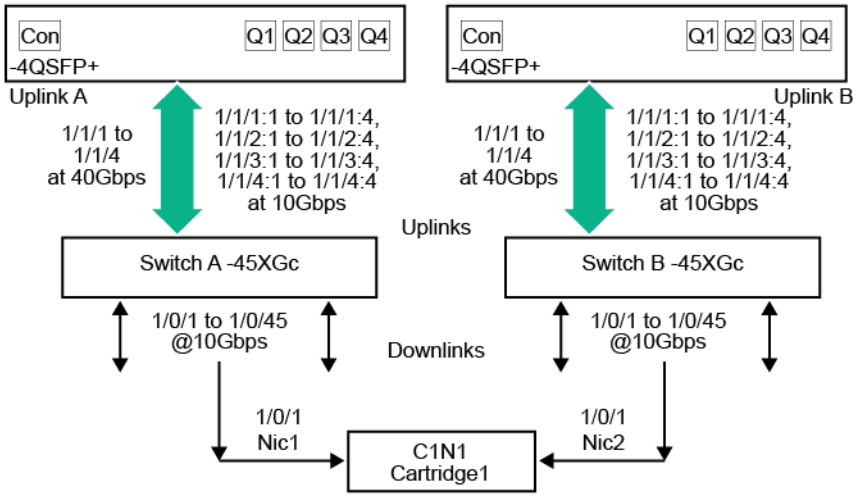


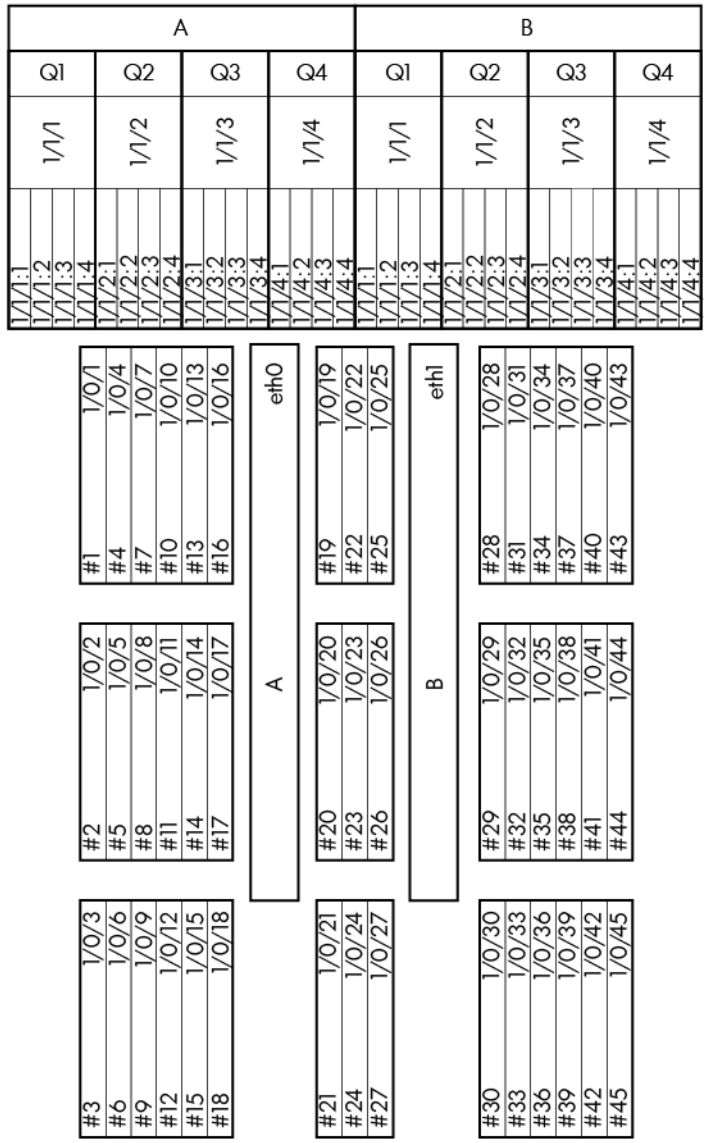
45XGc port naming convention with -4QSFP+ uplink module

The following diagram illustrates how the 45 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-4QSFP+ uplink module, has 4 uplink ports of 40 Gbps (1/1/1, 1/1/2, 1/1/3, 1/1/4) in the backend and 45 downlink ports (1/0/1 to 1/0/45) at 10 Gbps internally to cartridges. Each of these four QSFP+ ports can also be configured into 4 x 10 Gb SFP+/SFP ports.

This uplink module can use any of the following:

- 40 Gb QSFP+ cable
- Splitter cable (QSFP+ to SFP+ 4 x 10 Gb)
- 40 Gb to 10 Gb adapter


Con
-4QSFP+
Q1 Q2 Q3 Q4
Uplink A
1/1/1 to 1/1/4 at 40Gbps
1/1/1:1 to 1/1/1:4, 1/1/2:1 to 1/1/2:4, 1/1/3:1 to 1/1/3:4, 1/1/4:1 to 1/1/4:4 at 10Gbps
Uplinks
Switch A -45XGc
1/0/1 to 1/0/45 @10Gbps
Downlinks
1/0/1 Nic1
C1N1 Cartridge1
Con
-4QSFP+
Q1 Q2 Q3 Q4
Uplink B
1/1/1 to 1/1/4 at 40Gbps
1/1/1:1 to 1/1/1:4, 1/1/2:1 to 1/1/2:4, 1/1/3:1 to 1/1/3:4, 1/1/4:1 to 1/1/4:4 at 10Gbps
Switch B -45XGc
1/0/1 to 1/0/45 @10Gbps
1/0/1 Nic2

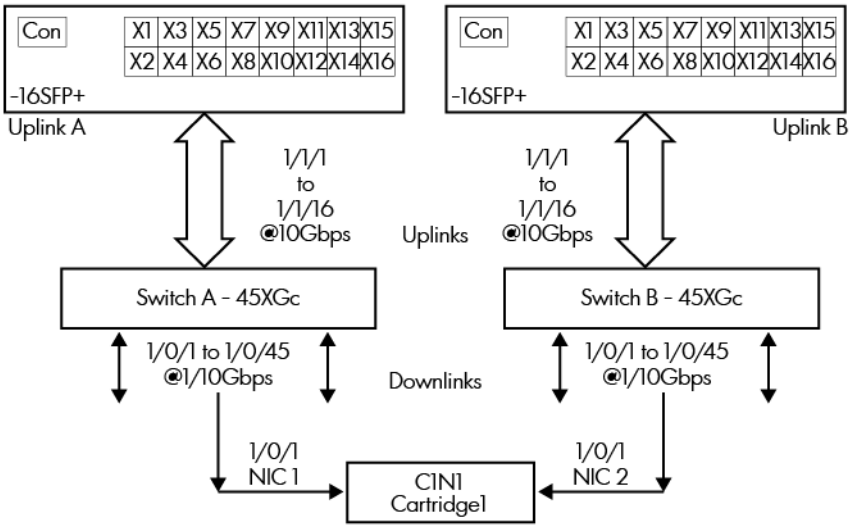

A
B
Q1 Q2 Q3 Q4
1/1/1 1/1/2 1/1/3 1/1/4
1/1/1:1 1/1/1:2 1/1/1:3 1/1/1:4
1/1/2:1 1/1/2:2 1/1/2:3 1/1/2:4
1/1/3:1 1/1/3:2 1/1/3:3 1/1/3:4
1/1/4:1 1/1/4:2 1/1/4:3 1/1/4:4
1/0/1 1/0/4 1/0/7 1/0/10 1/0/13 1/0/16
#1 #4 #7 #10 #13 #16
1/0/2 1/0/5 1/0/8 1/0/11 1/0/14 1/0/17
#2 #5 #8 #11 #14 #17
1/0/3 1/0/6 1/0/9 1/0/12 1/0/15 1/0/18
#3 #6 #9 #12 #15 #18
eth0
A
1/0/19 1/0/22 1/0/25
#19 #22 #25
1/0/20 1/0/23 1/0/26
#20 #23 #26
1/0/21 1/0/24 1/0/27
#21 #24 #27
eth1
B
1/0/28 1/0/31 1/0/34 1/0/37 1/0/40 1/0/43
#28 #31 #34 #37 #40 #43
1/0/29 1/0/32 1/0/35 1/0/38 1/0/41 1/0/44
#29 #32 #35 #38 #41 #44
1/0/30 1/0/33 1/0/36 1/0/39 1/0/42 1/0/45
#30 #33 #36 #39 #42 #45

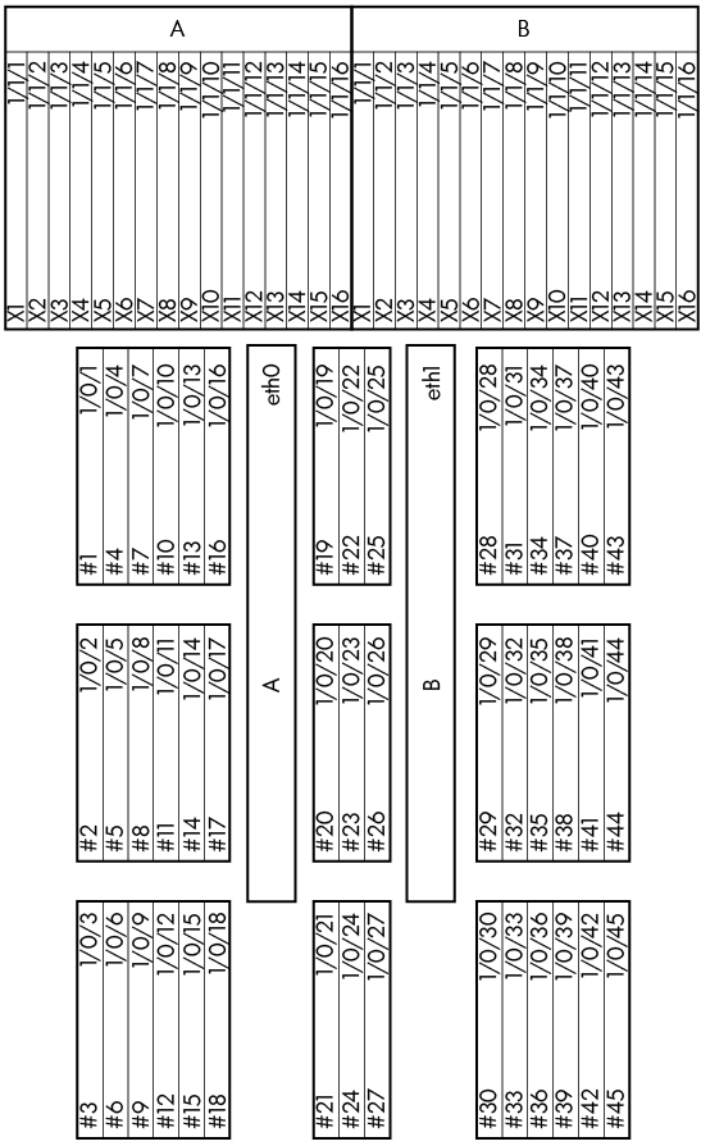
45XGc port naming convention with -16SFP+ uplink module

The following diagram illustrates how the 45 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-16SFP+ uplink module, has 16 uplink ports of 10 Gbps (1/1/1 to 1/1/16) in the backend and 45 downlink ports (1/0/1 to 1/0/45) at 1/10 Gbps internally to cartridges.

This uplink module can use any of the following:

- 10 Gb SFP+ to SFP+ DAC cable
- SFP+ to SR transceiver
- SFP to 1000Base-T transceiver
- SFP to 1000Base-SX transceiver



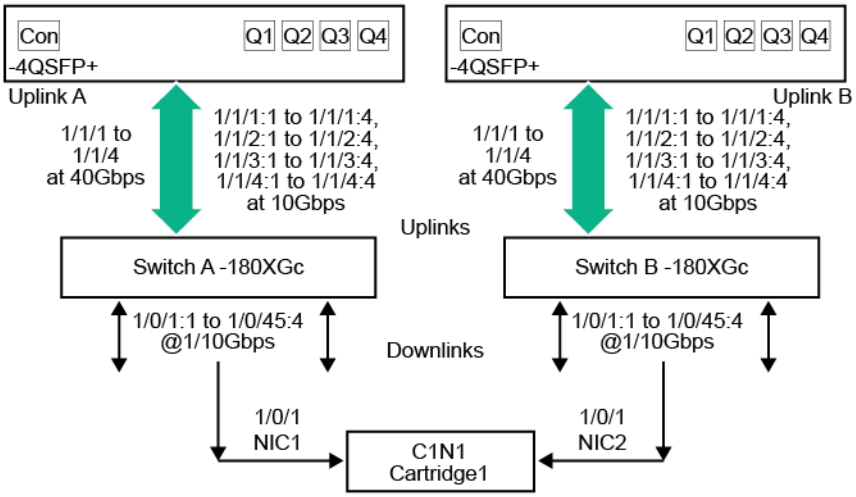


180XGc port naming convention with -4QSFP+ uplink module

The following diagram illustrates how the 180 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-4QSFP+ uplink module, has 4 uplink ports of 40 Gbps (1/1/1, 1/1/2, 1/1/3, 1/1/4) in the backend and 180 downlink ports (1/0/1:1 to 1/0/45:4) at 1/10 Gbps internally to cartridges. Each of these four QSFP+ ports can also be configured into 4 x 10 Gb SFP+/SFP ports.

This uplink module can use any of the following:

- 40 Gb QSFP+ cable
- Splitter cable (QSFP+ to SFP+ 4 x 10 Gb)
- 40 Gb to 10 Gb adapter



A				B			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1/1/1	1/1/2	1/1/3	1/1/4	1/1/1	1/1/2	1/1/3	1/1/4
1/1/1:1	1/1/2:1	1/1/3:1	1/1/4:1	1/1/1:1	1/1/2:1	1/1/3:1	1/1/4:1
1/1/1:2	1/1/2:2	1/1/3:2	1/1/4:2	1/1/1:2	1/1/2:2	1/1/3:2	1/1/4:2
1/1/1:3	1/1/2:3	1/1/3:3	1/1/4:3	1/1/1:3	1/1/2:3	1/1/3:3	1/1/4:3
1/1/1:4	1/1/2:4	1/1/3:4	1/1/4:4	1/1/1:4	1/1/2:4	1/1/3:4	1/1/4:4

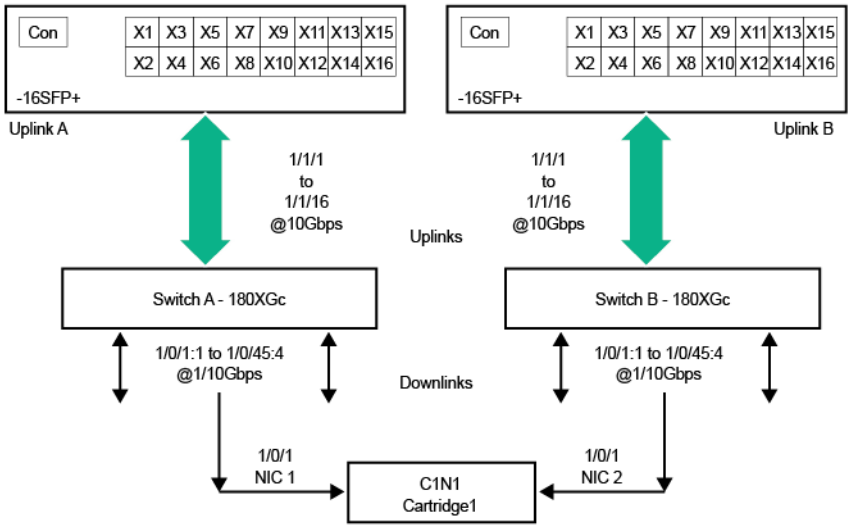
#1	1/0/(1:1-1:4)	#2	1/0/(2:1-2:4)	#3	1/0/(3:1-3:4)	A	eth0	#19	1/0/(19:1-19:4)	#20	1/0/(20:1-20:4)	#21	1/0/(21:1-21:4)
#4	1/0/(4:1-4:4)	#5	1/0/(5:1-5:4)	#6	1/0/(6:1-6:4)			#22	1/0/(22:1-22:4)	#23	1/0/(23:1-23:4)	#24	1/0/(24:1-24:4)
#7	1/0/(7:1-7:4)	#8	1/0/(8:1-8:4)	#9	1/0/(9:1-9:4)			#25	1/0/(25:1-25:4)	#26	1/0/(26:1-26:4)	#27	1/0/(27:1-27:4)
#10	1/0/(10:1-10:4)	#11	1/0/(11:1-11:4)	#12	1/0/(12:1-12:4)								
#13	1/0/(13:1-13:4)	#14	1/0/(14:1-14:4)	#15	1/0/(15:1-15:4)								
#16	1/0/(16:1-16:4)	#17	1/0/(17:1-17:4)	#18	1/0/(18:1-18:4)								
#28	1/0/(28:1-28:4)	#29	1/0/(29:1-29:4)	#30	1/0/(30:1-30:4)	B	eth1						
#31	1/0/(31:1-31:4)	#32	1/0/(32:1-32:4)	#33	1/0/(33:1-33:4)								
#34	1/0/(34:1-34:4)	#35	1/0/(35:1-35:4)	#36	1/0/(36:1-36:4)								
#37	1/0/(37:1-37:4)	#38	1/0/(38:1-38:4)	#39	1/0/(39:1-39:4)								
#40	1/0/(40:1-40:4)	#41	1/0/(41:1-41:4)	#42	1/0/(42:1-42:4)								
#43	1/0/(43:1-43:4)	#44	1/0/(44:1-44:4)	#45	1/0/(45:1-45:4)								

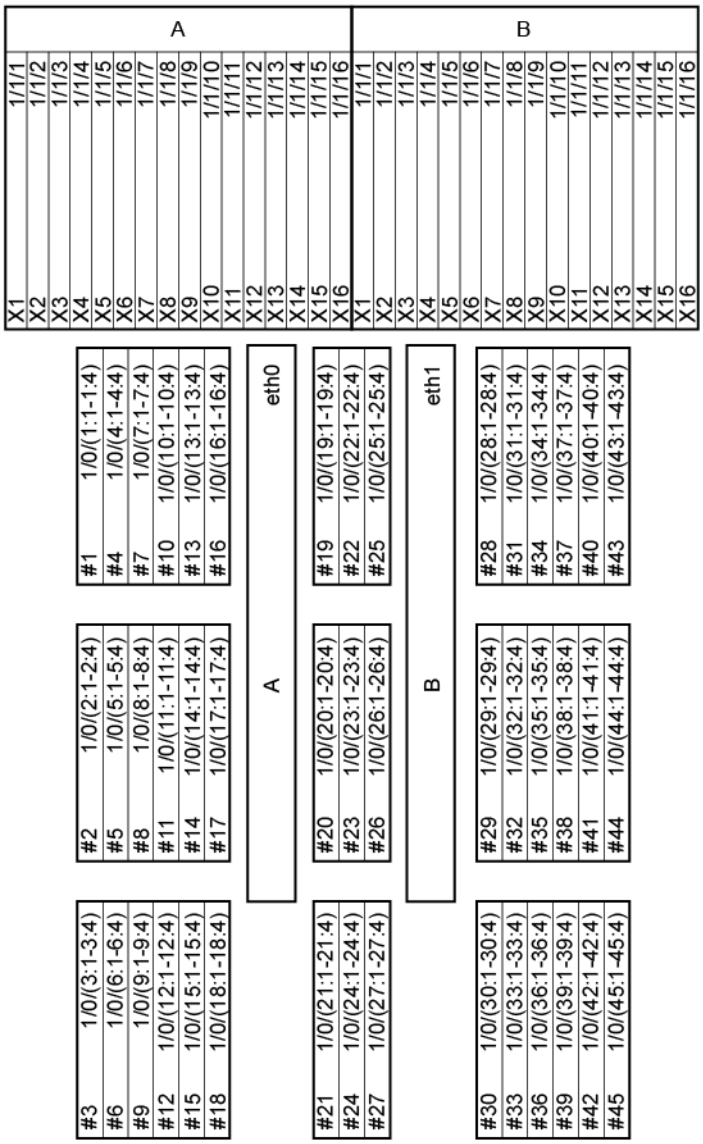
180XGc port naming convention with -16SFP+ uplink module

The following diagram illustrates how the 180 port switches interface to a 1P cartridge. It provides the port naming convention used by the switch firmware. This switch, when paired with a Moonshot-16SFP+ uplink module, has 16 uplink ports of 10 Gbps (1/1/1 to 1/1/16) in the backend and 180 downlink ports (1/0/1:1 to 1/0/45:4) at 1/10 Gbps internally to cartridges.

This uplink module can use any of the following:

- 10 Gb SFP+ to SFP+ DAC cable
- SFP+ to SR transceiver
- SFP to 1000Base-T transceiver
- SFP to 1000Base-SX transceiver





Configuring uplinks

This section provides examples for configuring uplinks depending on the components installed in the system configuration.

Example: Moonshot-45G switch with 6x10G SFP/SFP+ uplink module

The 6SFP uplink module can configure the uplink ports to either 1G or 10G mode. However, this is not automatic. To configure an uplink port to run at 1G, you must log in and enter privileged mode, then enter the configuration menu, and finally enter the interface menu for the ports you want to configure. Use the speed command to set the port speed and duplex settings. When completed, exit back to the root menu and write your settings to memory. A 1000BASE-T or 1000SR transceiver is required to achieve 1G from the SFP+ uplink module.

Connect through serial console port or VSP.

```
(Routing) #configure
(Routing) (Config)#interface 1/1/1
(Routing) (Interface 1/1/1)#speed 1000 full-duplex
```

```
(Routing) (Interface 1/1/1)#exit
(Routing) (Config)#exit
(Routing) #write memory
```

To set the port back to 10G mode, use the 10g keyword instead of the 1000 keyword in the previous example.

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Moonshot-180G switch with 4x40G QSFP+ uplink module

The 4QSFP+ uplink module has the capability of creating a 1G interface from a single 40G connection. To create a 1G interface from a 40G interface, you need a QSFP+ to SFP+ adapter and a SFP to 1000BASE-SX transceiver or SFP to 1000Base-T (RJ-45) transciever. To configure the interface, log in and enter into privileged mode. Configure the interface's portmode to operate each of the four 10G uplinks independently.

IMPORTANT:
This is ONLY for lab environment use. You will only have 1G of the 40G capable bandwidth. This may only be accessible with a switch bootleg

1. Perform the steps as shown in the following example to convert the 4x40G QSFP+ Uplink Module to 4x10G mode.
2. Reboot the switch.
3. Perform the steps as shown in the previous example to convert one of the 10G interfaces to 1G.

   Speed 1000 full-duplex

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Moonshot-180G switch with 16x10G SFP+ uplink module

The 16SFP+ Uplink Module has the capability of configuring its uplinks ports to either 1G or 10G mode. However, this action is not automatic. To configure an uplink port to run at 1G you will need to login and enter privileged mode, then enter the configuration menu, and finally enter the interface menu for the ports you want to configure. You will use the speed command to set the port speed and duplex settings. When completed, exit back to the root menu and write your settings to memory. A 1000BASE-T or 1000SR transceiver is required to achieve 1G from the SFP+ uplink module.

Connect through serial console port or VSP.

```
(Routing) #configure
(Routing) (Config)#interface 1/1/1
(Routing) (Interface 1/1/1)#speed 1000 full-duplex
(Routing) (Interface 1/1/1)#exit
(Routing) (Config)#exit
(Routing) #write memory
```

To set the port back to 10G mode, use the `10g` keyword instead of the `1000` keyword in the previous example.

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Moonshot-180G switch with 4x40G QSFP+ uplink module

The 4QSFP+ uplink module has the capability of creating four 10G interfaces from a single 40G connection. To create a 4x10G interface from a 1x40G interface, you need a QSFP+ 10G adapter. To configure the interface, log in and enter into privileged mode. Configure the interface's portmode to operate each of the four 10G uplinks independently.

IMPORTANT:
Take care not to create network loops with the 4x10G splitter cable. For more information, see "**Network loops**."

Connect through serial console port or VSP.

```
(Routing) # config
     (Routing) (Config)# interface 1/1/1
     (Routing) (Interface 1/1/1)# hardware profile portmode 4x10g
```

This command will not take effect until the switch is rebooted.

```
(Routing) (Interface 1/1/1)# exit
(Routing) (Config)# exit
(Routing) # reload

Are you sure you want to reload the stack? (y/n) y
```

After the switch reboots, the interface converts from a single 40G uplink into four individual links. To convert back from a 4x10G mode to 1x40G, use the 1x40g keyword instead of 4x10g in the previous example.

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Moonshot-45XGc/180XGc switch with 4/40G QSFP+ uplink module

The 4QSFP+ uplink module has the capability to create four 10 G interfaces from a single 40 G connection. To create a 4 x 10 G interface from a 1 x 40 G interface, you need a QSFP+ 10 G adapter.

To configure the interface:

1. Log in and enter privileged mode.
2. Configure the portmode of the interface to operate each of the four 10 G uplinks independently.

The Moonshot-45XGc/180XGc switches do not support 4 x 1 Gb mode.

IMPORTANT:
Take care not to create network loops with the 4x10G splitter cable. For more information, see "**Network loops**."

Connect through serial console port or VSP:

```
<HP>system-view
System View: return to User View with Ctrl+Z.
[HP]interface fortygige 1/1/4
[HP-FortyGigE1/1/4]using tengige
The interface FortyGigE1/1/4 will be deleted. Continue? [Y/N]:y
Reboot the member device to make the configuration take effect.
[HP-FortyGigE1/1/4]quit
[HP]quit
```

```
<HP>reboot
```

To convert uplink from 10 G back to 40 G:

```
<HP>system-view
System View: return to User View with Ctrl+Z.
[HP]interface ten-gigabitethernet 1/1/4:2
[HP-Ten-GigabitEthernet1/1/4:2]using fortygige
The interfaces Ten-GigabitEthernet1/1/4:1 through Ten-GigabitEthernet1/1/4:4
will be deleted. Continue? [Y/N]:y
Reboot the member device to make the configuration take effect.
[HP-Ten-GigabitEthernet1/1/4:2]quit
[HP]quit
<HP>reboot
```

After the switch reboots, the interface converts from a single 40 G uplink to four individual links. To revert from a 4 x 10 G mode to a 1 x 40 G mode, use the 1 x 40 G keyword instead of the 4 x 10 G in the previous example.

After the switch reboots, the interface converts from a single 40 G uplink to four individual 10 G links. The new 10 G ports are displayed as follows:

1/1/4:1

1/1/4:2

1/1/4:3

1/1/4:4

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Port commands

This section provides examples of port commands depending on the components installed in the system configuration.

Example: Show downlink and uplink ports: Moonshot-45G switch

This one command displays the downlink and uplink ports for the Moonshot-45G switch with the Moonshot-6SFP uplink module. This is displayed through the serial console port or the switch VSP.

The 0/3/x ports that follow the 1/1/6 port are not included in this example.

```
(Routing) #show port all

                    Admin     Physical  Physical  Link      Link      LACP
Actor     Type      Mode      Mode      Status    Status    Trap      Mode
INTF
Timeout
--------  --------  --------  --------  --------  --------  --------  --------
--------
```

Table Continued

```
1/0/1     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/2     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/3     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/4     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/5     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/6     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/7     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/8     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/9     Enable    Auto      1000      Full      Up        Enable    Enable
long
.
.
.
.
.
1/0/40    Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/41    Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/42    Enable    Auto                        Down      Enable    Enable
long
1/0/43    Enable    Auto                        Down      Enable    Enable
long
1/0/44    Enable    Auto                        Down      Enable    Enable
long
```

Table Continued

```
1/0/45     Enable    Auto                          Down       Enable    Enable
long
1/1/1      Enable    10G Full                      Down       Enable    Enable
long
1/1/2      Enable    10G Full                      Down       Enable    Enable
long
1/1/3      Enable    10G Full                      Down       Enable    Enable
long
1/1/4      Enable    10G Full                      Down       Enable    Enable
long
1/1/5      Enable    10G Full                      Down       Enable    Enable
long
1/1/6      Enable    10G Full                      Down       Enable    Enable
long
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Show downlink and uplink ports: Moonshot-180G Switch Module with the Moonshot-4QSFP+ Uplink Module

The following example shows how to display the downlink and uplink ports for the Moonshot-180G switch with the Moonshot-4QSFP+ uplink module. This is displayed through the serial console port or the switch VSP.

The 0/3/x ports that follow the 1/1/20 port are not included in this example.

```
                    Admin      Physical   Physical   Link       Link       LACP
Actor      Type     Mode       Mode       Status     Status     Trap       Mode
INTF
Timeout
---------  -------- ---------  ---------  ---------  ---------  ---------  ---------
---------
1/0/1      Enable   Auto       1000       Full       Up         Enable     Enable
long
1/0/2      Enable   Auto       1000       Full       Up         Enable     Enable
long
1/0/3      Enable   Auto       1000       Full       Up         Enable     Enable
long
```

Table Continued

```
1/0/4     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/5     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/6     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/7     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/8     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/9     Enable    Auto      1000      Full      Up        Enable    Enable
long
.
.
.
.
.
.
.
1/0/175   Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/176   Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/177   Enable    Auto                        Down      Enable    Enable
long
1/0/178   Enable    Auto                        Down      Enable    Enable
long
1/0/179   Enable    Auto                        Down      Enable    Enable
long
1/0/180   Enable    Auto                        Down      Enable    Enable
long
--more--
or (q)uit
```

Table Continued

1/1/1 long	Enable	40G	Full	Down	Enable	Enable
1/1/2 long	Enable	10G	Full	Detach	Enable	Enable
1/1/3 long	Enable	10G	Full	Detach	Enable	Enable
1/1/4 long	Enable	10G	Full	Detach	Enable	Enable
1/1/5 long	Enable	10G	Full	Detach	Enable	Enable
1/1/6 long	Enable	40G	Full	Down	Enable	Enable
1/1/7 long	Enable	10G	Full	Detach	Enable	Enable
1/1/8 long	Enable	10G	Full	Detach	Enable	Enable
1/1/9 long	Enable	10G	Full	Detach	Enable	Enable
1/1/10 long	Enable	10G	Full	Detach	Enable	Enable
1/1/11 long	Enable	40G	Full	Down	EnableEnable	Enable
1/1/12 long	Enable	10G	Full	Detach	Enable	Enable
1/1/13 long	Enable	10G	Full	Detach	Enable	Enable
1/1/14 long	Enable	10G	Full	Detach	Enable	Enable
1/1/15 long	Enable	10G	Full	Detach	Enable	Enable
1/1/16 long	Enable	40G	Full	Down	Enable	Enable
1/1/17 long	Enable	10G	Full	Detach	Enable	Enable

Table Continued

```
1/1/18     Enable     10G Full                        Detach     Enable     Enable
long
1/1/19     Enable     10G Full                        Detach     Enable     Enable
long
1/1/20     Enable     10G Full                        Detach     Enable     Enable
long
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Show downlink and uplink ports: Moonshot-180G Switch Module with the Moonshot-16SFP+ Uplink Module

The following example shows how to display the downlink and uplink ports for the Moonshot-180G switch with the Moonshot-16SFP+ uplink module. This is displayed through the serial console port or the switch VSP.

The 0/3/x ports that follow the 1/1/16 port are not included in this example.

```
(Routing) #show port all

                    Admin      Physical   Physical   Link       Link       LACP
Actor       Type    Mode       Mode       Status     Status     Trap       Mode
INTF
Timeout
---------   ------  ---------  ---------  ---------  ---------  ---------  ---------
---------
1/0/1       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/2       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/3       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/4       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/5       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/6       Enable  Auto       1000       Full       Up         Enable     Enable
long
1/0/7       Enable  Auto       1000       Full       Up         Enable     Enable
long
```

Table Continued

```
1/0/8     Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/9     Enable    Auto      1000      Full      Up        Enable    Enable
long
.
.
.
.
.
.
1/0/175   Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/176   Enable    Auto      1000      Full      Up        Enable    Enable
long
1/0/177   Enable    Auto                        Down      Enable    Enable
long
1/0/178   Enable    Auto                        Down      Enable    Enable
long
1/0/179   Enable    Auto                        Down      Enable    Enable
long
1/0/180   Enable    Auto                        Down      Enable    Enable
long
--More--
or (q)uit
1/1/1     Enable    10G Full                    Down      Enable    Enable
long
1/1/2     Enable    10G Full                    Down      Enable    Enable
long
1/1/3     Enable    10G Full                    Down      Enable    Enable
long
1/1/4     Enable    10G Full                    Down      Enable    Enable
long
1/1/5     Enable    10G Full                    Down      Enable    Enable
long
```

Table Continued

```
1/1/6     Enable    1000 Full                    Down      Enable    Enable
long
1/1/7     Enable    10G Full                     Down      Enable    Enable
long
1/1/8     Enable    10G Full                     Down      Enable    Enable
long
1/1/9     Enable    10G Full                     Down      Enable    Enable
long
1/1/10    Enable    10G Full                     Down      Enable    Enable
long
1/1/11    Enable    10G Full                     Down      Enable    Enable
long
1/1/12    Enable    10G Full                     Down      Enable    Enable
long
1/1/13    Enable    10G Full                     Down      Enable    Enable
long
1/1/14    Enable    10G Full                     Down      Enable    Enable
long
1/1/15    Enable    10G Full                     Down      Enable    Enable
long
1/1/16    Enable    10G Full  10G       Full     Up        Enable    Enable
long
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Show 1 GbE downlink ports: Moonshot-45Gc switch

The following example shows how to display the status of the 1 GbE downlink ports for the Moonshot-45Gc switches. This is displayed through the serial console port or the switch VSP.

```
<HP> display interface gigabitethernet brief

Brief information on interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed: (a)/A - auto
Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
```

Interface	Link	Speed	Duplex	Type	PVID	Description
GE1/0/1	UP	1G(a)	F(a)	A	1	
GE1/0/2	DOWN	auto	A	A	1	
GE1/0/3	DOWN	auto	A	A	1	
GE1/0/4	DOWN	auto	A	A	1	
GE1/0/5	DOWN	auto	A	A	1	
GE1/0/6	DOWN	auto	A	A	1	
GE1/0/7	DOWN	auto	A	A	1	
GE1/0/8	DOWN	auto	A	A	1	
GE1/0/9	DOWN	auto	A	A	1	
GE1/0/10	DOWN	auto	A	A	1	
GE1/0/11	UP	1G(a)	F(a)	A	1	
GE1/0/12	DOWN	auto	A	A	1	
GE1/0/13	DOWN	auto	A	A	1	
GE1/0/14	DOWN	auto	A	A	1	
GE1/0/15	DOWN	auto	A	A	1	
GE1/0/16	DOWN	auto	A	A	1	
GE1/0/17	DOWN	auto	A	A	1	
GE1/0/18	UP	1G(a)	F(a)	A	1	
GE1/0/19	DOWN	auto	A	A	1	
GE1/0/20	UP	1G(a)	F(a)	A	1	
GE1/0/21	DOWN	auto	A	A	1	
GE1/0/22	DOWN	auto	A	A	1	
GE1/0/23	DOWN	auto	A	A	1	
GE1/0/24	DOWN	auto	A	A	1	
GE1/0/25	DOWN	auto	A	A	1	
GE1/0/26	DOWN	auto	A	A	1	
GE1/0/27	DOWN	auto	A	A	1	
GE1/0/28	DOWN	auto	A	A	1	
GE1/0/29	DOWN	auto	A	A	1	
GE1/0/30	DOWN	auto	A	A	1	
GE1/0/31	DOWN	auto	A	A	1	
GE1/0/32	DOWN	auto	A	A	1	
GE1/0/33	UP	1G(a)	F(a)	A	1	
GE1/0/34	DOWN	auto	A	A	1	
GE1/0/35	DOWN	auto	A	A	1	

Table Continued

GE1/0/36	DOWN	auto	A	A	1
GE1/0/37	DOWN	auto	A	A	1
GE1/0/38	DOWN	auto	A	A	1
GE1/0/39	DOWN	auto	A	A	1
GE1/0/40	DOWN	auto	A	A	1
GE1/0/41	DOWN	auto	A	A	1
GE1/0/42	DOWN	auto	A	A	1
GE1/0/43	DOWN	auto	A	A	1
GE1/0/44	DOWN	auto	A	A	1
GE1/0/45	UP	1G(a)	F(a)	A	1

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Show 10GbE downlink and uplink ports: Moonshot-45XGc switch

The following example shows how to display the status of the 10 GbE downlink ports for the Moonshot-45XGc switch with an Moonshot-16SFP+ uplink module. This is displayed through the serial console port or the switch VSP.

<HP> **display interface ten-gigabitethernet brief**

```
Brief information on interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed: (a)/A - auto
Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
```

Interface	Link	Speed	Duplex	Type	PVID	Description
XGE1/0/1	UP	1G(a)	F(a)	A	1	
XGE1/0/2	DOWN	auto	A	A	1	
XGE1/0/3	DOWN	auto	A	A	1	
XGE1/0/4	DOWN	auto	A	A	1	
XGE1/0/5	DOWN	auto	A	A	1	
XGE1/0/6	DOWN	auto	A	A	1	
XGE1/0/7	DOWN	auto	A	A	1	
XGE1/0/8	DOWN	auto	A	A	1	
XGE1/0/9	DOWN	auto	A	A	1	
XGE1/0/10	DOWN	auto	A	A	1	
XGE1/0/11	UP	1G(a)	F(a)	A	1	
XGE1/0/12	DOWN	auto	A	A	1	

Table Continued

XGE1/0/13	DOWN	auto	A	A	1
XGE1/0/14	DOWN	auto	A	A	1
XGE1/0/15	DOWN	auto	A	A	1
XGE1/0/16	DOWN	auto	A	A	1
XGE1/0/17	DOWN	auto	A	A	1
XGE1/0/18	UP	1G(a)	F(a)	A	1
XGE1/0/19	DOWN	auto	A	A	1
XGE1/0/20	UP	1G(a)	F(a)	A	1
XGE1/0/21	DOWN	auto	A	A	1
XGE1/0/22	DOWN	auto	A	A	1
XGE1/0/23	DOWN	auto	A	A	1
XGE1/0/24	DOWN	auto	A	A	1
XGE1/0/25	DOWN	auto	A	A	1
XGE1/0/26	DOWN	auto	A	A	1
XGE1/0/27	DOWN	auto	A	A	1
XGE1/0/28	DOWN	auto	A	A	1
XGE1/0/29	DOWN	auto	A	A	1
XGE1/0/30	DOWN	auto	A	A	1
XGE1/0/31	DOWN	auto	A	A	1
XGE1/0/32	DOWN	auto	A	A	1
XGE1/0/33	UP	1G(a)	F(a)	A	1
XGE1/0/34	DOWN	auto	A	A	1
XGE1/0/35	DOWN	auto	A	A	1
XGE1/0/36	DOWN	auto	A	A	1
XGE1/0/37	DOWN	auto	A	A	1
XGE1/0/38	DOWN	auto	A	A	1
XGE1/0/39	DOWN	auto	A	A	1
XGE1/0/40	DOWN	auto	A	A	1
XGE1/0/41	DOWN	auto	A	A	1
XGE1/0/42	DOWN	auto	A	A	1
XGE1/0/43	DOWN	auto	A	A	1
XGE1/0/44	DOWN	auto	A	A	1
XGE1/0/45	UP	1G(a)	F(a)	A	1
XGE1/1/1	UP	10G(a)	F(a)	A	1
XGE1/1/2	DOWN	auto	A	A	1
XGE1/1/3	DOWN	auto	A	A	1
XGE1/1/4	DOWN	auto	A	A	1

Table Continued

```
XGE1/1/5    DOWN        auto        A           A           1
XGE1/1/6    UP          10G(a)      F(a)        A           1
XGE1/1/7    DOWN        auto        A           A           1
XGE1/1/8    DOWN        auto        A           A           1
XGE1/1/9    UP          10G(a)      F(a)        A           1
XGE1/1/10   DOWN        auto        A           A           1
XGE1/1/11   DOWN        auto        A           A           1
XGE1/1/12   DOWN        auto        A           A           1
XGE1/1/13   DOWN        auto        A           A           1
XGE1/1/14   DOWN        auto        A           A           1
XGE1/1/15   DOWN        auto        A           A           1
XGE1/1/16   DOWN        auto        A           A           1
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Display 10GbE uplink ports: Moonshot-45Gc switch

The following example indicates how to display the status of the 10 GbE ports of the Moonshot-6SFP uplink module from a Moonshot-45Gc switch. This is displayed through the serial console port or the switch VSP.

```
<HP> display interface ten-gigabitethernet brief

Brief information on interfaces in bridge mode:
Link: ADM - administratively down; Stby - standby
Speed: (a) - auto
Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
Interface   Link        Speed       Duplex      Type        PVID        Descriptio
                                                                        n
XGE1/1/1    DOWN        auto        A           A           1
XGE1/1/2    DOWN        auto        A           A           1
XGE1/1/3    DOWN        auto        A           A           1
XGE1/1/4    UP          10G(a)      F(a)        A           1
XGE1/1/5    DOWN        auto        A           A           1
XGE1/1/6    DOWN        auto        A           A           1
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Display 40 GbE uplink ports: Moonshot-45XGc/180XGc switch

The following example indicates how to display the status of the 40 GbE ports of the Moonshot-4QSFP+ uplink module from a Moonshot-45XGc/180XGc switch. This is displayed through the serial console port or the switch VSP.

```
<HP> display interface fortygige brief

Brief information on interfaces in bridge mode:
Link: ADM - administratively down; Stby - standby
Speed: (a) - auto
Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
```

Interface	Link	Speed	Duplex	Type	PVID	Description
FGE1/1/1	UP	40G(A)	F(a)	A	1	
FGE1/1/2	DOWN	auto	A	A	1	
FGE1/1/3	DOWN	auto	A	A	1	
FGE1/1/4	UP	auto	A	A	1	

```
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Show 10 GbE downlink and uplink ports: Moonshot-180XGc switch

The following example shows how to display the status of the 10 GbE downlink ports for the Moonshot-180XGc switch with a Moonshot-16SFP+ uplink module. This is displayed through the serial console port or the switch VSP.

```
<HP> display interface ten-gigabitethernet brief

Brief information on interface(s) under bridge mode:
Link: ADM - administratively down; Stby - standby
Speed: (a)/A - auto
Duplex: (a)/A - auto; H - half; F - full
Type: A - access; T - trunk; H - hybrid
```

Interface	Link	Speed	Duplex	Type	PVID	Description
XGE1/0/1:1	UP	1G(a)	F(a)	A	1	
XGE1/0/1:2	UP	1G(a)	F(a)	A	1	
XGE1/0/1:3	UP	1G(a)	F(a)	A	1	
XGE1/0/1:4	UP	1G(a)	F(a)	A	1	
XGE1/0/2:1	DOWN	auto	A	A	1	
XGE1/0/2:2	DOWN	auto	A	A	1	

Table Continued

```
XGE1/0/2:3  DOWN        auto        A           A           1
XGE1/0/2:4  DOWN        auto        A           A           1
XGE1/0/3:1  DOWN        auto        A           A           1
XGE1/0/3:2  DOWN        auto        A           A           1
XGE1/0/3:3  DOWN        auto        A           A           1
XGE1/0/3:4  DOWN        auto        A           A           1
XGE1/0/4:1  DOWN        auto        A           A           1
XGE1/0/4:2  DOWN        auto        A           A           1
XGE1/0/4:3  DOWN        auto        A           A           1
XGE1/0/4:4  DOWN        auto        A           A           1
XGE1/0/5:1  DOWN        auto        A           A           1
XGE1/0/5:2  DOWN        auto        A           A           1
XGE1/0/5:3  DOWN        auto        A           A           1
XGE1/0/5:4  DOWN        auto        A           A           1
.
.
.
XGE1/0/44:  UP          1G(a)       F(a)        A           1
1
XGE1/0/44:  DOWN        auto        A           A           1
2
XGE1/0/44:  DOWN        auto        A           A           1
3
XGE1/0/44:  DOWN        auto        A           A           1
4
XGE1/0/45:  UP          1G(a)       F(a)        A           1
1
XGE1/0/45:  DOWN        auto        A           A           1
2
XGE1/0/45:  DOWN        auto        A           A           1
3
XGE1/0/45:  DOWN        auto        A           A           1
4
XGE1/1/1    DOWN        auto        A           A           1
XGE1/1/2    DOWN        auto        A           A           1
XGE1/1/3    DOWN        auto        A           A           1
XGE1/1/4    DOWN        auto        A           A           1
XGE1/1/5    DOWN        auto        A           A           1
XGE1/1/6    DOWN        auto        A           A           1
```

Table Continued

```
XGE1/1/7    DOWN        auto        A           A           1
XGE1/1/8    DOWN        auto        A           A           1
XGE1/1/9    DOWN        auto        A           A           1
XGE1/1/10   DOWN        auto        A           A           1
XGE1/1/11   DOWN        auto        A           A           1
XGE1/1/12   DOWN        auto        A           A           1
XGE1/1/13   DOWN        auto        A           A           1
XGE1/1/14   DOWN        auto        A           A           1
XGE1/1/15   DOWN        auto        A           A           1
XGE1/1/16   DOWN        auto        A           A           1
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Troubleshooting port setup

The following information helps you avoid some of the most common errors in setting up the ports on Moonshot.

- Take care not to create network loops with the 4x10G splitter cable. See "**Network loops**."
- When configuring QSFP+ uplink ports, a reboot of the switch is necessary.
- Network traffic is disrupted when the switch is rebooted.

Network loops

Network loop overview

Moonshot network switches are integrated into the chassis. This means you must take care when connecting to environments or a network loop can result. This section helps you understand what a network loop is and how to avoid undesired results with your Moonshot system. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

What is a network loop?

A network loop, or Layer 2 loop topology, is one in which multiple physical and logical paths exist between two forwarding devices, such as an Ethernet switch. Such a topology exposes a condition where broadcast traffic is multiplied and sent back and forth between switches over the redundant connections. Switches cannot function in this environment because it creates an infinite feedback loop of broadcast packets. Consider what happens when a microphone gets too close to an amplified speaker that it is connected to. The microphone picks up the sound from the speaker and the speaker amplifies that signal over and over again until all you hear is ear-splitting noise. This is analogous to what happens to a switch when you put it into a loop topology. The effect is known as a broadcast storm.

When is a loop topology OK?

A loop topology is not always a bad thing. Most approaches to high availability networking involve having identical redundant paths between two points on the network. As long as broadcast traffic is not allowed to multiply over a loop topology, it is not harmful.

Methods for avoiding broadcast storms on a loop topology include the following:

- Spanning Tree Protocol
- TRILL
- Link Aggregation
- VLANs

STP and TRILL build a network topology representation that allows each switch to detect loops. In the case of STP, some connections are disabled to break the loop topology. In the case of TRILL, all connections remain active, but forwarding rules prevent broadcast traffic from following a loop path.

Link aggregation is a manual setting that informs the switch that multiple physical interfaces are to be treated as a single logical interface. After multiple ports are known as a single logical interface, the switch will not forward broadcast traffic through it more than once.

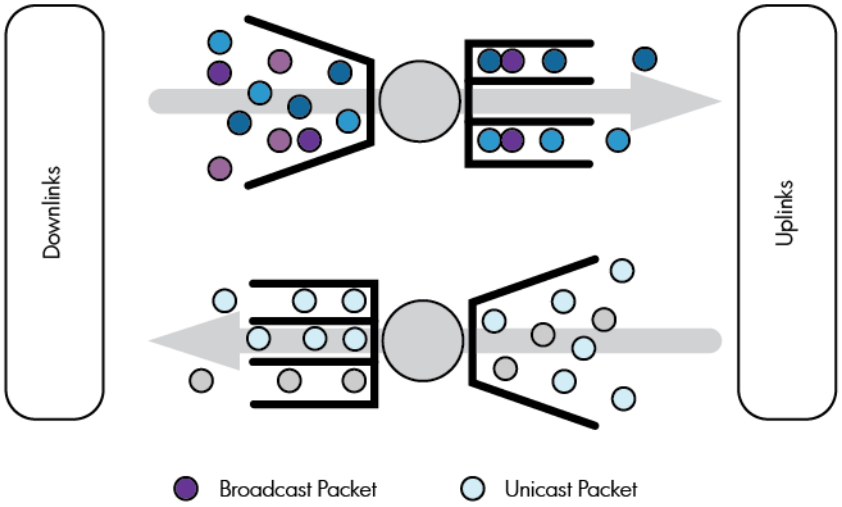
VLANs provide a way to mark traffic on the switch as belonging to a unique virtual network with its own broadcast domain. Because broadcast traffic stays only within its L2 broadcast domain, there is no risk of a broadcast storm if two redundant paths are part of different VLANs.

Uncontrolled loops - what happens?

What happens to a switch when a switch is exposed to an uncontrolled loop topology?

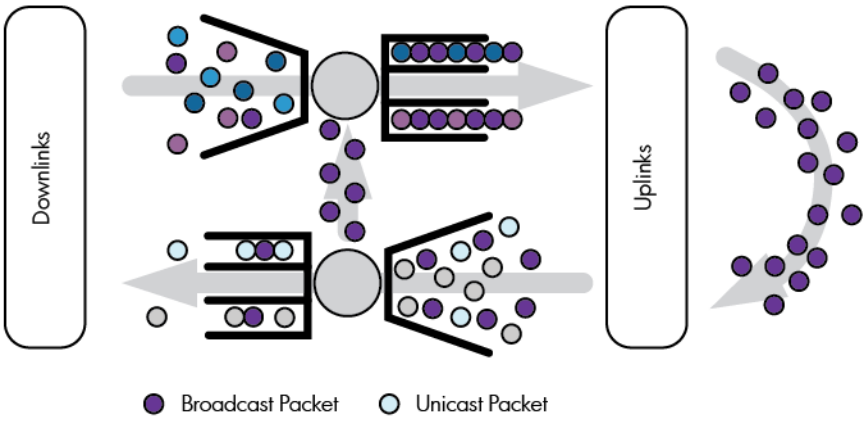
To understand the problem you must first understand what a network switch does. A simple switch has three functions:

1. Receive packets (ingress).
2. Analyze and route those packets to the appropriate interface.
3. Transmit those packets on that interface (egress).



The switch receives packets into its ingress pipeline then creates a slightly modified clone of that packet and transmits that packet out its egress pipeline.

If the switch is exposed to a network loop, it routes those broadcast packets it recently generated back into its uplink-facing ingress pipeline. It continues to do so until enough of these broadcast packets regenerate and the switch bandwidth becomes saturated.



It is important to understand that this is a simplified example of what would occur during a single switch exposed to a loop topology; as more switches are exposed to that same topology, the feedback effect grows exponentially.

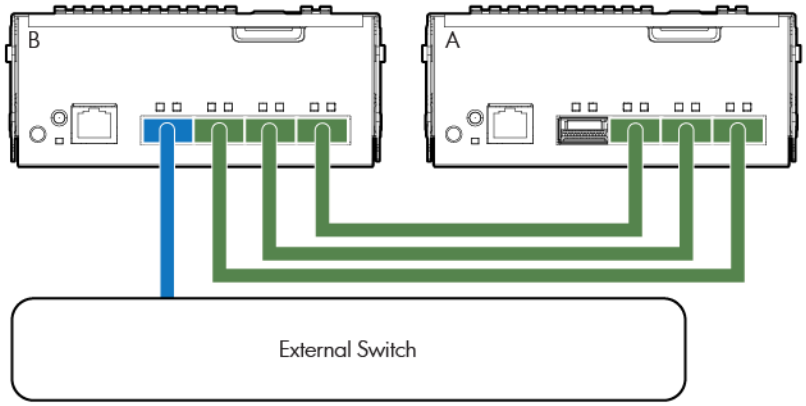
Situations to avoid in Moonshot configurations

This section provides the most common situations that can cause broadcast storms with a Moonshot 1500 system when STP or TRILL are disabled.

Example: Multiple links

In this example, a Moonshot 1500 Chassis is installed with two Moonshot-4QSFP+ uplink modules attached to an external ToR switch.

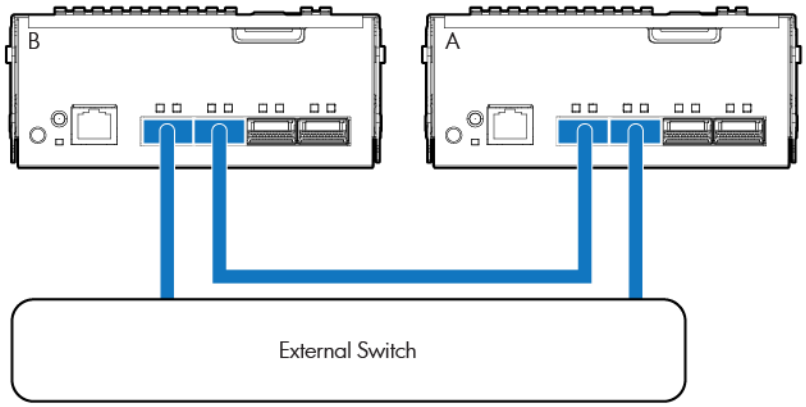
In this case a loopback has been created between uplink modules A and B because there is more than one link between them.



Example: Redundant links

In this example, a Moonshot 1500 Chassis is installed with two Moonshot-6SFP+ uplink modules attached to an external ToR switch.

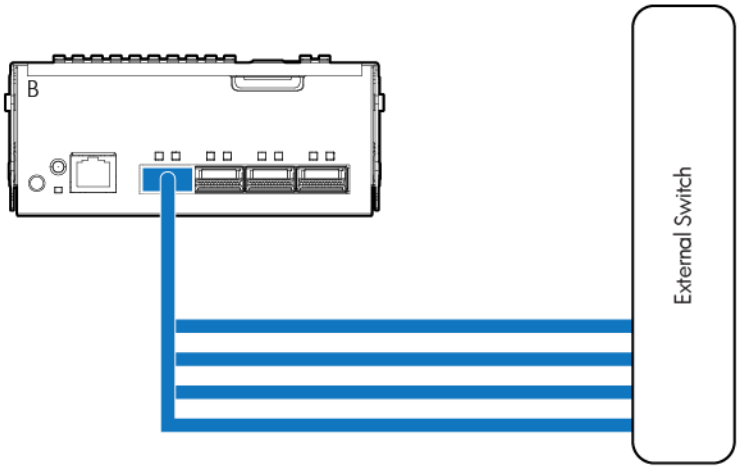
In this case, a loopback has been created because both uplink modules A and B are uplinked to the external switch as well to each other.



Example: Splitter cable

In this example, a Moonshot 1500 Chassis is installed with one Moonshot-4QSFP+ uplink module attached to an external ToR switch through a QSFP+ to 4xSFP+ splitter cable.

In this case, the QSFP port is already converted into four separate interfaces. Therefore, a similar topology to that of case #1 has been created; that is, there are multiple independent links between the Moonshot switch and the external ToR switch.



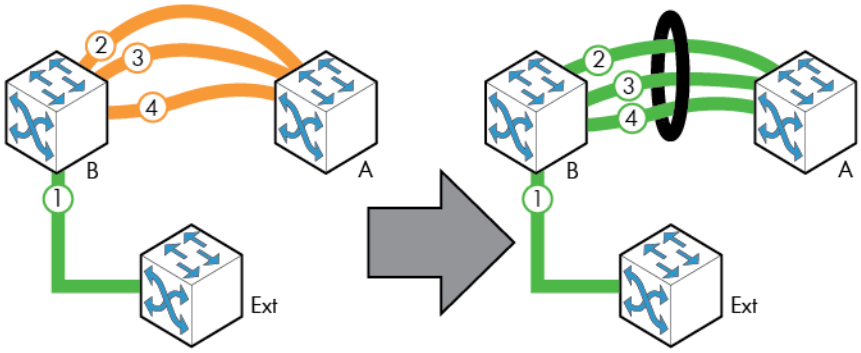
Preventing broadcast storms

The best way to ensure that network loops are prevented is to ensure that all of the switches on your network have the same network loop management protocol enabled, such as STP or TRILL. Both of these protocols automatically create a logical network that avoids topologies that can cause broadcast storms.

Alternatively, you can use LAGs and/or VLANs to manually create a logical network that isolates the broadcast domains.

Example: Preventing loops by creating a Link Aggregation Group

Using this example, you can create a LAG between Switches A and B. This will form a single interface, and thus, a single broadcast domain between the switches instead of three independent interfaces.

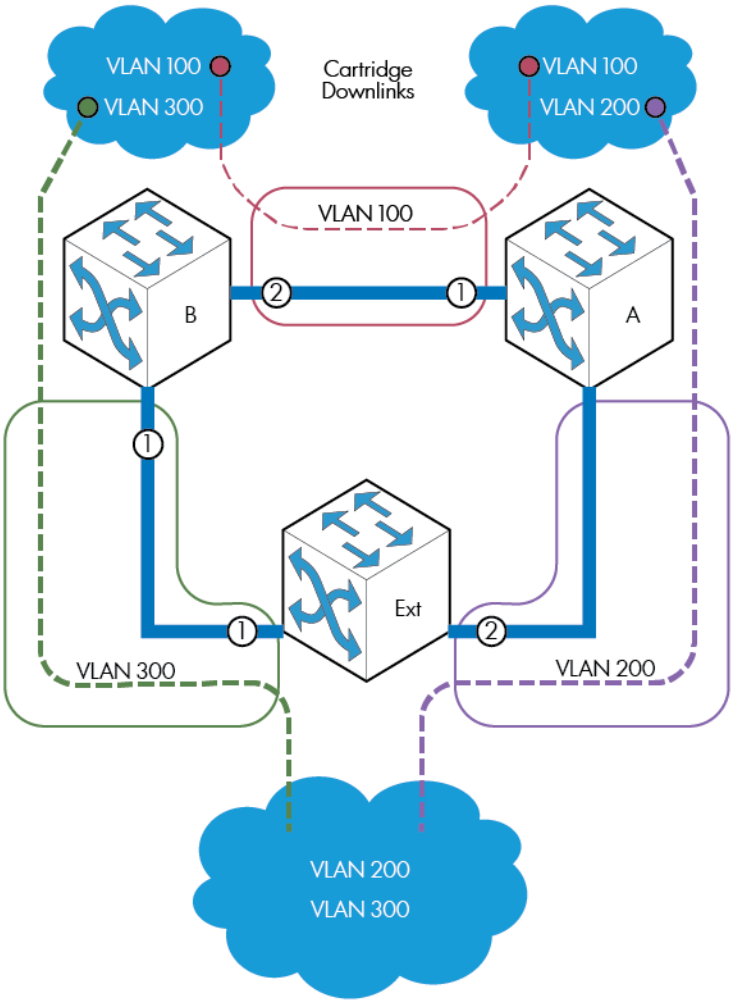


For information on implementing LAGs on Moonshot-45G/180G and Moonshot-45Gc/45XGc/180XGc switches, see "**High availability networking**."

Example: Preventing loops by creating VLANs to isolate broadcast domains

In this example, both Switch A and Switch B are Moonshot-45G switches. The external switch is outside the scope of this example.

By adding VLANs across each of the uplinks and relevant downlinks, you ensure that broadcast traffic will not be forwarded back to the switch it originated from.


VLAN 100
VLAN 300
Cartridge
Downlinks
VLAN 100
VLAN 200
VLAN 100
B
A
2
1
1
Ext
1
2
VLAN 300
VLAN 200
VLAN 200
VLAN 300

Network installation

Network installation overview

After your system is set up and links are verified using the **Quick start** section, you can review the following examples of network installation. This is not an exhaustive set of examples, but is intended to help you understand how to setup several select OS PXE environments. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

Performing a network installation of a Linux operating system to a Moonshot cartridge requires the use of a PXE server. If you already have a PXE server on your network, go to "**Modifying PXE for the Moonshot serial console**." If you do not have a PXE server, proceed to the next section, which provides information on creating one.

Creating a PXE server

This section includes examples for each step in setting up a PXE server.

1. **Basic network configuration**
2. **Configure DHCP service**
3. **TFTP service configuration**
4. **HTTP server for OS installation files**
5. **Prepare OS installation files for HTTP server**
6. **PXE boot files**

Example: Basic network configuration

You must have a dedicated network interface that your server will use to provide DHCP and other services to your installation targets. Take care when attaching this interface to a network. To avoid DHCP addressing problems, avoid using a network on which another DHCP server is present.

For the purposes of this document, it is assumed that you have configured in the file `/etc/sysconfig/network-scripts/ifcfg-eth0` your first NIC (eth0) as follows:

```
DEVICE="eth0"
BOOTPROTO="static"
HWADDR="aa:bb:cc:dd:ee:ff"
NM_CONTROLLED="no"
ONBOOT="yes"
TYPE="Ethernet"
IPADDR="192.168.1.1"
NETMASK="255.255.255.0"
```

with

- `Static IP Address: 192.168.1.1`
- `Network Mask: 255.255.255.0`

The `HWADDR` value should match the MAC address of your NIC, or be absent from the configuration file.

- Disable the built-in firewall with the commands: `chkconfig iptables off` and `service iptables stop`
- Disable `selinux` with the command `setenforce 0`.
- Edit `/etc/sysconfig/selinux`, changing the value of the `SELINUX` variable from `enforcing` to `disabled`.

IMPORTANT:
These settings make it easier to set up your installation server, but also disable the firewall and Security-Enhanced Linux (SELinux). Be sure that your installation server is running within a private environment before making these changes..

For more information on on how to configure these services (rather than disabling them), have your installation server accessible via the internet and see the Linux distribution documentation.

Example: Configure DHCP service

The purpose of DHCP is to provide IP addresses to your servers.

Install the ISC DHCP daemon with the command **yum install dhcp**.

Edit the file `/etc/dhcp/dhcp.conf` and replace the current contents with the following:

```
option domain-name "moonshotnet";
default-lease-time 600;
max-lease-time 7200;
authoritative;
allow booting;

subnet 192.168.1.0 netmask 255.255.255.0 {
     range 192.168.1.150 192.168.1.249;
     option bootfile-name "pxelinux.0";
     next-server 192.168.1.1;
}
```

Edit `/etc/sysconfig/dhcpd` and set the value of `DHCPARGS` to **eth0**.

Run the commands **chkconfig dhcpd on** and **service dhcpd start** to start the DHCP service.

Example: TFTP service configuration

The TFTP service is used to provide the starting set of files (the Kernel and Ramdisk) to your network booting system. The `next-server` parameter provided in the DHCP configuration specifies the IP addresses of the TFTP server to access, and the `option bootfile-name` parameter defines the name of the boot file that the PXE client should request.

Complete the following steps to install and configure the TFTP service on your installation server:

1. Install the TFTP service with the command **yum install tftp-server syslinux**.
2. Enable and start the two required services with the following commands:

   ```
   chkconfig tftp on
   chkconfig xinetd on
   service xinetd start
   ```

   This creates and configures the TFTP server to use the directory.
3. `/var/lib/tftpboot` by default on your system to service TFTP requests. Populate the TFTP server directory with the basic network boot files:

   How to format this number?

   ```
   cd /usr/share/syslinux
   cp pxelinux.0 menu.c32 chain.c32 /var/lib/tftpboot
   ```

   mkdir /var/lib/tftpboot/pxelinux.cfg

Example: HTTP server for OS installation files

HTTP server for OS installation files

While TFTP is used to provide the starting set of files, other protocols are used for the bulk of the files used to deploy Linux. Most Linux distributions support installation using HTTP, NFS, and/FTP. The following procedure installs and configures the Apache Web server so that it can provide the installation files over HTTP.

1. Install Apache by entering the command: **yum install httpd**
2. Start Apache/httpd: with the command: **chkconfig httpd on**
3. Set the service to start automatically at boot time: **service httpd start**

By default, this configures a directory found at `/var/www/html` to provide files via your web server.

Example: Preparing OS installation files for HTTP server

Preparing OS installation files for HTTP server

The next task is to extract the operating system installation files from your Linux distribution installation media. In most cases, you will be working with an ISO file containing the operating system to be installed.

Each model of HPE ProLiant server cartridges requires a specific minimum version of certain Linux distributions, due to certain device and driver requirements. For specific details on which Linux distribution versions are supported on the different ProLiant server cartridges, see the interactive OS Support Matrix available on the **Hewlett Packard Enterprise website**.

The process for copying the installation files is essentially the same for all Linux distributions. The names of the ISO files you have might vary from those used in the following examples.

RHEL (and CentOS, Scientific Linux, Fedora)

1. Create a directory in your web server:

   mkdir –p /var/www/html/os/rhel-6.5
2. Mount the ISO file with the command:

   mount –o ro,loop RHEL-6.5Server-x86_64-DVD1.iso /mnt
3. Copy the contents of the ISO to the directory you created:

   cp –a /mnt/* /var/www/html/os/rhel-6.5
4. Unmount the ISO:

   umount /mnt

Ubuntu

1. Create a directory in your web server:

   mkdir –p /var/www/html/os/ubuntu-14.04
2. Mount the ISO file with the command:

   mount –o ro,loop ubuntu-14.04-server-amd64.iso /mnt
3. Copy the contents of the ISO to the directory you created:

   cp –a /mnt/* /var/www/html/os/ubuntu-14.04
4. Unmount the ISO:

   umount /mnt

SLES

Certain ProLiant server cartridges require a special Kernal, Ramdisk, and/or packages for required device drivers. SUSE provides these using an image format called a kISO. You must extract the contents of the kISO in addition to the standard installation media.

If your Moonshot cartridge requires the use of a kISO with SLES11SP3, obtain the image from SUSE at the **SUSE website**.

Extract the standard installation files from the media:

1. Create a directory in your web server:

   mkdir –p /var/www/html/os/sles-11sp3
2. Mount the ISO file with the command:

   mount –o ro,loop SLES-11-SP3-DVD-x86_64-GM.DVD1.iso /mnt
3. Copy the contents of the ISO to the directory you created:

   cp –a /mnt/* /var/www/html/os/sles-11sp
4. Unmount the ISO: **umount /mnt**

   Extract the kISO files:
5. Create a directory for the extracted files:

   mkdir /var/www/html/os/m300-kiso-1.0
6. Mount the kISO:

   mount –o ro,loop hp_proliant_m300-sles11sp3-x86-1.0.iso /mnt
7. Copy the files from the kISO to the directory you created:

   cp –a /mnt/* /var/www/html/os/m300-kiso-1.0
8. Unmount the kISO: **unmount /mnt**

RHEL DUPs and SLES kISOs

Some cartridge types require the use of an additional image to provide updated drivers that might have not been available in the main distributions at the time the hardware was released. RHEL calls these Driver Update Packs (or Process) and SUSE calls them kISOs. For information on obtaining and using these files in a network installation, see the *Operating System Deployment Guide* on the **Hewlett Packard Enterprise website**.

Example: PXE boot files

In addition to copying the OS installation files into your HTTP server, you must also copy the Kernel and Ramdisk files to your TFTP server.

RHEL

1. Create a directory in your TFTP server:

   mkdir –p /var/lib/tftpboot/rhel-6.5
2. Change directory to your web server:

   cd/var/www/html/os/rhel-6.5/images/pxeboot
3. Copy the files:

   cp initrd.img vmlinuz /var/lib/tftpboot/rhel-6.5

Ubuntu

1. Create a directory in your TFTP server:

   mkdir –p /var/lib/tftpboot/ubuntu-14.04
2. Change directory to your web server:

   cd /var/www/html/os/ubuntu-14.04/install/netboot/ubuntu-installer/amd64
3. Copy the files:

cp initrd.gz linux /var/lib/tftpboot/ubuntu-14.04

SLES

1. Create a directory in your TFTP server: **`mkdir -p /var/lib/tftpboot/sles-11-sp3`**
2. Change directory to your web server:**`cd /var/www/html/os/sles-11sp3/boot/x86_64/loader`**
3. Copy the files:

   cp initrd linux /var/lib/tftpboot/sles-11sp3

If your Moonshot cartridge requires a kISO, perform the following steps:

1. Make a directory for the files:

   mkdir /var/lib/tftpboot/sles-11sp3/m300-kiso-1.0
2. Change directories:

   cd /var/www/html/os/m300-kiso-1.0
3. Copy the files:

   cp linux initrd /var/lib/tftpboot/sles-11sp3/m300-kiso-1.0

As indicated above, if your cartridge requires the use of a Red Hat DUP, or SUSE kISO, see the OS Deployment Guide for details on integrating it during the network installation.

Your file names might vary. These are just examples.

Modifying PXE for the Moonshot serial console

The following instructions provide the necessary steps to modify an existing PXE server for use with Moonshot.

Example: Modifying your PXE configuration

Unlike traditional servers, Moonshot cartridges use a serial console to provide basic messages and interaction with the operating system. The modifications to your PXE configuration are made in two places in the `pxelinux.cfg/default` file.

At the top of the file add:

SERIAL 0 9600

CONSOLE 0

These statements cause the PXE environment itself to use the serial console on the cartridge. Secondly, for each bootable entry (see examples below) in your `pxelinux.cfg/default` file, you need to add:

console=ttyS0,9600n8

to the "append" section of each entry. For instance, an entry for Red Hat Enterprise Linux (RHEL) 6.5 which originally appeared as:

```
LABEL rhel-6.5
 kernel rhel-6.5/vmlinuz
 append initrd=rhel-6.5/initrd.img
```

would be modified to:

LABEL rhel-6.5

kernel rhel-6.5/vmlinuz

append initrd=rhel-6.5/initrd.img console=ttyS0,9600n8

The following shows a complete example `pxelinux.cfg/default file` that contains a bootable installation entry for all three of the major Linux distributions:

```
SERIAL 0 9600
CONSOLE 0
PROMPT 0
ONTIMEOUT local
TIMEOUT 300
DEFAULT menu.c32

LABEL local
 kernel chain.c32
 append hd0 0

LABEL rhel-6.5
 kernel rhel-6.5/vmlinuz
 append initrd=rhel-6.5/initrd.img repo=http://192.168.1.1/os/rhel-6.5
console=ttyS0,9600n8

LABEL ubuntu-14.04
  kernel ubuntu-14.04/linux
  append initrd=ubuntu-14.04/initrd.gz console=ttyS0,9600n8

LABEL sles-11sp3
  kernel sles-11sp3/m300-kiso-1.0/linux
  append initrd=sles-11sp3/m300-kiso-1.0/initrd
install=http://192.168.1.1/os/sles-11sp3
addon=http://192.168.1.1/os/m300-kiso-1.0 console=ttyS0,9600n8
```

The append lines included above occur on a single line and do not "wrap" as they are shown here. The last entry, for SLES 11 SP3, also shows the use of a kISO from SUSE to provide additional network drivers. See the documentation and OS support matrix for your selected cartridge to determine if a kISO or a DUP for RHEL is required.

Adding the PXE boot files from your Linux distributions

The example configuration above will instruct your cartridge, when network booted (as described below), to load a Kernel and Ramdisk used to install Linux. You must make these files available on your PXE server. The examples above use three subdirectories within your PXE/TFTP server named rhel-6.5, Ubuntu-14.04 and sles-11sp3. Create these directories at the top level of your PXE/TFTP server (same directory that the pxelinux.cfg directory exists) then copy these files from the ISO file used by your Linux distribution. Download the ISO file(s) from your Linux distribution vendor, or reseller.

For RHEL-6.5, mount the ISO using the following command to mount the contents to a directory named /mnt on your system:

mount –o ro,loop RHEL6.5-Server-x86_64-DVD1.iso /mnt

Then, copy the files named `/mnt/images/pxeboot/initrd.img` and **/mnt/images/pxeboot/vmlinuz** to the rhel-6.5 directory created above.

Unmount the ISO file with the using the following command:

umount /mnt

Mount the SLES ISO files and copy the required files:

/mnt/boot/x86_64/loader/linux and **/mnt/boot/x86_64/initrd**

Mount the Ubuntu ISO files and copy the required files:

/mnt/install/netboot/ubuntu-installer/amd64/linux and **/mnt/install/netboot/ubuntu-installer/amd64/initrd.gz**

Configuring the server

Like traditional servers, Moonshot cartridges and nodes support the concept of boot device order.

There are fewer devices to choose from in Moonshot, but you are still required to specify which device you want, and when.

There are two commands to manipulate the boot order of your node(s):

- Permanent Boot Order: **set node boot** device **c1n1**
- One Time Boot Order: **set node bootonce** device **c1n1**

Both of these commands modify the boot order of the first node (n1) of the first cartridge (c1). Valid values of the **device** field are pxe, hdd, and m.2. m.2 is only available on certain cartridges that support the flash storage.

- To set your node to boot from the network a single time, use the following command:

  set node bootonce pxe c1n1
- To set the same node to boot from the network at ALL times, use the following command:

  set node boot pxe c1n1
- To make the same node boot from a hard drive, use the same commands, but use **hdd** as the device parameter instead.

With the boot device configuration set to boot from the network, power on your node using the command: **set node power on c1n1**

If the cartridge was already powered on, power it off with the following command:

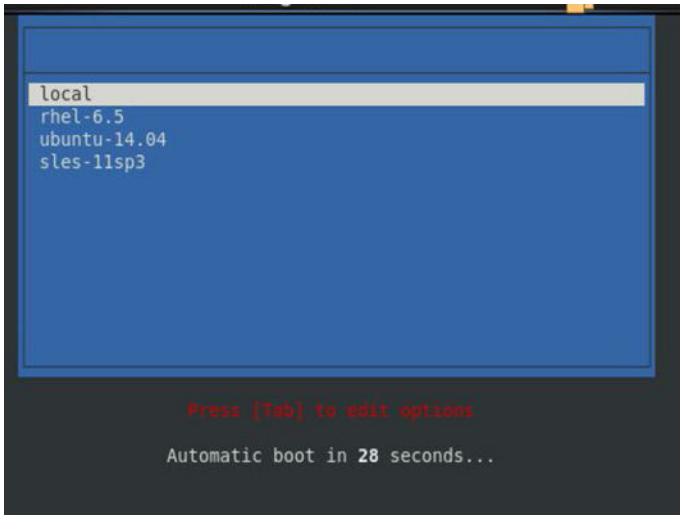
set node power off force c1n1

Then, issue the power-on command.

In the same (or a separate) SSH connection to your Chassis Manager, open a virtual serial port session (as described in the "**Network management**" section) to interact and complete the installation using the following command:

connect node vsp c1n1

With your PXE configuration set as described above, and your node configured to boot from the network, you will be presented with a menu and allowed to choose to either boot from the local hard drive, or to install one of the chosen Linux distributions. When the system boots, it loads the interactive installer used by your distribution.



Automating your Linux installation

Each of the Linux distributions supports a mechanism to automate the process of deploying Linux to a server. These mechanisms require the use of an additional configuration file. For RHEL, the file is called a Kickstart file, for SLES it is an AutoYaST file, and Ubuntu names it a preseed file. Regardless of what it is called, it is a file, made available typically on a Web or ftp server, that contains the configurations necessary to "answer" the questions you usually answer manually during an interactive installation.

Example: Kickstart file for RHEL

```
text
url --url=http://192.168.1.1/os/rhel-6.5/
lang en_US.UTF-8
keyboard us
network --device eth0 --noipv6 --bootproto dhcp
network --device eth1 --noipv6 --bootproto dhcp
rootpw --plaintext moonshot
user --name="moonshot" --gecos="moonshot" --shell="/bin/bash" --plaintext --
password=moonshot
authconfig --enableshadow --passalgo=sha512 --enablefingerprint
firewall --disabled
selinux --disabled
timezone America/Chicago
bootloader --location=mbr --driveorder=sda --append="crashkernel=auto
console=ttyS0n8"
poweroff
#reboot
zerombr
clearpart --all --drives=sda
part /boot --fstype=ext4 --size=700
```

```
part swap --recommended
part / --fstype=ext4 --size=1 --grow
%post
cat >>/etc/sudoers <<EOF
moonshot ALL=(ALL) ALL
EOF
%end
%packages
@base
@core
%end
```

Automated installations also typically require that the entire contents of the ISO file provided be extracted and made similarly available on a Web or FTP server. The configuration above instructs the installer to obtain the installation files from a Web server available to the server at http://192.168.1.1/os/rhel-6.5/.

For more information on extracting the installation files and storing them on your Web server, see the **Operating System Deployment on HPE ProLiant Moonshot Server Cartridges User Guide** starting on page 46. The same guide also provides an example AutoYaST file (Page 70) for SUSE, and preseed file (Page 52) for Ubuntu. They are both somewhat longer than the format used by the Kickstart file, so they are not included here.

Example: Modifying PXE configuration file for a RHEL kickstart

To instruct your network installation to use these installation configuration files, you must update your `pxelinux.cfg/default` file in your PXE server to include additional parameters for each installation that will instruct it to load and use the corresponding file.

For example, the above RHEL PXE configuration file would change the original entry from:

```
LABEL rhel-6.5
 kernel rhel-6.5/vmlinuz
 append initrd=rhel-6.5/initrd.img repo=http://192.168.1.1/os/rhel-6.5
console=ttyS0,9600n8
```

to:

```
LABEL rhel-6.5-automatic
 kernel rhel-6.5/vmlinuz
 append initrd=rhel-6.5/initrd.img ksdevice=auto ks=http://192.168.1.1/answers/
rhel-6.5.cfg console=ttyS0,9600n8
```

The append lines are a single contiguous line without breaks. This modification instructs the installer to obtain the installation configuration file (Kickstart, in this case) from a Web server at 192.168.1.1, in a subdirectory called answers. The configuration file itself is named `rhel-6.5.cfg`. You can name these whatever you want, but the boot entries must be configured to match what you choose.

A complete example `pxelinux.cfg/default` file that shows both interactive and automatic examples of each of the main operating systems is:

```
SERIAL 0 9600
CONSOLE 0
PROMPT 0
ONTIMEOUT local
TIMEOUT 300
DEFAULT menu.c32
```

```
LABEL local
 kernel chain.c32
 append hd0 0

LABEL rhel-6.5-auto
 kernel rhel-6.5/vmlinuz
 append initrd=rhel-6.5/initrd.img ksdevice=eth0 ks=http://192.168.1.1/answers/
rhel-6.5.cfg console=ttyS0,9600n8

LABEL rhel-6.5-interactive
  kernel rhel-6.5/vmlinuz
  append initrd=rhel-6.5/initrd.img repo=http://192.168.1.1/os/rhel-6.5
console=ttyS0,9600n8

LABEL ubuntu-14.04-auto
  kernel ubuntu-14.04/linux
  append initrd=ubuntu-14.04/initrd.gz priority=critical auto=true
preseed/url=http://16.84.217.164/answers/ubuntu-14.04.cfg interface=em2
console=ttyS0,9600n8

LABEL ubuntu-14.04-interactive
 kernel ubuntu-14.04/linux
 append initrd=ubuntu-14.04/initrd.gz console=ttyS0,9600n8

LABEL sles-11sp3-auto
 kernel sles-11sp3/m300-kiso-1.0/linux
 append initrd=sles-11sp3/m300-kiso-1.0/initrd
install=http://192.168.1.1/os/sles-11sp3
addon=http://192.168.1.1/os/m300-kiso-1.0
autoyast=http://192.168.1.1/answers/sles-11sp3.xml console=ttyS0,9600n8

LABEL sles-11sp3-interactive
kernel sles-11sp3/m300-kiso-1.0/linux
 append initrd=sles-11sp3/m300-kiso-1.0/initrd
install=http://192.168.1.1/os/sles-11sp3
addon=http://192.168.1.1/os/m300-kiso-1.0 console=ttyS0,9600n8
```

If you execute an automated installation, Linux is deployed to your system without further interaction from you. You can customize your installation by manipulating the parameters included in the installation configuration file.

Troubleshooting network installation

The following information helps you avoid some of the most common errors in network installation on Moonshot.

- If you do not see any output on your screen as your node PXE boots, make sure that the "`SERIAL 0 9600`" and "`CONSOLE 0`" parameters are specified at the top of the `pxelinux.cfg/default` configuration file on your PXE/TFTP server.
- If you do not see any output on your screen after you choose a boot entry (configured as above) verify that the "append" line includes the parameter "`console=ttyS0,9600n8`".
- If your cartridge node attempts to PXE, but does not get a DHCP assigned IP address, verify that your network has DHCP enabled by connecting a laptop and then running "`ipconfig`" in a command window (or "`ifconfig`" on Linux) to verify that you can obtain an IP address dynamically.

- If your cartridge node attempts to PXE, obtains an IP address, but then cannot obtain a PXE configuration file (default), verify that your PXE server is providing TFTP access to the file "`pxelinux.0`". On another system with the tftp client installed, run "`tftp your.server.ip.address`" (replacing with your PXE server IP) then "`get pxelinux.0`" to verify that TFTP is working.
- If your cartridge node PXE's successfully, but then encounters a problem loading your kernel and/or ramdisk, ensure that the files are on your TFTP server and in the directory indicated in the configuration file (`pxelinux.cfg/default`), and that they have adequate permissions to be read over the network (0644). Also ensure that any network installation files and configuration files are available at their specified URL addresses.
- If you try to start a service and you get a `[Failed]`, you can recall the last 50 executed lines to find the error by doing the following commands: `cd /var/log` and `tail -50 messages |more`

Spanning Tree Protocol

Spanning Tree Protocol overview

This advanced topic for network use is a method to prevent network loops. With your Moonshot system connected and linked, this section helps you understand how you might use this feature. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

What is Spanning Tree Protocol?

Spanning Tree Protocol is a layer 2 protocol that provides a tree topology for switches on a bridged LAN. STP allows a network to have redundant paths without the risk of network loops. STP uses the spanning-tree algorithm to provide a single path between end stations on a network.

Moonshot switches support STP, RSTP, and RSTP.

How STP works

The switches (bridges) that participate in the spanning tree elect a switch to be the root bridge for the spanning tree. The root bridge is the switch with the lowest bridge ID, which is computed from the unique identifier of the bridge and its configurable priority number. When two switches have an equal bridge ID value, the switch with the lowest MAC address is the root bridge.

After the root bridge is elected, each switch finds the lowest-cost path to the root bridge. The port that connects the switch to the lowest-cost path is the root port on the switch. The switches in the spanning tree also determine which ports have the lowest-path cost for each segment. These ports are the designated ports.

Only the root ports and designated ports are placed in a forwarding state to send and receive traffic. All other ports are put into a blocked state to prevent redundant paths that might cause loops.

To determine the root path costs and maintain topology information, switches that participate in the spanning tree use BPDUs to exchange information.

Types of Spanning Tree Protocols

Spanning Tree Protocol (STP)

Spanning Tree Protocol (IEEE 802.1D) is a standard requirement of Layer 2 switches that allows bridges to automatically prevent and resolve L2 forwarding loops.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol detects and uses network topologies to enable faster spanning tree convergence after a topology change, without creating forwarding loops. RSTP is considerably faster than STP.

Multiple Spanning Tree Protocol (MSTP)

Multiple Spanning Tree operation maps VLANs to spanning tree instances. Packets assigned to various VLANs are transmitted along different paths within MSTP Regions (MST Regions). Regions are one or more interconnected MSTP bridges with identical MSTP settings. The MSTP standard lets administrators assign VLAN traffic to unique paths.

Per-VLAN Spanning Tree (PVST)

Per-VLAN Spanning Tree operation allows every VLAN configured in the network to have its own spanning tree, which increases utilization of links and bandwidth. Because each VLAN runs STP or RSTP independently, a spanning tree only serves its own VLAN.

Setting Spanning Tree mode

Example – Set STP mode: Moonshot-45G/180G

Use the following information to set up Moonshot-45G/180G Switches with different types of spanning trees.

Set STP Mode:

In configuration mode, you can set the spanning tree mode by running the following commands:

- STP: **spanning-tree forceversion 802.1d**
- RSTP: **spanning-tree forceversion 802.1w**
- MSTP: **spanning-tree forceversion 802.1s**

Change STP Device Priority:

In configuration mode, you can set the spanning tree device priority:

- STP/RSTP: **spanning-tree mst priority 0 <priority>**
- MSTP: **spanning-tree mst priority <instance-id> <priority>**

Enable/Disable STP:

By default, STP is enabled on the Moonshot-45G/180G switch. In configuration mode, you can:

- Disable STP with the following command:

  no spanning-tree
- Enable STP using the following command:

  spanning-tree
- Save your configuration using the following command:

```
(Routing) # write memory
This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.
(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example – Set STP mode: Moonshot-45Gc/45XGc/180XGc

Use the following information to set up Moonshot-45Gc/45XGc/180XGc Switches with different types of spanning trees.

Set STP Mode:

In system-view, you can set the spanning tree mode by running the following command:

stp mode { mstp | pvst | rstp | stp }

Change STP Device Priority:

In system-view, you can set the spanning tree device priority by running the following command:

stp priority {1-32768}

Enable/Disable STP:

By default, STP is enabled on the Moonshot-45Gc/45XGc/180XGc switch. In system view, you can:

- Disable STP with the following command:

undo stp global enable

- Enable STP using the following command:

stp global enable

- Save your configuration using the following command:

```
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Troubleshooting STP setup

The main issue encountered with STP setup is not having an STP compatible network; for STP to work, all switches on the network must have STP enabled. When a switch with STP enabled is linked to a switch that does not, that link is shut down.

VLANs

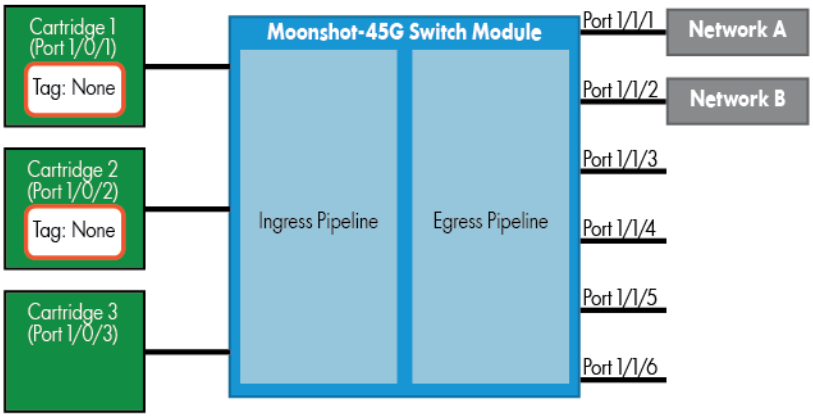
VLAN overview

The VLAN standard, IEEE 802.1Q, is a standard that defines a system for tagging Ethernet frames and procedures for handling such frames. The Moonshot Switch Module software is in full compliance with IEEE 802.1Q VLAN tagging. Following are two simple examples of VLAN configuration. For more information, see the switch documentation.

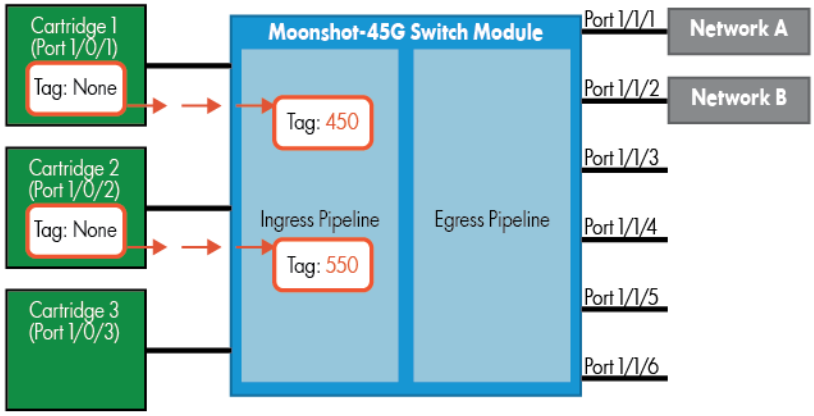
Isolating cartridges to Network A versus Network B

Isolate a cartridge downlink interface to Network A (uplink 1/1/1) while having another cartridge network interface isolated to Network B (uplink 1/1/2).

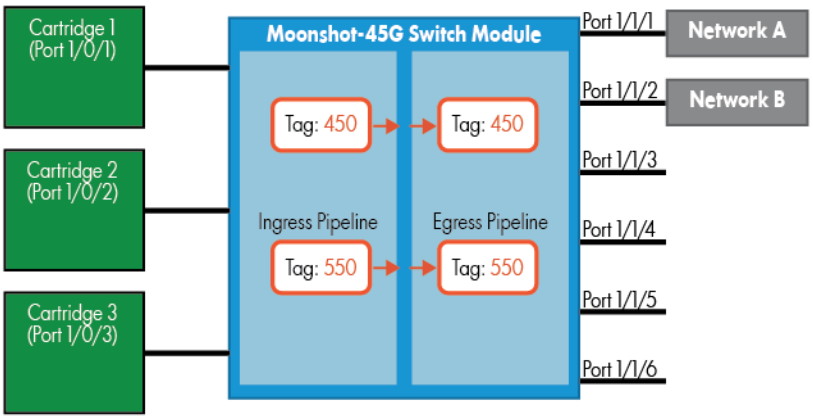
Step 1—Packets come into the switch.



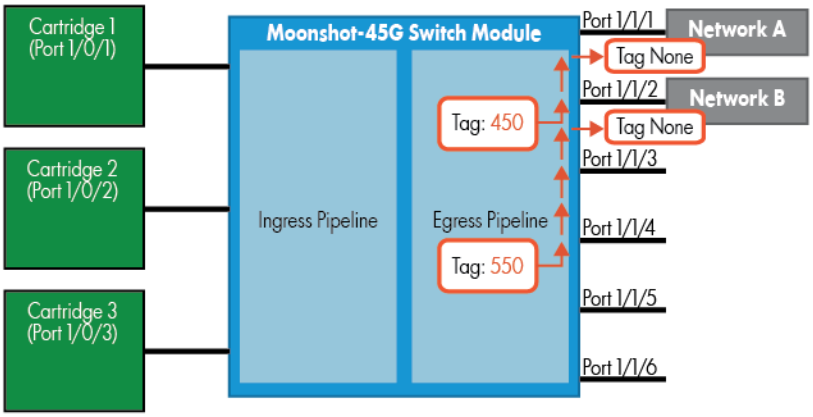
Step 2—Packets get tagged in ingress pipeline.



Step 3—Tagged packets move to egress pipeline.



Step 4—Packets are untagged and forwarded to appropriate network.



Example: VLAN - untagged in, untagged out, C1 to Network A switch, C2 to Network B switch (Moonshot-45G/180G)

Isolate some servers onto Network A (uplink 1/1/1) while having another cartridge network interface isolated to Network B (uplink 1/1/2).

```
(Routing) >enable
```

create the private VLANs that are used to separate Network A and Network B traffic

```
(Routing) #vlan database
(Routing) (Vlan)#vlan 450
(Routing) (Vlan)#vlan 550
(Routing) (Vlan)#exit
(Routing) #config
(Routing) (config)#interface 1/1/1! Setup Network A uplink on private vlan 450
(Routing) (interface 1/1/1)#vlan pvid 450! tells the switch to tag all frames
ingressing on 1/1/1 with 450
(Routing) (interface 1/1/1)#vlan participation include 450
(Routing) (interface 1/1/1)#exit
(Routing) (config)#interface 1/1/2! Setup Network B uplink on private vlan 550
(Routing) (interface 1/1/2)#vlan pvid 550! tells the switch to tag all frames
ingressing on 1/1/2 with 550
(Routing) (interface 1/1/2)#vlan participation include 550
(Routing) (interface 1/1/2)#exit
(Routing) (config)#interface 1/0/1! Use these steps for a cartridge that you
want on Network A
```

```
(Routing) (interface 1/0/1)#vlan pvid 450! tells the switch to tag all frames
ingressing on 1/0/1 with 450
(Routing) (interface 1/0/1)#vlan participation include 450! tells switch that
this port can pass or receive traffic if the VLAN is 450
(Routing) (interface 1/0/1)#vlan participation exclude 1! Do not let vlan 1
traffic participate on this port
(Routing) (interface 1/0/1)#exit
(Routing) (config)#interface 1/0/2! Use these steps for a cartridge that you
want on Network B
(Routing) (interface 1/0/2)#vlan pvid 550! tells the switch to tag all frames
ingressing on 1/0/2 with 550
(Routing) (interface 1/0/2)#vlan participation include 550! tells switch that
this port can pass or receive traffic if the VLAN is 550
(Routing) (interface 1/0/2)#vlan participation exclude 1! don't let vlan 1
traffic participate on this port
(Routing) (interface 1/0/2)#exit
(Routing) (config)#exit
(Routing) #write memory

This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n)y
Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: VLAN - untagged in, untagged out, C1 to Network A switch, C2 to Network B switch (Moonshot-45Gc/45XGc/180XGc)

Isolate some servers onto Network A (uplink 1/1/1) while having another cartridge network interface isolated to Network B (uplink 1/1/2).

create two vlans 450 (Network A) and 550 (Network B)

```
<HP>system-view

System View: return to User View with Ctrl+Z.

[HP]vlan 450

[HP-vlan450]vlan 550

[HP-vlan550]quit
```

Setup Network A uplink on private vlan 450 as untagged on interface forty1/1/1

```
[HP]interface FortyGigE 1/1/1

[HP-FortyGigE1/1/1]port access vlan 450

[HP-FortyGigE1/1/1]quit
```

Setup Network B uplink on private vlan 550 as tagged on interface forty1/1/2 and prevent vlan 1 traffic from passing

```
[HP]interface FortyGigE 1/1/2

[HP-FortyGigE1/1/2]port access vlan 550

[HP-FortyGigE1/1/2]quit
```

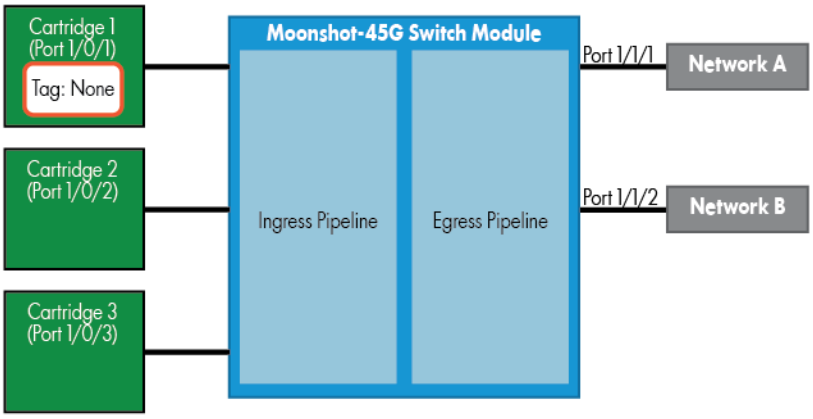
```
# configure downlink (server) ports as untagged and vlan 450 (network A) and 550 (network B)
[HP]int ten 1/0/1
[HP-Ten-GigabitEthernet1/0/1]port access vlan 450
[HP-Ten-GigabitEthernet1/0/1]quit
[HP]int ten 1/0/2
[HP-Ten-GigabitEthernet1/0/2]port access vlan 550
[HP-Ten-GigabitEthernet1/0/2]quit
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* and the *Moonshot-45XGc Switch Layer 3 – IP Routing Configuration Guide* on the **Hewlett Packard Enterprise website**.

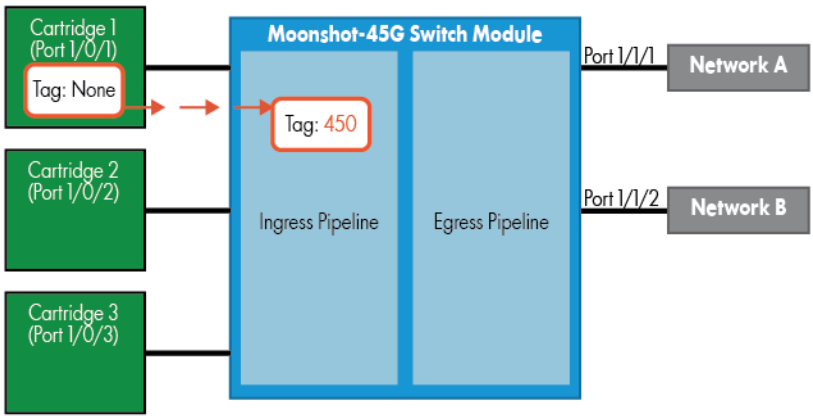
No tagging

Have the network port of some servers VLAN tagged on Network A (uplink 1/1/1) while having the network interface of another cartridge to Network B (uplink 1/1/2) with no tagging.

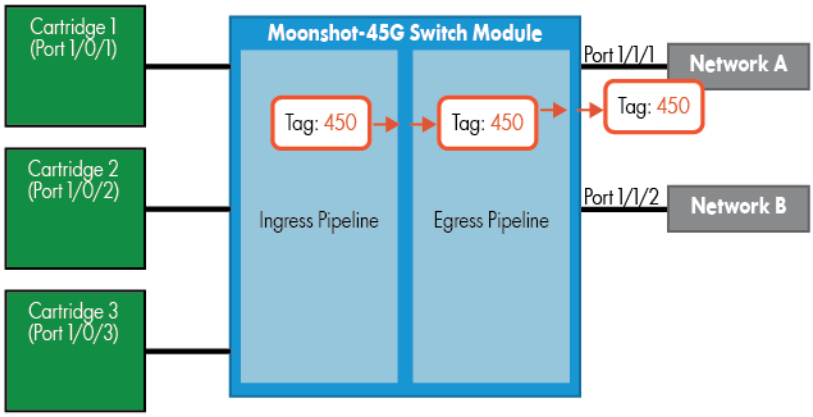
Step 1—Packet comes into switch untagged.



Step 2—Packet gets tagged in ingress pipeline.



Step 3—Tagged packets out egress pipeline.



Example: VLAN - untagged in, tagged out, C1 to Network A (Moonshot-45G/180G)

Have the network port of some servers VLAN tagged on Network A (uplink 1/1/1) while having the network port on other servers on Network B (uplink 1/1/2) with no tagging.

```
(Routing) >enable
```

create the vlan

```
(Routing) #vlan database
(Routing) (Vlan)#vlan 450
(Routing) #exit
(Routing) #config
(Routing) (config)#interface 1/0/1
(Routing) (Interface 1/0/1)#vlan pvid 450 # tells the switch to tag all frames
ingressing on 1/0/1 with 450
(Routing) (Interface 1/0/1)#vlan participation include 450 # tells switch that
this port can pass or receive traffic if the VLAN is 450
(Routing) (Interface 1/0/1)#vlan participation exclude 1 # Do not let vlan 1
traffic participate on this port
(Routing) (Interface 1/0/1)#exit
(Routing) (config)#interface 1/1/1
(Routing) (Interface 1/1/1)#vlan participation include 450
(Routing) (Interface 1/1/1)#vlan tagging 450 # on egress, continue to tag -
otherwise it would have stripped the tag
(Routing) (Interface 1/1/1)#vlan participation exclude 1# Do not let vlan 1
```

```
traffic participate on this port
(Routing) (Interface 1/1/1)#exit
(Routing) (config)#exit
(Routing) #write memory

This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: VLAN - untagged in, tagged out, C1 to Network A (Moonshot-45Gc/45XGc/180XGc)

Have the network port of some servers VLAN tagged on Network A (uplink 1/1/1) while having the network interface of another cartridge to Network B (uplink 1/1/2) with no tagging.

create vlan 450 (Network A)

```
<HP>system-view
System View: return to User View with Ctrl+Z.
[HP]vlan 450
[HP-vlan450]quit
```

Setup Network A uplink on private vlan 450 as tagged on interface forty1/1/1 and prevent vlan 1 traffic from passing

```
[HP]interface FortyGigE 1/1/1
[HP-FortyGigE1/1/1]port link-type trunk
[HP-FortyGigE1/1/1]port trunk permit vlan 450
[HP-FortyGigE1/1/1]undo port trunk permit vlan 1
[HP-FortyGigE1/1/1]quit
```

configure downlink (server) ports as untagged and vlan 450 (network A)

```
[HP]int ten 1/0/1
[HP-Ten-GigabitEthernet1/0/1]port access vlan 450
[HP-Ten-GigabitEthernet1/0/1]quit
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* and the *Moonshot-45XGc Switch Layer 3 – IP Routing Configuration Guide* on the **Hewlett Packard Enterprise website**.

Port mirroring on a Moonshot switch

Port monitoring overview

After your Moonshot system is connected and linked, this section helps you understand how you can set up and disable port mirroring in Moonshot. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

Port mirroring is the process of copying the packets passing through a port to the monitoring port connecting to a monitoring device for packet analysis. Network engineers or administrators use port mirroring to analyze and debug data or diagnose errors on a network. It helps administrators keep a close eye on network performance and alerts them when problems occur. It can be used to mirror either inbound or outbound traffic (or both) on single or multiple interfaces.

This guide provides information for configuring port mirroring via the switch command line interface. It shows the steps required to setup port mirroring, and the necessary steps required to setup the mirroring if a network breakout board is used in the port mirroring configuration.

Setting up port mirroring

Setting up port mirroring is slightly different depending on the switch installed in the system. This section provides examples on how to set up port mirroring depending on the switches installed in the Moonshot System.

Example: Set up port mirroring on Moonshot-45G/180G switches

Set up port mirroring where port 1/1/1 will receive all network traffic on port 1/0/1.

Log into switch

`User:`**Admin**

`Password:` # press ‘Enter’ as there is no password

`(Routing) >`**enable**

`(Routing) #`**configure**

Setup the port 1/0/1 as the mirrored port.

`(Routing) (Config)#`**monitor session 1 source interface 1/0/1**

Setup the port 1/1/1 (probe port) to watch the mirrored port.

`(Routing) (Config)#`**monitor session 1 destination interface 1/1/1**

Enables port mirroring.

`(Routing) (Config)#`**monitor session 1 mode**

`(Routing) (Config)#`**exit**

Display the state of the mirrored port.

`(Routing) #`**show monitor session 1**

Lists all the ports and their current speed/status

`(Routing) #`**show port all**

`(Routing) #`**write memory**

```
This operation may take a few minutes.
```

```
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.
(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Set up local port mirroring on Moonshot-45XGc/180XGc switches

Set up port mirroring where port 1/1/1 will receive all network traffic on port 1/0/3 and 1/0/4.

Create local mirroring group 1.

```
<HP> system-view
[HP] mirroring-group 1 local
```

Configure Ten-GigabitEthernet 1/0/3 and Ten-GigabitEthernet 1/0/4 as source ports, and port FortyGigE 1/1/1 as the monitor port for local mirroring group 1. Note: only FortyGigE 1/1/1 port can be used for a monitoring port.

```
[HP] mirroring-group 1 mirroring-port ten-gigabitethernet 1/0/3 ten-gigabitethernet 1/0/4 both
[HP] mirroring-group 1 monitor-port fortygige 1/1/1
```

Disable the spanning tree feature on the monitor port FortyGigE 1/1/1.

```
[HP] interface fortygige 1/1/1
[HP-FortyGigE1/1/1] undo stp enable
[HP-FortyGigE1/1/1] quit
[HP]
```

Display information about all mirroring groups.

```
[HP] display mirroring-group all
Mirroring group 1:
     Type: Local
     Status: Active
     Mirroring port:
          Ten-GigabitEthernet1/0/3 Both
          Ten-GigabitEthernet1/0/4 Both
     Monitor port: FortyGigE 1/1/1
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Network Management and Monitoring Configuration Guide* on the **Hewlett Packard Enterprise website**.

Removing port mirroring

Removing port mirroring is slightly different depending on the switch installed in the system. This section provides examples on how to remove port mirroring depending on the switches installed in the Moonshot System.

Example: Removing port mirroring on Moonshot-45G/180G switches

After port mirroring is no longer required, it can be removed as shown in the following example.

#Log into switch vsp session.

```
hpiLO-> connect switch vsp [<sa> / <sb>]
User:Admin
Password: // press ‘Enter’ as there is no password
(Routing) >enable
(Routing) #configure
```

#If port mirroring is already enabled, disable it.

```
(Routing) (Config)#monitor session 1 mode
```

#Disable the mirroring port.

```
(Routing) (Config)#no monitor session 1 source interface 1/0/<port-num>
```

#Remove the probe port.

```
(Routing) (Config)#no monitor session 1 destination interface
(Routing) (Config)#exit
```

#Verifies port mirroring has been disabled and mirror and probe ports have been removed.

```
(Routing) #show monitor session 1
(Routing) #write memory

This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Removing port mirroring on Moonshot-45XGc/180XGc switches

After port mirroring is no longer required, it can be removed as shown in the following example.

#Remove local mirroring group 1.

```
<HP> system-view
[HP] undo mirroring-group 1
```

Enable the spanning tree feature on port FortyGigE 1/1/1.

```
[HP] interface fortygige 1/1/1
```

```
[HP-FortyGigE1/1/1] stp enable
[HP-FortyGigE1/1/1] quit
[HP]
```

Display information about all mirroring groups.

```
[HP] display mirroring-group all
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Network Management and Monitoring Configuration Guide* on the **Hewlett Packard Enterprise website**.

High availability networking

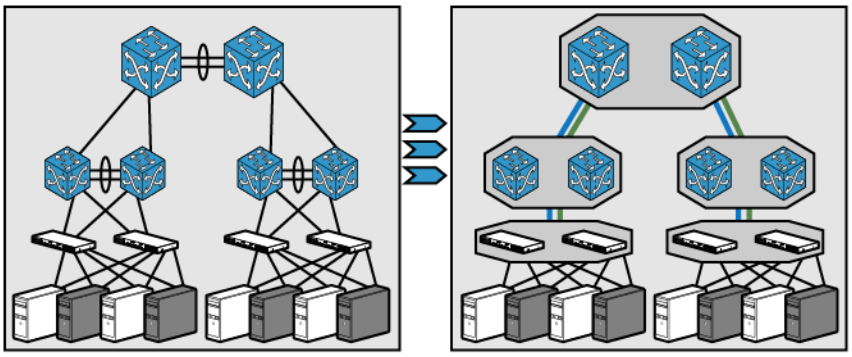
High availability networking overview

After your Moonshot system is connected and linked, this section helps you understand certain steps to configure your system for high availability. This is not an exhaustive set of examples but is intended to help you understand and get started on setting up your switches and then your downstream servers for high availability. You can find videos created for this section on the **Hewlett Packard Enterprise website**.

This section is divided into two main areas of increased bandwidth and/or availability of networking within a Moonshot chassis. The first area covered is on switch stacking. This is followed by LAGs, which can be formed using the switch uplink ports and can be formed by server cartridge NICs and the switch downlink ports.

Switch stacking and IRF fabrics

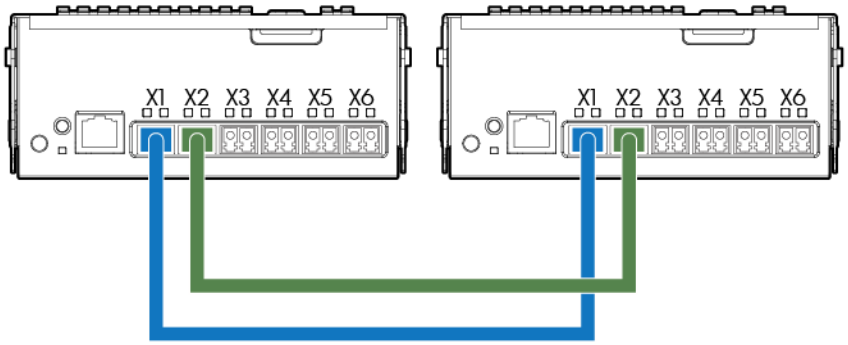
This section explains how to connect two or more Moonshot switches together in a stack. In a stacked configuration, a group of switches can be managed as if they were a single switch that has the port capacity of the sum of all the ports of these combined switches, minus the stacking ports.



- MSTP + VRRP makes the topology complicated and converges slowly.
- Stacking/IRF allows customers to connect multiple devices through physical stacking/IRF ports to combine them into a logical device.

The examples below show a simple stacking configuration of two Moonshot switches (uplink modules shown). The blue and green lines represent the cables used to create the stacking links. In these examples, the second cable provides stack resiliency, so that if one of the stacking links goes down, the switches remain stacked together.

Example: Stacking the Moonshot-45G/180G switch modules



The following steps are used to create the stack shown with these types of switches.

1. Make sure that all switches have the latest software image.
2. Identify one of the switches to be the manager and give it the highest priority value. By default, all switches are configured with a priority of 1, the lowest value.

   ```
   (Routing) #config

   (Routing) (Config)#switch 1 priority 15
   ```

   The priority of the second switch can be left at 1 which is the default setting.
3. On each stack member, configure the Ethernet ports that are to be used as stacking ports. Refer to the basic section in the beginning of this document for a list of available ports that can be used as stacking ports. Use the following steps to configure the two stacking ports shown in the previous example. The switch must be reset (with the reload command) for the changes to take effect.

   ```
   (Routing) #config

   (Routing) (Config)#stack

   (Routing) (Config-stack)#stack-port 1/1/1 stack

   (Routing) (Config-stack)#stack-port 1/1/2 stack

   (Routing) (Config-stack)#exit

   (Routing) (Config)#exit

   (Routing) #reload

   Are you sure you would like to reset the system? (y/n)y
   ```
4. Monitor the console port of the switch with the highest priority, also known as the manager switch.
5. Connect the uplink ports of both switches, as shown in the previous example. The lower priority switch will reboot to become a part of the stack.
6. To verify whether the other switch has joined the stack, monitor the manager switch using the **show switch** command as shown in the following example:

   ```
   (Routing) #show switch

   SW           Management   Standby      Preconfig    Plugged-in
                Switch       Status       Model ID     Model ID

   ---          -----------  ---------    ------------ ------------ ------------
                                          ----         ----         -

   -----------
   ```

Table Continued

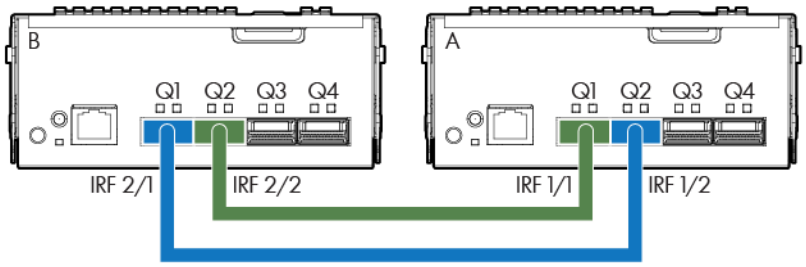
```
1             Mgmt Sw                    Moonshot-180 Moonshot-180 OK
                                         G            G

2.0.0.16
2             Stack Mbr    Oper Stby     Moonshot-180 Moonshot-180 OK
                                         G            G

2.0.0.1
```

7. Save your configuration.

```
(Routing) #write memory

This operation may take a few minutes.

Management interfaces will not be available during this time.

Are you sure you want to save? (y/n) y

Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Creating an Intelligent Resilient Framework fabric with Moonshot-45XGc/180XGc switch modules



The following steps are used to create a stacking/IRF fabric with multiple Moonshot-45XGc/180XGc Switch Modules.

1. Make sure that all switches have the latest software image.
2. Number the switches in the IRF fabric. The switch chosen to be the manager or master will have number 1. Since the default for all switches is 1, the manager switch does not need to be renumbered. Renumber the second switch as 2:

```
<HP>system-view

[HP]irf member 1 renumber 2

[HP]save

[HP]quit

<HP>reboot
```

3. Change the priority of the master switch to the highest priority of 32. The priority of the other IRF members can stay at 1, the default. Use the following instructions:

```
<HP>system-view

[HP]irf member 1 priority 32
```

```
[HP]save
```

4. On each IRF member, configure the IRF ports that are to be used to connect the two IRF members together forming an IRF fabric.

   There are three basic steps to create the IRF ports:

   a. Shut down the uplink ports.
   b. Bond uplink Ethernet ports to a specific IRF port.
   c. Turn on the uplink ports.

   The following instructions show the steps for creating two IRF ports on switch 1 using two ports from a Moonshot-4QSFP+ Uplink Module.

   NOTE:

   If a single 40G port is sufficient for the IRF connection, configure only one IRF port.

```
<HP>system-view
[HP]interface fortygige 1/1/1
[HP-FortyGigE1/1/1]shutdown
[HP]interface fortygige 1/1/2
[HP-FortyGigE1/1/2]shutdown
[HP]quit
[HP]irf-port 1/1
[HP-irf-port1/1]port group interface fortygige 1/1/1
[HP-irf-port1/1]quit
[HP]irf-port 1/2
[HP-irf-port1/2]port group interface fortygige 1/1/2
[HP-irf-port1/2]quit
[HP]interface fortygige 1/1/1
[HP-FortyGigE1/1/1]undo shutdown
[HP]interface fortygige 1/1/2
[HP-FortyGigE1/1/2]undo shutdown
[HP]quit
[HP]save
[HP]irf-port-configuration active
```

The following instructions show the steps for creating the IRF stacking ports on switch 2. In this example, two IRF ports, each comprising a single 40 GbE port, have been used to connect the IRF members, to provide redundancy as well as higher bandwidth (80 GbE). It is possible to use a single IRF port to build an IRF instance between the two switches. It is also possible to add more than one physical port to a single logical IRF port so that it can provide higher aggregate bandwidth.

```
<HP>system-view
[HP]interface fortygige 2/1/1
[HP-FortyGigE2/1/1]shutdown
[HP]interface fortygige 2/1/2
[HP-FortyGigE2/1/2]shutdown
```

```
[HP]quit
[HP]irf-port 2/1
[HP-irf-port2/1]port group interface fortygige 2/1/1
[HP-irf-port2/1]quit
[HP]irf-port 2/2
[HP-irf-port2/2]port group interface fortygige 2/1/2
[HP-irf-port2/2]quit
[HP]interface fortygige 2/1/1
[HP-FortyGigE2/1/1]undo shutdown
[HP]interface fortygige 2/1/2
[HP-FortyGigE2/1/2]undo shutdown
[HP]quit
[HP]save
[HP]irf-port-configuration active
```

16-SFP+ Uplink Module

To create an IRF port using a 16-SFP+ uplink module, at least four 10 GbE ports must be bound to a logical IRF port. The permitted grouping of these four ports is as follows:

- Ten-GigabitEthernet1/1/1, Ten-GigabitEthernet1/1/2, Ten-GigabitEthernet1/1/3, Ten-GigabitEthernet1/1/4
- Ten-GigabitEthernet1/1/5, Ten-GigabitEthernet1/1/6, Ten-GigabitEthernet1/1/7, Ten-GigabitEthernet1/1/8
- Ten-GigabitEthernet1/1/9, Ten-GigabitEthernet1/1/10, Ten-GigabitEthernet1/1/11, Ten-GigabitEthernet1/1/12
- Ten-GigabitEthernet1/1/13, Ten-GigabitEthernet1/1/14, Ten-GigabitEthernet1/1/15, Ten-GigabitEthernet1/1/16

The following example shows how to bind multiple physical interfaces to an IRF port:

```
[HP]interface ten-gigabitethernet 1/1/1
[Ten-GigabitEthernet1/1/1]shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/2
[Ten-GigabitEthernet1/1/2]shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/3
[Ten-GigabitEthernet1/1/3]shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/4
[Ten-GigabitEthernet1/1/4]shutdown
[Ten-GigabitEthernet1/1/4]quit
[HP]irf-port 1/1
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/1
```

```
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/2
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/3
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/4
[HP-irf-port1/1]quit
[HP]interface ten-gigabitethernet 1/1/1
[Ten-GigabitEthernet1/1/1]undo shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/2
[Ten-GigabitEthernet1/1/2]undo shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/3
[Ten-GigabitEthernet1/1/3]undo shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/4
[Ten-GigabitEthernet1/1/4]undo shutdown
[Ten-GigabitEthernet1/1/4]quit
[HP]save
[HP]irf-port-configuration active
```

Repeat the procedure on switch 2 to configure `irf-port 2/2`. If more than a single IRF port is needed, configure `irf-port 1/2` and `irf-port 2/1` as well.

6-SFP Uplink Module

To create an IRF port using a 6-SFP uplink module, at least two 10 GbE ports must be bound to a logical IRF port. The permitted grouping of these two ports is as follows:

- Ten-GigabitEthernet1/1/1, Ten-GigabitEthernet1/1/2
- Ten-GigabitEthernet1/1/3, Ten-GigabitEthernet1/1/4
- Ten-GigabitEthernet1/1/5, Ten-GigabitEthernet1/1/6

The following example shows how to bind multiple physical interfaces to an IRF port:

```
[HP]interface ten-gigabitethernet 1/1/1
[Ten-GigabitEthernet1/1/1]shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/2
[Ten-GigabitEthernet1/1/2]shutdown
[Ten-GigabitEthernet1/1/1]quit
[HP]irf-port 1/1
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/1
[HP-irf-port1/1]port group interface ten-gigabitethernet 1/1/2
[HP-irf-port1/1]quit
```

```
[HP]interface ten-gigabitethernet 1/1/1
[Ten-GigabitEthernet1/1/1]undo shutdown
[HP]quit
[HP]interface ten-gigabitethernet 1/1/2
[Ten-GigabitEthernet1/1/2]undo shutdown

[Ten-GigabitEthernet1/1/1]quit
[HP]save
[HP]irf-port-configuration active
```

Repeat the procedure on switch 2 to configure `irf-port 2/2`. If more than a single IRF port is needed, configure `irf-port 1/2` and `irf-port 2/1` as well.

5. Connect the cables to the IRF-ports of both switches as defined in the previous example. The valid connections for 4-QSFP uplink modules are IRF port 1/2 to 2/1, and 1/1 to 2/2. Connecting IRF port 1/1 to 2/1, or 1/2 to 2/2, will not work. For 6-SFP and 16-SFP+ uplink modules, valid connections are IRF port 1/1 to 2/2.

   The second switch will reboot and take the switch configuration from the master switch (switch 1 in this example). Also, at this time, if the OS versions are different, the OS on switch 2 will either be upgraded or downgraded to match the OS version on the master switch.
6. Verify the configuration of the IRF fabric that has been created.

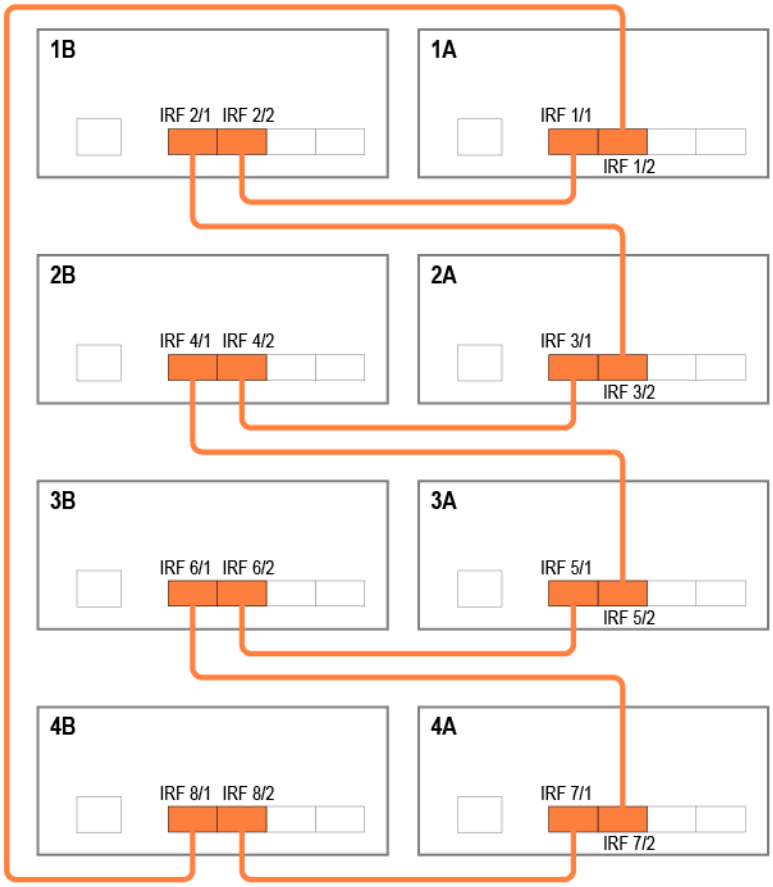
```
[HP]display irf
MemberID        Role            Priority        CPU-Mac         Description
*+1             Master          1               00e0-fc0f-8c02  ---
2               Standby         1               00e0-fc0f-8c03  ---
--------------
--------------
--------------
--------

* indicates the device is the master.
+ indicates the device through which the user logs in.

The Bridge MAC of the IRF is: a0d3-c100-029b
Auto upgrade : yes
Mac persistent : 6 min
Domain ID : 0
[HP]display irf configuration
MemberID            NewID               IRF-Port1           IRF-Port2
1                   1                   FortyGigE1/1/1      FortyGigE1/1/2
2                   2                   FortyGigE2/1/1      FortyGigE2/1/2

[HP]display irf topology
Topology Info
----------------------------------------
```

```
                IRF-Port1                                   IRF-Port2
MemberID        Link          eighbor       Link          neighbor      Belong To
1               DOWN          ---           UP            2             00e0-
                                                                        fc0f-8c03
2               UP            1             DOWN          ---           00e0-
                                                                        fc0f-8c03
```

For more information, see the *Moonshot-45XGc Switch IRF Configuration Guide and Moonshot-45XGc Switch IRF Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Creating an Intelligent Resilient Framework fabric with Moonshot-45XGc/180XGc switch modules

An IRF fabric can have up to eight stack members. For the example below, the number in the upper left corner of each uplink module represents the chassis number in the rack and the letter represents the switch. The IRF numbers shown represent the unit number/IRF port number.



For more information on stacking Moonshot-45G Switch Modules and Moonshot-180G Switch Modules, see the Moonshot Switch Module Administrator's Guide and Moonshot-45G/180G Switch Module CLI Command Reference documents.

Tips and more information on switch stacking

Following are tips for stacking on Moonshot-45G/180G Switch Modules:

- Make sure that all the switches in a stack have a unique priority (1 through 15).
- Make sure that the master switch in a stack has the highest priority of 15.

Following are tips for IRF fabrics on Moonshot-45XGc/180XGc Switch Modules:

- Make sure that all the switches in an IRF fabric have unique member IDs.
- Make sure that all the switches in an IRF fabric have a unique priority (1 through 32).
- Make sure that the master switch in an IRF fabric has the highest priority of 32.
- Make sure to undo shutdown on the interface ports assigned to IRF ports so that they will link to neighboring ports in the IRF fabric.
- Make sure to save when any changes are made, otherwise the changes are lost when the switch is rebooted.

For more information on IRF fabrics, see the Moonshot45XGc Switch Series IRF Configuration Guide.

For more information on stacking Moonshot-45G Switch Modules and Moonshot-180G Switch Modules, see the Moonshot Switch Module Administrator's Guide and Moonshot-45G/180G Switch Module CLI Command Reference documents.

For more information on troubleshooting Moonshot-45XGc/180XGc Switch Modules, see the *Moonshot-45XGc Switch Troubleshooting Guide*. For more information on general troubleshooting, the *Moonshot System Troubleshooting Guide* provides procedures for resolving common problems and comprehensive courses of action for fault isolation and identification, issue resolution, and software maintenance on the Moonshot System. These documents are available in the **Hewlett Packard Enterprise Information Library**.

Switch and server cartridge LAGs

In addition to grouping multiple uplinks on a switch into an aggregated network path to provide additional bandwidth and/or availability, it is possible to also combine the NICs on a server cartridge to provide similar functionality. To do this requires special setup of the switches and the server cartridges via the OS (LAG). The setup of the server side LAGs is presented first. The switch LAG setup follows.

Server cartridge LAG setup

The Linux bonding driver is used to aggregate multiple NICs into a single interface. The driver can be configured to use one of a number of modes that will distribute traffic according to different characteristics of each mode. These different modes are listed and described in the following table.

Mode	Name	Description
0	Round-robin (balance-rr)	Transmit network packets in sequential order from the first available NIC slave through the last. This mode provides load balancing and fault tolerance.
1	Active-backup (active-backup)	Only one NIC slave in the bond is active. If the active slave fails, a different slave becomes active. The single logical bonded interface MAC address is externally visible on only one NIC (port) to avoid distortion in the network switch. This mode provides fault tolerance.

Table Continued

Mode	Name	Description
2	XOR (balance-xor)	Transmit network packets based on [(source MAC address XOR'd with destination MAC address) modulo NIC slave count]. This mode selects the same NIC slave for each destination MAC address and provides load balancing and fault tolerance.
3	Broadcast (broadcast)	Transmit network packets on all slave network interfaces. This mode provides fault tolerance.
4	IEEE 802.3ad Dynamic link aggregation (802.3ad)(LACP)	Creates aggregation groups that share speed and duplex settings. Utilizes all slave network interfaces in the active aggregator group according to the 802.3ad specification.
5	Adaptive transmit load balancing (balance-tlb)	Linux bonding driver mode that does not require any special network-switch support. The outgoing network packet traffic is distributed according to the current load (computed relative to the speed) on each network interface slave. One currently designated slave network interface receives incoming traffic. If this receiving slave fails, another slave takes over the MAC address of the failed receiving slave.
6	Adaptive load balancing (balance-alb)	Includes balance-tlb plus receive load balancing (rlb) for IPV4 traffic, and does not require any special network switch support. ARP negotiation achieves receive load balancing. The bonding driver intercepts the ARP Replies sent by the local system on their way out and overwrites the source hardware address with the unique hardware address of one of the NIC slaves in the single logical bonded interface such that different network-peers use different MAC addresses for their network packet traffic.

Reference:

Mode 5, identified in the previous table as LACP/802.3ad, is the mode used for Dynamic Link Aggregation. The other modes are used to configure a Static Link Aggregation. Modes 1 (balance-rr), 3 (balance-xor), 4 (broadcast), and 5 (LACP/802.3ad) require that the two chassis switches be stacked into a single logical switch, whereas the other modes may be configured with the switches set to operate independently.

Example: Configuring link aggregation on RHEL (+CenTOS, Fedora, and so on)

Use the following instructions to configure link aggregation on RHEL.

#Configuring Link Aggregation on RHEL (and CentOS, Fedora, and so on)

All of the RHEL and related Linux distributions configure Link aggregation in a similar fashion, so these steps should apply to them all:

#First, create a file named /etc/sysconfig/network-scripts/ifcfg-bond0 with the following contents:

```
DEVICE=bond0
ONBOOT=yes
USERCTL=no
```

#You can also configure your bond interface to specify DHCP or static IP addressing as you would other standard Ethernet interfaces. For example, to configure your bonded interface to have a static IP address, you would modify this file to contain:

```
DEVICE=bond0
ONBOOT=yes
USERCTL=no
BOOTPROTO=static
IPADDR=192.168.1.10
NETMASK=255.255.255.0
GATEWAY=192.168.1.1
```

#Or to configure it for DHCP:

```
DEVICE=bond0
ONBOOT=yes
USERCTL=no
BOOTPROTO=dhcp
DHCP_HOSTNAME=myhostname
```

#Next, edit the interface configuration for each NIC you wish to include in the bonded interface. With Moonshot cartridges, which will mean /etc/sysconfig/ifcfg-eth0 and /etc/sysconfig/ifcfg-eth1 most of the time. Edit these to contain

```
DEVICE=ethX
ONBOOT=yes
BOOTPROTO=manual
MASTER=bond0
SLAVE=yes
USERCTL=no
```

Replacing the ‘X’ with the appropriate interface number.

#Configure the bonding mode options by editing or created /etc/modprobe.conf to include the following:

```
alias bond0 bonding
options bond0 miimon=100 mode=0
```

#To configure your bonded interface to use the first mode, bonding-rr (round-robin.) You can alter this mode to use one of the other modes described above. For instance, to use LACP (and to specify an additional parameter) you would adjust the same file to include:

```
alias bond0 bonding
options bond0 miimon=100 mode=4 lacp_rate=1
```

Test your configuration by loading the bonding module with the command "modprobe bond0" and restart your networking with the command "service network restart".

Example: Configuring link aggregation on Ubuntu

Use the following instructions to configure link aggregation on Ubuntu.

To configure Link Aggregation on Ubuntu, simply edit the `/etc/network/interfaces` file to include the following:

```
auto eth0
iface eth0 inet manual
bond-master bond0

auto eth1
iface eth1 inet manual
bond-master bond0

auto bond0
iface bond0 inet static
address 192.168.1.10
netmask 255.255.255.0
gateway 192.168.1.1

bond-mode bonding-rr
bond-miimon 100
```

(You can specify the mode as a name, or a number.) Or to enable dynamic LACP bonding:

```
auto eth0
iface eth0 inet manual
bond-master bond0

auto eth1
iface eth1 inet manual
bond-master bond0

auto bond0
iface bond0 inet static
address 192.168.1.10
netmask 255.255.255.0
gateway 192.168.1.1

bond-mode 4
bond-miimon 100
bond-lacp-rate 1
```

Test your new bonded interface by restarting your networking services with the command "service network restart".

Example: Configuring link aggregation on SLES

Configuring link aggregation on SLES is done in a similar fashion, by editing a few network configuration files, and executing a couple of commands (or just rebooting.)

First, create a file named /etc/sysconfig/network/ifcfg-bond0 with the following contents:

BOOTPROTO='static'

BROADCAST=''

ETHTOOL_OPTIONS=''

IPADDR=’192.168.1.10/24’

MTU=''

NAME=''

NETWORK=''

REMOTE_IPADDR=''

STARTMODE='auto'

USERCONTROL='no'

BONDING_MASTER='yes'

BONDING_MODULE_OPTS='mode=active-backup miimon=100'

BONDING_SLAVE_0='eth0'

BONDING_SLAVE_1='eth1'

You can configure this new interface to use a static IP, or DHCP as you require. You can also choose a different bonding mode using the table above to determine the name or mode number you want.

Then edit both of the NIC configuration files (/etc/sysconfig/network/ifcfg-eth0 and ifcfg-eth1) to contain:

BOOTPROTO='none'

IPADDR=''

BROADCAST=''

STARTMODE='hotplug'

USERCONTROL='no'

ETHTOOL_OPTIONS=''

MTU=''

NETWORK=''

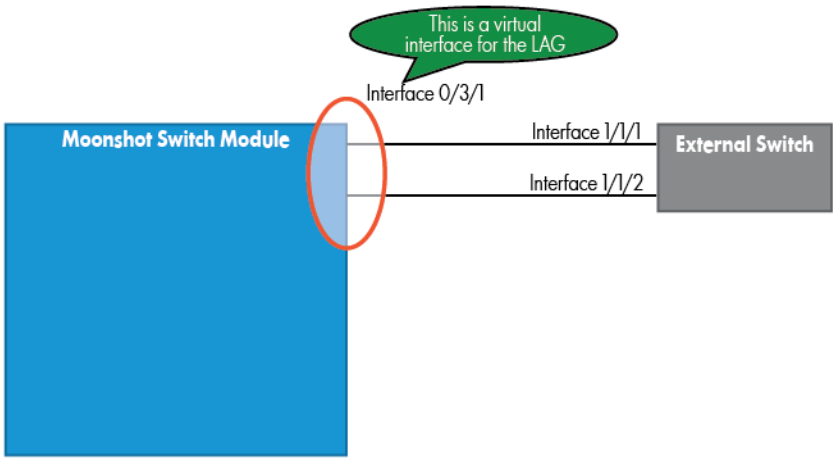
REMOTE_IPADDR=''

Disable your current network by shutting down both Ethernet interfaces with the commands "ifdown eth0; ifdown eth1" and then start the new bonded interface with the command "ifup bond0".

Switch LAG setup

This section explains how to create a static LAG. A LAG is the combining of multiple physical network interfaces in parallel in order to increase the throughput beyond that of what a single network interface can sustain. There are two main types of LAGs supported by the Moonshot switches: static and dynamic. A dynamic LAG uses a LACP packet exchange between the two LAG partners. A static LAG does not use the LACP packet exchange between the two LAG partners. It relies on the user to configure both LAG partners identically to ensure proper operation of the LAG.

The following drawing shows a simple example of a LAG of two uplink ports of a Moonshot switch. Only two ports (or interfaces) are shown for simplicity.



Example: Creating static LAG with Moonshot-45G/180G switches

The following steps are used to create a static LAG of two physical uplink ports as shown in the previous illustration with these types of switch modules.

1. Enter the following commands:

```
(Routing) >en
(Routing) #config
(Routing) (Config)#interface 1/1/1,1/1/2
(Routing) (Interface 1/1/1,1/1/2)#addport 0/3/1
(Routing) (Interface 1/1/1,1/1/2)#no port lacpmode
(Routing) (Interface 1/1/1,1/1/2)#interface 0/3/1
(Routing) (Interface 0/3/1)#port-channel static
(Routing) (Interface 0/3/1)#exit
(Routing) (Config)#exit
(Routing) #
```

2. Connect the two uplink ports of the newly formed LAG to the two ports of the remote switch. Make sure that the two ports of the connecting switch have the same speed configured as a static LAG.
3. Save the configuration.

```
(Routing) #write memory

This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n) y
Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Creating static LAG with Moonshot-45XGc/180XGc switches

The following steps are used to create a static LAG of two physical uplink ports shown above in the example with these types of switch modules.

1. Enter the following commands:

```
<HP>system-view
[HP]interface bridge-aggregation 1
[HP-Bridge-Aggregation1]quit
[HP]interface fortygige 1/1/1
[HP-FortyGigE1/1/1]port link-aggregation group 1
[HP-FortyGigE1/1/1]interface fortygige 1/1/2
[HP-FortyGigE1/1/2]port link-aggregation group 1
[HP-FortyGigE1/1/2]quit
[HP]interface bridge-aggregation 1
[HP-Bridge-Aggregation1]port link-type trunk
[HP-Bridge-Aggregation1]port trunk permit vlan all
```

   NOTE:

   The vlan can be an integer 1 to 4096 or all.

```
[HP-Bridge-Aggregation1]quit
[HP]
```

2. Connect the two uplink ports of the newly formed LAG to the two ports of the remote switch. Make sure that the two ports of the connecting switch are of the same speed configured as a static LAG.
3. Save the configuration:

```
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Example: Creating dynamic LAG with Moonshot-45G/180G switches

The following steps are used to create a dynamic LAG of two physical uplink ports shown above in the example with these types of switch modules.

1. Enter the following commands:

```
(Routing) >en
(Routing) #config
(Routing) (Config)#interface 1/1/1,1/1/2
(Routing) (Interface 1/1/1,1/1/2)#addport 0/3/1
(Routing) (Interface 1/1/1,1/1/2)#port lacpmode
```

```
(Routing) (Interface 1/1/1,1/1/2)#interface 0/3/1
(Routing) (Interface 0/3/1)#no port-channel static
(Routing) (Interface 0/3/1)#exit
(Routing) (Config)#exit
(Routing) #
```

2. Connect the two uplink ports of the newly formed LAG to the two ports of the remote switch.

   NOTE:

   Be sure that the connecting switch has two ports of similar type configured as a dynamic LAG.

3. Save the configuration.

```
(Routing) #write memory

This operation may take a few minutes.
Management interfaces will not be available during this time.
Are you sure you want to save? (y/n)y
Config file 'startup-config' created successfully.

(Routing) #
```

For more information, see the *Moonshot-45G/180G Switch Module CLI Command Reference Guide* on the **Hewlett Packard Enterprise website**.

Example: Creating dynamic LAG with Moonshot-45XGc/180XGc switches

The following steps are used to create a dynamic LAG of two physical uplink ports shown above in the example with these types of switch modules.

1. Enter the following commands:

```
<HP>system-view
[HP]interface bridge-aggregation 1
[HP-Bridge-Aggregation1]link-aggregation mode dynamic
[HP-Bridge-Aggregation1]interface fortygige 1/1/1
[HP-FortyGigE1/1/1]port link-aggregation group 1
[HP-FortyGigE1/1/1]interface fortygige 1/1/2
[HP-FortyGigE1/1/2]port link-aggregation group 1
[HP-FortyGigE1/1/2]quit
[HP]interface bridge-aggregation 1
[HP-Bridge-Aggregation1]port link-type trunk
[HP-Bridge-Aggregation1]port trunk permit vlan all
```

   NOTE:

   The vlan can be an integer 1 to 4096 or all.

```
[HP-Bridge-Aggregation1]quit
[HP]
```

2. Connect the two uplink ports of the newly formed LAG to the two ports of the remote switch.

NOTE:

Be sure that the connecting switch has two ports of similar type configured as a dynamic LAG.

3. Save the configuration:

```
<HP>save
The current configuration will be written to the device. Are you sure? [Y/N]:y
Please input the file name(*.cfg)[flash:/startup.cfg]
(To leave the existing filename unchanged, press the enter key):
flash:/startup.cfg exists, overwrite? [Y/N]:y
Validating file. Please wait...
Saved the current configuration to mainboard device successfully.
<HP>
```

For more information, see the *Moonshot-45XGc Switch Layer 2 – LAN Switching Command Reference* on the **Hewlett Packard Enterprise website**.

Tips and more information on switch LAG setup

Following are general tips for LAGs on both Moonshot-45G/180G and Moonshot-45XGc/180XGc Switch Modules:

- Each member of the LAG must be running the same speed and must be in full duplex mode.
- The configured speed of a LAG member cannot be changed.
- The port cannot be a mirrored port.
- A port can only be a member of one LAG.
- Make sure that the LAG ports on the connecting switch are configured the same as the newly created LAG ports. **Do not** intermix static LAGs and dynamic LAGs.

Tip for LAGs on Moonshot-45G/180G Switch Modules:

- Make sure that the LAG port used is in the form of x/3/x.

Tips for LAGs on Moonshot-45XGc/180XGc Switch Modules:

- Make sure to choose a bridge-aggregation interface number that is not already used on the switch. The display link-aggregation summary command shows all bridge-aggregation (BAGG) interfaces that are being used, if any.
- Make sure to add any VLANs (other than the default of VLAN 1) required on this LAG.

For more information on troubleshooting Moonshot-45XGc/180XGc Switch Modules, see the *Moonshot-45XGc Switch Troubleshooting Guide*. For more information on general troubleshooting, the *Moonshot System Troubleshooting Guide* provides procedures for resolving common problems and comprehensive courses of action for fault isolation and identification, issue resolution, and software maintenance on the Moonshot System. These document are available in the **Hewlett Packard Enterprise Information Library**.

PXE support when LACP is configured

When LACP is configured between a cartridge and a switch but the cartridge is booting up with PXE, LACP will not run on the cartridge. Complete the following to ensure that packet communications will occur even with a lack of a successful LACP connection between the cartridge and the switch:

- 45G and 180G switches: To allow communication through the switch when the cartridge is PXE-booting, ensure that the firmware version on the switches is 2.0.3 or later.
- 45XGc, 180XGc, and 45Gc switches: To allow communication through the switch when the cartridge is PXE-booting, use the following configuration on the switch on each aggregation between the switch and the cartridge (In this example, it is configured on a single LACP instance, "bridge-aggregation 1"):

  ```
  [HP]interface bridge-aggregation 1
  [HP-Bridge-Aggregation1]lacp edge-port
  ```

Troubleshooting server cartridge LAG setup

Check for bonding errors by running the command "`cat /proc/net/bonding/bond0`". This action displays the current status of the aggregated connection and additional details, depending on the mode chosen.

Support and other resources

Accessing Hewlett Packard Enterprise Support

- For live assistance, go to the Contact Hewlett Packard Enterprise Worldwide website:

  http://www.hpe.com/assistance
- To access documentation and support services, go to the Hewlett Packard Enterprise Support Center website:

  http://www.hpe.com/support/hpesc

Information to collect

- Technical support registration number (if applicable)
- Product name, model or version, and serial number
- Operating system name and version
- Firmware version
- Error messages
- Product-specific reports and logs
- Add-on products or components
- Third-party products or components

Accessing updates

- Some software products provide a mechanism for accessing software updates through the product interface. Review your product documentation to identify the recommended software update method.
- To download product updates:

  Hewlett Packard Enterprise Support Center

  www.hpe.com/support/hpesc

  Hewlett Packard Enterprise Support Center: Software downloads

  www.hpe.com/support/downloads

  Software Depot

  www.hpe.com/support/softwaredepot
- To subscribe to eNewsletters and alerts:

  www.hpe.com/support/e-updates
- To view and update your entitlements, and to link your contracts and warranties with your profile, go to the Hewlett Packard Enterprise Support Center **More Information on Access to Support Materials** page:

  www.hpe.com/support/AccessToSupportMaterials

IMPORTANT:

Access to some updates might require product entitlement when accessed through the Hewlett Packard Enterprise Support Center. You must have an HPE Passport set up with relevant entitlements.

Customer self repair

Hewlett Packard Enterprise customer self repair (CSR) programs allow you to repair your product. If a CSR part needs to be replaced, it will be shipped directly to you so that you can install it at your convenience.

Some parts do not qualify for CSR. Your Hewlett Packard Enterprise authorized service provider will determine whether a repair can be accomplished by CSR.

For more information about CSR, contact your local service provider or go to the CSR website:

http://www.hpe.com/support/selfrepair

Remote support

Remote support is available with supported devices as part of your warranty or contractual support agreement. It provides intelligent event diagnosis, and automatic, secure submission of hardware event notifications to Hewlett Packard Enterprise, which will initiate a fast and accurate resolution based on your product's service level. Hewlett Packard Enterprise strongly recommends that you register your device for remote support.

If your product includes additional remote support details, use search to locate that information.

Remote support and Proactive Care information

HPE Get Connected

www.hpe.com/services/getconnected

HPE Proactive Care services

www.hpe.com/services/proactivecare

HPE Proactive Care service: Supported products list

www.hpe.com/services/proactivecaresupportedproducts

HPE Proactive Care advanced service: Supported products list

www.hpe.com/services/proactivecareadvancedsupportedproducts

Proactive Care customer information

Proactive Care central

www.hpe.com/services/proactivecarecentral

Proactive Care service activation

www.hpe.com/services/proactivecarecentralgetstarted

Warranty information

To view the warranty for your product or to view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products* reference document, go to the Enterprise Safety and Compliance website:

www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional warranty information

HPE ProLiant and x86 Servers and Options

www.hpe.com/support/ProLiantServers-Warranties

HPE Enterprise Servers

www.hpe.com/support/EnterpriseServers-Warranties

HPE Storage Products

www.hpe.com/support/Storage-Warranties

HPE Networking Products

www.hpe.com/support/Networking-Warranties

Regulatory information

To view the regulatory information for your product, view the *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at the Hewlett Packard Enterprise Support Center:

www.hpe.com/support/Safety-Compliance-EnterpriseProducts

Additional regulatory information

Hewlett Packard Enterprise is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH (Regulation EC No 1907/2006 of the European Parliament and the Council). A chemical information report for this product can be found at:

www.hpe.com/info/reach

For Hewlett Packard Enterprise product environmental and safety information and compliance data, including RoHS and REACH, see:

www.hpe.com/info/ecodata

For Hewlett Packard Enterprise environmental information, including company programs, product recycling, and energy efficiency, see:

www.hpe.com/info/environment

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Acronyms and abbreviations

AOC
active optical cable
BPDU
Bridge Protocol Data Unit
CM
chassis manager
DAC
direct attach cable
ESD
electrostatic discharge
FC
Fibre Channel
GbE
gigabit Ethernet
GBIC
Gigabit Interface Converter
HPE APM
HPE Advanced Power Manager
iLO
Integrated Lights-Out
IRF
Intelligent Resilient Framework
LACP
Link Aggregation Control Protocol
LAG
link aggregation group
LC
Lucent connector
MPO
multifiber push-on
NOS
network operating system
PXE
preboot execution environment
QoS

Quality of Service

QSFP+

enhanced quad small form-factor pluggable

SCP

Secure Copy Protocol

SD

Secure Digital

SFP+

enhanced small form-factor pluggable

SLES

SUSE Linux Enterprise Server

SoC

system on chip

SR

short range

SSH

Secure Shell

SX

short haul

TFTP

Trivial File Transfer Protocol

ToR

top of rack

TRILL

Transparent Interconnection of Lots of Links

USB

universal serial bus

VLAN

virtual local-area network

VNC

virtual network computing

VSP

virtual serial port

VTY

Virtual Type terminal user interface