QFX3000-G QFabric System Deployment Guide

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The information in this document is current as of the date on the title page.

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IN THIS SECTION

Use this guide to plan, set up and configure the elements of a QFX3000-G QFabric System, a highly scalable distributed Layer 2 and Layer 3 networking architecture managed as a single entity that provides a high-performance, low-latency, and unified interconnect solution.

Documentation and Release Notes

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Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   system {
       scripts {
           commit {
               file ex-script.xsl;
           }
       }
   }
   interfaces {
       fxp0 {
           disable;
           unit 0 {
               family inet {
                   address 10.0.0.1/24;
               }
           }
       }
   }
   ```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

   ```
   [edit]
   user@host# load merge /var/tmp/ex-script.conf
   load complete
   ```

Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

   For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

   ```
   commit {
       file ex-script-snippet.xsl; }
   ```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

   ```
   [edit]
   user@host# edit system scripts
   [edit system scripts]
   ```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

   ```
   [edit system scripts]
   user@host# load merge relative /var/tmp/ex-script-snippet.conf
   load complete
   ```

For more information about the **load** command, see CLI Explorer.

Documentation Conventions

Table 1 on page xx defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

Table 2 on page xx defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*

Table 2: Text and Syntax Conventions *(continued)*

<table>
<tr><th>Convention</th><th>Description</th><th>Examples</th></tr>
<tr><td>Italic text like this</td><td>Represents variables (options for which you substitute a value) in commands or configuration statements.</td><td>Configure the machine’s domain name:

[edit]
root@# set system domain-name
domain-name</td></tr>
<tr><td>Text like this</td><td>Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.</td><td>• To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level.
• The console port is labeled CONSOLE.</td></tr>
<tr><td>< > (angle brackets)</td><td>Encloses optional keywords or variables.</td><td>stub <default-metric <i>metric</i>>;</td></tr>
<tr><td>| (pipe symbol)</td><td>Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.</td><td>broadcast | multicast

(string1 | string2 | string3)</td></tr>
<tr><td># (pound sign)</td><td>Indicates a comment specified on the same line as the configuration statement to which it applies.</td><td>rsvp { # Required for dynamic MPLS only</td></tr>
<tr><td>[ ] (square brackets)</td><td>Encloses a variable for which you can substitute one or more values.</td><td>community name members [community-ids]</td></tr>
<tr><td>Indention and braces ({ })</td><td>Identifies a level in the configuration hierarchy.</td><td rowspan="2">[edit]
routing-options {
  static {
    route default {
      nexthop address;
      retain;
    }
  }
}</td></tr>
<tr><td>; (semicolon)</td><td>Identifies a leaf statement at a configuration hierarchy level.</td></tr>
<tr><td colspan="3">GUI Conventions</td></tr>
</table>

Table 2: Text and Syntax Conventions *(continued)*

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

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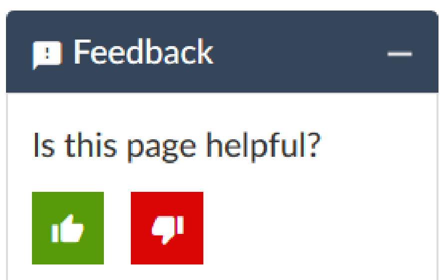
- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the Juniper Networks TechLibrary site, and do one of the following:



  - Click the thumbs-up icon if the information on the page was helpful to you.
  - Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.

- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

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- Find product documentation: https://www.juniper.net/documentation/
- Find solutions and answer questions using our Knowledge Base: https://kb.juniper.net/
- Download the latest versions of software and review release notes: https://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: https://www.juniper.net/company/communities/
- Create a service request online: https://myjuniper.juniper.net

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://entitlementsearch.juniper.net/entitlementsearch/

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You can create a service request with JTAC on the Web or by telephone.

- Visit https://myjuniper.juniper.net.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see https://support.juniper.net/support/requesting-support/.

1
PART

Overview

CHAPTER 1

Before You Begin

IN THIS CHAPTER

QFabric System Overview

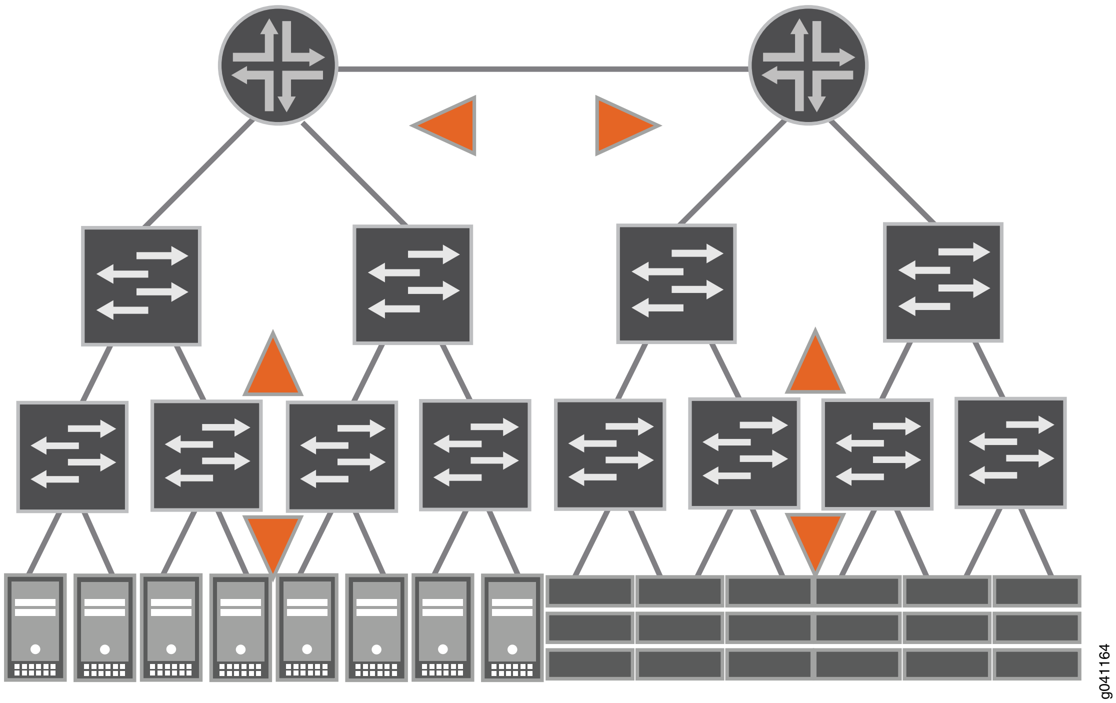
IN THIS SECTION

The architecture of legacy data centers contrasts significantly with the revolutionary Juniper Networks data center solution.

Legacy Data Center Architecture

Service providers and companies that support data centers are familiar with legacy multi-tiered architectures, as seen in Figure 1 on page 3.

Figure 1: Legacy Data Center Architecture



The *access layer* connects servers and other devices to a Layer 2 switch and provides an entry point into the data center. Several access switches are in turn connected to intermediate Layer 2 switches at the *aggregation layer* (sometimes referred to as the *distribution layer*) to consolidate traffic. A *core layer* interconnects the aggregation layer switches. Finally, the core switches are connected to Layer 3 routers in the *routing layer* to send the aggregated data center traffic to other data centers or a wide area network (WAN), receive external traffic destined for the data center, and interconnect different Layer 2 broadcast domains within the data center.

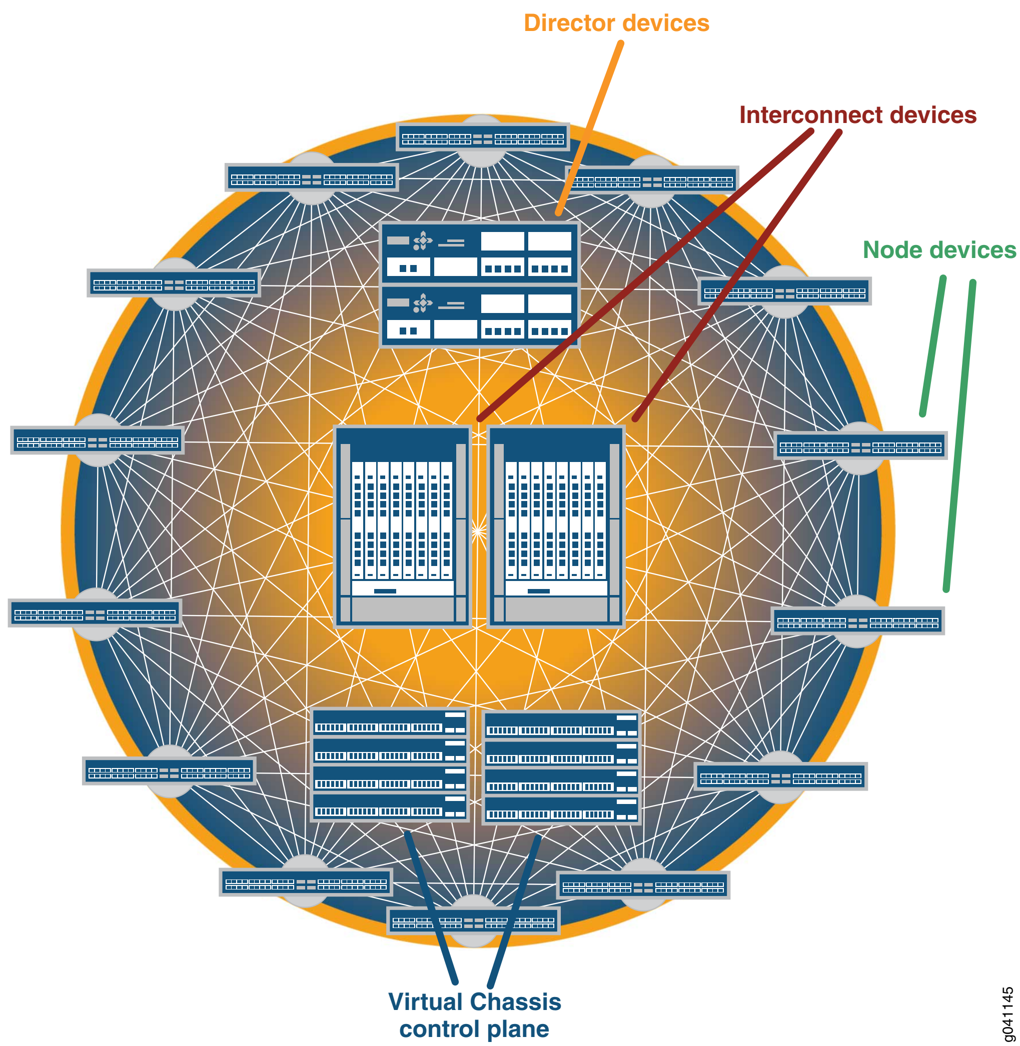
The problems that exist with the multi-tiered data center architecture include:

- **Limited scalability**—The demands for electrical power, cooling, cabling, rack space, and port density increase exponentially as the traditional data center expands, which prohibits growth after minimal thresholds are met.
- **Inefficient resource usage**—Up to 50 percent of switch ports in a legacy data center are used to interconnect different tiers rather than support server and storage connections. In addition, traffic that ideally should move horizontally between servers within a data center often must also be sent vertically up through the tiers to reach a router and down through the tiers to reach the required destination server.
- **Increased latency**—By requiring the devices at each tier level to perform multiple iterations of packet and frame processing, the data plane traffic takes significantly longer to reach its destination than if the sending and receiving devices were directly connected. This processing overhead results in potentially poor performance for time-sensitive applications, such as voice, video, or financial transactions.

QFX Series QFabric System Architecture

In contrast to legacy multi-tiered data center architectures, the Juniper Networks QFX Series QFabric System architecture provides a simplified networking environment that solves the most challenging issues faced by data center operators. A fabric is a set of devices that act in concert to behave as a single switch. It is a highly scalable, distributed, Layer 2 and Layer 3 networking architecture that provides a high-performance, low-latency, and unified interconnect solution for next-generation data centers as seen in Figure 2 on page 4.

Figure 2: QFX Series QFabric System Architecture



A QFabric system collapses the traditional multi-tiered data center model into a single tier where all access layer devices (known in the QFabric system model as *Node devices*) are essentially directly connected to all other access layer devices across a very large scale fabric backplane (known in the QFabric system model as the *Interconnect device*). Such an architecture enables the consolidation of data center endpoints (such as servers, storage devices, memory, appliances, and routers) and provides better scaling and network virtualization capabilities than traditional data centers.

Essentially, a QFabric system can be viewed as a single, nonblocking, low-latency switch that supports thousands of 10-Gigabit Ethernet ports or 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel ports to interconnect servers, storage, and the Internet across a high-speed, high-performance fabric. The entire QFabric system is managed as a single entity through a *Director group*, containing redundant hardware and software components that can be expanded and scaled as the QFabric system grows in size. In addition, the Director group automatically senses when devices are added or removed from the QFabric system and dynamically adjusts the amount of processing resources required to support the system. Such intelligence helps the QFabric system use the minimum amount of power to run the system efficiently, but not waste energy on unused components.

As a result of the QFabric system architecture, data center operators are now realizing the benefits of this next-generation architecture, including:

- **Low latency**—Because of its inherent advantages in this area, the QFabric system provides an excellent foundation for mission-critical applications such as financial transactions and stock trades, as well as time-sensitive applications such as voice and video.
- **Enhanced scalability**—The QFabric system can be managed as a single entity and provides support for thousands of data center devices. As Internet traffic continues to grow exponentially with the increase in high-quality video transmissions and rise in the number of mobile devices used worldwide, the QFabric system can keep pace with the demands for bandwidth, applications, and services offered by the data center.
- **Virtualization-enabled**—The QFabric system was designed to work seamlessly with virtual servers, virtual appliances, and other virtual devices, allowing for even greater scalability, expandability, and rapid deployment of new services than ever before. Migrating to virtual devices also results in significant costs savings, fueled by reduced space requirements, decreased needs for power and cooling, and increased processing capabilities.
- **Simplicity**—Although the QFabric system can scale to hundreds of devices and thousands of ports, you can still manage the QFabric system as a single system.
- **Flexibility**—You can deploy the QFabric system as an entire system or in stages.
- **Convergence**—Because the congestion-free fabric is lossless, all traffic in a QFabric system can be converged onto a single network. As a result, the QFabric system supports Ethernet, Fibre Channel over Ethernet, and native Fibre Channel packets and frames.

Flat, nonblocking, and lossless, the network fabric offered by the QFabric system has the scale and flexibility to meet the needs of small, medium, and large-sized data centers for years to come.

RELATED DOCUMENTATION

Understanding QFabric System Terminology

To understand the QFabric system environment and its components, you should become familiar with the terms defined in Table 3 on page 6.

Table 3: QFabric System Terms

Term	Definition
Clos network fabric	Three-stage switching network in which switch elements in the middle stages are connected to all switch elements in the ingress and egress stages. In the case of QFabric system components, the three stages are represented by an ingress chipset, a midplane chipset, and an egress chipset in an Interconnect device (such as a QFX3008-I Interconnect device). In Clos networks, which are well known for their nonblocking properties, a connection can be made from any idle input port to any idle output port, regardless of the traffic load in the rest of the system.
Director device	Hardware component that processes fundamental QFabric system applications and services, such as startup, maintenance, and inter-QFabric system device communication. A set of Director devices with hard drives can be joined to form a *Director group*, which provides redundancy and high availability by way of additional memory and processing power. (See also *Director group*.)
Director group	Set of Director devices that host and load-balance internal processes for the QFabric system. The Director group handles tasks such as QFabric system network topology discovery, Node and Interconnect device configuration, startup, and DNS, DHCP, and NFS services. Operating a Director group is a minimum requirement to manage a QFabric system. The Director group runs the Director software for management applications and runs dual processes in active/standby mode for maximum redundancy and high availability. (See also *Director software* and *Director device*.)

Table 3: QFabric System Terms *(continued)*

Term	Definition
Director software	Software that handles QFabric system administration tasks, such as fabric management and configuration. The Junos OS-based Director software runs on the *Director group*, provides a single, consolidated view of the QFabric system, and enables the main QFabric system administrator to configure, manage, monitor, and troubleshoot QFabric system components from a centralized location. To access the Director software, log in to the default partition. (See also *Director device* and *Director group*.)
fabric control Routing Engine	Virtual Junos OS Routing Engine instance used to control the exchange of routes and flow of data between QFabric system hardware components within a partition. The fabric control Routing Engine runs on the Director group.
fabric manager Routing Engine	Virtual Junos OS Routing Engine instance used to control the initialization and maintenance of QFabric system hardware components belonging to the default partition. The fabric manager Routing Engine runs on the Director group.
infrastructure	QFabric system services processed by the virtual Junos Routing Engines operating within the Director group. These services, such as fabric management and fabric control, support QFabric system functionality and high availability.
Interconnect device	QFabric system component that acts as the primary fabric for data plane traffic traversing the QFabric system between Node devices. Examples of Interconnect devices include the QFX3008-I Interconnect device in a QFX3000-G QFabric system, the QFX5100-24Q configured as an Interconnect device, and the QFX3600-I Interconnect device in a QFX3000-M QFabric system. (See also *Node device*.)
Junos Space	Carrier-class network management system for provisioning, monitoring, and diagnosing Juniper Networks routing, switching, security, and data center platforms.
network Node group	Set of one to eight Node devices that connects to an external network.
network Node group Routing Engine	Virtual Junos OS Routing Engine instance that handles routing processes for a network Node group. The network Node group Routing Engine runs on the Director group.

Table 3: QFabric System Terms *(continued)*

Term	Definition
Node device	Routing and switching device that connects to endpoints (such as servers or storage devices) or external network peers, and is connected to the QFabric system through an Interconnect device. You can deploy Node devices similarly to the way a top-of-rack switch is implemented. Examples of Node devices include the QFX3500 Node device, QFX3600 Node device, and QFX5100 Node device. (See also *Interconnect device* and *network Node group*.)
partition	Collection of physical or logical QFabric system hardware components (such as Node devices) that provides fault isolation, separation, and security. In their initial state, all QFabric system components belong to a *default partition*.
QFabric system	Highly scalable, distributed, Layer 2 and Layer 3 networking architecture that provides a high-performance, low-latency, and unified interconnect solution for next-generation data centers. A QFabric system collapses the traditional multi-tier data center model, enables the consolidation of data center endpoints (such as servers, storage devices, memory, appliances, and routers), and provides better scaling and network virtualization capabilities than traditional data centers. Essentially, a QFabric system can be viewed as a single, nonblocking, low-latency switch that supports thousands of 10-Gigabit Ethernet ports or 2-Gbps, 4-Gbps or 8-Gbps Fibre Channel ports to interconnect servers, storage, and the Internet across a high-speed, high-performance fabric. The QFabric system must have sufficient resources and devices allocated to handle the *Director group*, *Node device*, and *Interconnect device* functions and capabilities.

Table 3: QFabric System Terms *(continued)*

Term	Definition
QFabric system control plane	Internal network connection that carries control traffic between QFabric system components. The QFabric system control plane includes management connections between the following QFabric system hardware and software components: • *Node devices*, such as the QFX3500 Node device. • *Interconnect devices*, such as the QFX3008-I Interconnect device. • *Director group* processes, such as management applications, provisioning, and topology discovery. • *Control plane Ethernet switches* to provide interconnections to all QFabric system devices and processes. For example, you can use EX Series EX4200 switches running in Virtual Chassis mode for this purpose. To maintain high availability, the QFabric system control plane uses a different network than the QFabric system data plane, and uses a fabric provisioning protocol and a fabric management protocol to establish and maintain the QFabric system.
QFabric system data plane	Redundant, high-performance, and scalable data plane that carries QFabric system data traffic. The QFabric system data plane includes the following high-speed data connections: • 10-Gigabit Ethernet connections between QFabric system endpoints (such as servers or storage devices) and Node devices. • 40-Gbps quad small form-factor pluggable plus (QSFP+) connections between Node devices and Interconnect devices. • 10-Gigabit Ethernet connections between external networks and a Node device acting as a network Node group. To maintain high availability, the QFabric system data plane is separate from the QFabric system control plane.
QFabric system endpoint	Device connected to a Node device port, such as a server, a storage device, memory, an appliance, a switch, or a router.
QFabric system fabric	Distributed, multistage network that consists of a queuing and scheduling system that is implemented in the Node device, and a distributed cross-connect system that is implemented in Interconnect devices. The QFabric system fabric is part of the QFabric system data plane.

Table 3: QFabric System Terms *(continued)*

Term	Definition
QFX3500 Node device	Node device that connects to either endpoint systems (such as servers and storage devices) or external networks in a QFabric system. It is packaged in an industry-standard 1U, 19-inch rack-mounted enclosure. The QFX3500 Node device provides up to 48 10-Gigabit Ethernet interfaces to connect to the endpoints. Twelve of these 48 interfaces can be configured to support 2-Gbps, 4-Gbps or 8-Gbps Fibre Channel, and 36 of the interfaces can be configured to support Gigabit Ethernet. Also, there are four uplink connections to connect to Interconnect devices in a QFabric system. These uplinks use 40-Gbps quad small form-factor pluggable plus (QSFP+) interfaces. (See also *QFX3500 switch*.)
QFX3500 switch	Standalone data center switch with 10-Gigabit Ethernet access ports and 40-Gbps quad, small form-factor pluggable plus (QSFP+) uplink interfaces. You can (optionally) configure some of the access ports as 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel ports or Gigabit Ethernet ports. The QFX3500 switch can be converted to a QFabric system Node device as part of a complete QFabric system. The switch is packaged in an industry-standard 1U, 19-inch rack-mounted enclosure. (See also *QFX3500 Node device*.)
QFX3600 Node device	Node device that connects to either endpoint systems (such as servers and storage devices) or external networks in a QFabric system. It is packaged in an industry-standard 1U, 19-inch rack-mounted enclosure. The QFX3600 Node device provides 16 40-Gbps QSFP+ ports. By default, 4 ports (labeled **Q0** through **Q3**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect device, and 12 ports (labeled **Q4** through **Q15**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the first eight ports (**Q0** through **Q7**) for uplink connections between your Node device and your Interconnect device, and ports **Q2** through **Q15** for 10-Gigabit Ethernet connections to either endpoint systems or external networks. (See also *QFX3600 switch*.)

Table 3: QFabric System Terms *(continued)*

Term	Definition
QFX3600 switch	Standalone data center switch with 16 40-Gbps quad, small form-factor pluggable plus (QSFP+) interfaces. By default, all the 16 ports operate as 40-Gigabit Ethernet ports. Optionally, you can choose to configure the 40-Gbps ports to operate as four 10-Gigabit Ethernet ports. You can use QSFP+ to four SFP+ breakout cables to connect the 10-Gigabit Ethernet ports to other servers, storage, and switches. The QFX3600 switch can be converted to a QFabric system Node device as part of a complete QFabric system. The switch is packaged in an industry-standard 1U, 19-inch rack-mounted enclosure. (See also *QFX3600 Node device*.)

Table 3: QFabric System Terms *(continued)*

Term	Definition
QFX5100 Node device	QFabric system Node device that connects to either endpoint systems (such as servers and storage devices) or external networks. All three supported models are packaged in an industry-standard 1U, 19-inch rack-mounted enclosure. A QFX5100 Node device can be any of these models: • QFX5100-48S By default, the QFX5100-48S Node device provides 48 10-Gigabit Ethernet interfaces to connect to the endpoints. There are also six 40-Gbps quad small form-factor pluggable plus (QSFP+) interfaces, of which four are uplinks (FTE). • QFX5100-48T By default, the QFX5100-48T Node device provides 48 10GBASE-T interfaces to connect to endpoints. There are also six 40-Gbps QSFP+ interfaces, of which four are uplinks (FTE) • QFX5100-24Q By default, the QFX5100-24Q Node device provides 24 40-Gigabit Ethernet QSFP+ interfaces to connect to the endpoints. The QFX5100-24Q has two expansion bays. The number of additional interfaces available depends on the expansion module and the System mode configured for the Node device. By default, on the QFX5100-48S Node device and QFX5100-48T Node device, the first 4 ports (labeled **fte-0/1/0** through **fte-0/1/3**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 2 ports (labeled **xle-0/1/4** and **xle-0/1/5**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 8 10-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the middle 2 ports (**xle-0/1/2** and **xle-0/1/3**) for additional connections to either endpoint systems or external networks. (See also *QFX3500 Node device* and *QFX3600 Node device*.)
redundant server Node group	Set of two Node devices that connect to servers or storage devices. Link aggregation group (LAG) interfaces can span the Node devices within a redundant server Node group.

Table 3: QFabric System Terms *(continued)*

Term	Definition
rolling upgrade	Method used in the QFabric system to upgrade the software for components in a systematic, low-impact way. A rolling upgrade begins with the Director group, proceeds to the fabric (Interconnect devices), and finishes with the Node groups.
Routing Engine	Juniper Networks-proprietary processing entity that implements QFabric system control plane functions, routing protocols, system management, and user access. Routing Engines can be either physical or virtual entities. The Routing Engine functions in a QFabric system are sometimes handled by Node devices (when connected to endpoints), but mostly implemented by the Director group (to provide support for QFabric system establishment, maintenance, and other tasks).
routing instance	Private collection of routing tables, interfaces, and routing protocol parameters unique to a specific customer. The set of interfaces is contained in the routing tables, and the routing protocol parameters control the information in the routing tables. (See also *virtual private network*.)
server Node group	Set of one or more Node devices that connect to servers or storage devices.
virtual LAN (VLAN)	Unique Layer 2 broadcast domain for a set of ports selected from the components available in a partition. VLANs allow manual segmentation of larger Layer 2 networks and help to restrict access to network resources. To interconnect VLANs, Layer 3 routing is required.
virtual private network (VPN)	Layer 3 routing domain within a partition. VPNs maintain privacy with a tunneling protocol, encryption, and security procedures. In a QFabric system, a Layer 3 VPN is configured as a *routing instance*.
flow group	Force redundant multicast streams to flow through different interconnect devices to prevent a single interconnect device from potentially dropping both streams of multicast traffic during a failure.

RELATED DOCUMENTATION

QFabric System Overview | 2

Understanding Interfaces on the QFabric System

IN THIS SECTION

This topic describes:

Four-Level Interface Naming Convention

When you configure an interface on the QFabric system, the interface name needs to follow a four-level naming convention that enables you to identify an interface as part of either a Node device or a Node group. Include the name of the network or server Node group at the beginning of the interface name.

The four-level interface naming convention is:
device-name:*type-fpc/pic/port*
where *device-name* is the name of the Node device or Node group. The remainder of the naming convention elements are the same as those in the QFX3500 switch interface naming convention.

An example of a four-level interface name is:
node2:*xe-0/0/2*

QSFP+ Interfaces

The QFX3500 Node device provides four 40-Gbps QSFP+ (quad small form-factor pluggable plus) interfaces (labeled **Q0** through **Q3**) for uplink connections between your Node device and your Interconnect devices.

The QFX3600 Node device provides 16 40-Gbps QSFP+ interfaces. By default, 4 interfaces (labeled **Q0** through **Q3**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 12 interfaces (labeled **Q4** through **Q15**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the first eight interfaces (Q0 through Q7) for uplink connections between your Node device and your Interconnect devices, and interfaces Q2 through Q15 for 10-Gigabit Ethernet or 40-Gigabit Ethernet connections to either endpoint systems or external networks (see "Configuring the Port Type on QFX3600 Node Devices" on page 467). Table 4 on page 15 shows the port mappings for QFX3600 Node devices.

Table 4: QFX3600 Node Device Port Mappings

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q0	Not supported on this port	xle-0/1/0	fte-0/1/0
Q1	Not supported on this port	xle-0/1/1	fte-0/1/1
Q2	xe-0/0/8 xe-0/0/9 xe-0/0/10 xe-0/0/11	xle-0/1/2	fte-0/1/2
Q3	xe-0/0/12 xe-0/0/13 xe-0/0/14 xe-0/0/15	xle-0/1/3	fte-0/1/3
Q4	xe-0/0/16 xe-0/0/17 xe-0/0/18 xe-0/0/19	xle-0/1/4	fte-0/1/4
Q5	xe-0/0/20 xe-0/0/21 xe-0/0/22 xe-0/0/23	xle-0/1/5	fte-0/1/5

Table 4: QFX3600 Node Device Port Mappings *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q6	xe-0/0/24 xe-0/0/25 xe-0/0/26 xe-0/0/27	xle-0/1/6	fte-0/1/6
Q7	xe-0/0/28 xe-0/0/29 xe-0/0/30 xe-0/0/31	xle-0/1/7	fte-0/1/7
Q8	xe-0/0/32 xe-0/0/33 xe-0/0/34 xe-0/0/35	xle-0/1/8	Not supported on this port
Q9	xe-0/0/36 xe-0/0/37 xe-0/0/38 xe-0/0/39	xle-0/1/9	Not supported on this port
Q10	xe-0/0/40 xe-0/0/41 xe-0/0/42 xe-0/0/43	xle-0/1/10	Not supported on this port

Table 4: QFX3600 Node Device Port Mappings *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q11	xe-0/0/44 xe-0/0/45 xe-0/0/46 xe-0/0/47	xle-0/1/11	Not supported on this port
Q12	xe-0/0/48 xe-0/0/49 xe-0/0/50 xe-0/0/51	xle-0/1/12	Not supported on this port
Q13	xe-0/0/52 xe-0/0/53 xe-0/0/54 xe-0/0/55	xle-0/1/13	Not supported on this port
Q14	xe-0/0/56 xe-0/0/57 xe-0/0/58 xe-0/0/59	xle-0/1/14	Not supported on this port
Q15	xe-0/0/60 xe-0/0/61 xe-0/0/62 xe-0/0/63	xle-0/1/15	Not supported on this port

The QFX5100-48S Node device provides 48 10-Gigabit Ethernet interfaces and 6 40-Gbps QSFP+ interfaces. By default, 4 interfaces (labeled **48** through **51**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 2 interfaces (labeled **52** and **53**) support 40-Gigabit Ethernet connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the middle two interfaces (**50** and **51**) for 40-Gigabit Ethernet connections to either endpoint systems or external networks, and you can choose to configure the last two interfaces (**52** and **53**) for uplink connections between your Node device and your Interconnect devices (see "Configuring the QSFP+ Port Type on QFX5100 Devices" on page 473). Table 5 on page 18 shows the port mappings for QFX5100-48S Node devices.

Table 5: QFX5100-48S Node Device Port Mappings

Port Number	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
48	Not supported on this PIC	fte-0/1/0
49	Not supported on this PIC	fte-0/1/1
50	xle-0/1/2	fte-0/1/2
51	xle-0/1/3	fte-0/1/3
52	xle-0/1/4	fte-0/1/4
53	xle-0/1/5	fte-0/1/5

Link Aggregation

Link aggregation enables you to create link aggregation groups across Node devices within a network Node group or redundant server Node group. You can include up to eight Ethernet interfaces in a LAG. You can have up to 48 LAGs within a redundant server Node group, and 128 LAGs in a network Node group. To configure a LAG, include the **aggregated-devices** statement at the **[edit chassis node-group *node-group-name*]** hierarchy level and the **device-count** statement at the **[edit chassis node-group *node-group-name* aggregated-devices ethernet]** hierarchy level. Additionally, include any aggregated Ethernet options (**minimum-links** and **link-speed**) at the **[edit interfaces *interface-name* aggregated-ether-options]** hierarchy level and the **802.3ad** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level. To configure the Link Aggregation Control Protocol (LACP), include the **lacp** statement at the **[edit interfaces aggregated-ether-options]** hierarchy level.

RELATED DOCUMENTATION

Configuring the Port Type on QFX3600 Node Devices | 467
Configuring the QSFP+ Port Type on QFX5100 Devices | 473

CHAPTER 2

Hardware Architecture Overview

IN THIS CHAPTER

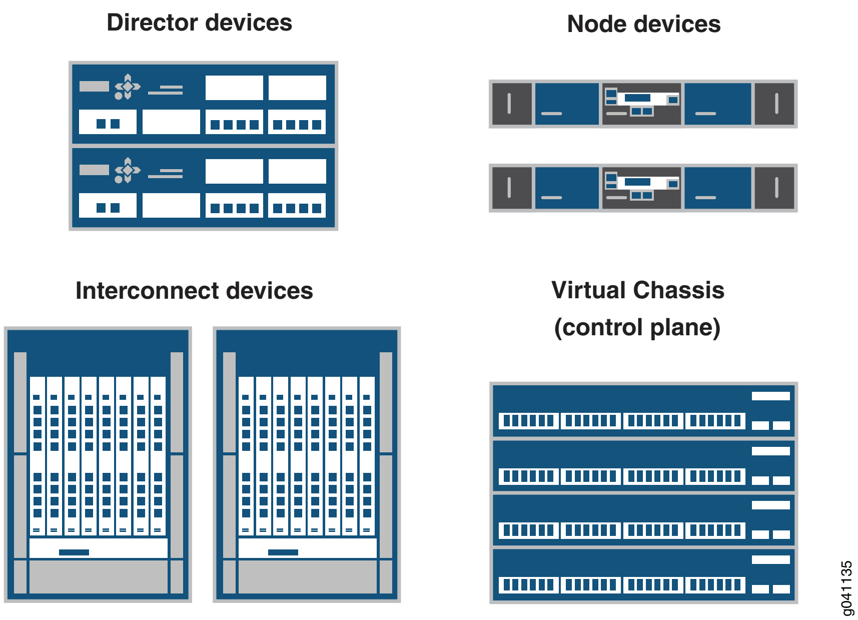
Understanding the QFabric System Hardware Architecture

IN THIS SECTION

QFabric System Hardware Architecture Overview

The QFabric system is a single-layer networking tier that connects servers and storage devices to one another across a high-speed, unified core fabric. You can view the QFabric system as a single, extremely large, nonblocking, high-performance Layer 2 and Layer 3 switching system. The reason you can consider the QFabric system as a single system is that the Director software running on the Director group allows the main QFabric system administrator to access and configure every device and port in the QFabric system from a single location. Although you configure the system as a single entity, the fabric contains four major hardware components. The hardware components can be chassis-based, group-based, or a hybrid of the two. As a result, it is important to understand the four types of generic QFabric system components and their functions, regardless of which hardware environment you decide to implement. A representation of these components is shown in Figure 3 on page 20.

Figure 3: QFabric System Hardware Architecture



The four major QFabric system components include the following:

- **Director group**—The *Director group* is a management platform that establishes, monitors, and maintains all components in the QFabric system. It is a set of Director devices that run the Junos operating system (Junos OS) on top of a CentOS foundation. The Director group handles tasks such as QFabric system network topology discovery, Node and Interconnect device configuration and startup, and Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), and Network File System (NFS) services. The Director group also runs the software for management applications, hosts and load-balances internal processes for the QFabric system, and starts additional QFabric system processes as requested.
- **Node devices**—A *Node device* is a hardware system located on the ingress of the QFabric system that connects to endpoints (such as servers or storage devices) or external networks, and is connected to the heart of the QFabric system through an Interconnect device. A Node device can be used in a manner similar to how a top-of-rack switch is implemented. By default, Node devices connect to servers or storage devices. However, when you group Node devices together to connect to a network that is external to the QFabric system, the formation is known as a *network Node group*.
- **Interconnect devices**—An *Interconnect device* acts as the primary fabric for data plane traffic traversing the QFabric system between Node devices. To reduce latency to a minimum, the Interconnect device

implements multistage Clos switching to provide nonblocking interconnections between any of the Node devices in the system.

- **Control plane network**—The *control plane network* is an out-of-band Gigabit Ethernet management network that connects all QFabric system components. For example, you can use a group of EX4200 Ethernet switches or a group of EX4300 Ethernet switches configured as a Virtual Chassis to enable the control plane network. The control plane network connects the Director group to the management ports of the Node and Interconnect devices. By keeping the control plane network separate from the data plane, the QFabric system can scale to support thousands of servers and storage devices.

The four major QFabric system components can be assembled from a variety of hardware options. Currently supported hardware configurations are shown in Table 6 on page 21.

Table 6: Supported QFabric System Hardware Configurations

QFabric System Configuration	Director Group	Node Device	Interconnect Device	Control Plane Device
QFX3000-G QFabric system	QFX3100 Director group	QFX3500, QFX3600, and QFX5100-48S, QFX5100-48T, and QFX5100-24Q Node devices **NOTE:** There can be a maximum of 128 Node devices in the QFX3000-G QFabric system.	QFX3008-I Interconnect device **NOTE:** There can be a maximum of four Interconnect devices in the QFX3000-G QFabric system.	Two Virtual Chassis composed of either four EX4200-48T or four EX4300-48T switches each (for a copper-based control plane) or eight EX4200-24F or four EX4300-48P switches each (for a fiber-based control plane)

Table 6: Supported QFabric System Hardware Configurations *(continued)*

QFabric System Configuration	Director Group	Node Device	Interconnect Device	Control Plane Device
QFX3000-M QFabric system	QFX3100 Director group **NOTE:** For a copper-based QFX3000-M QFabric system control plane network, use QFX3100 Director devices with RJ-45 network modules installed. For a fiber-based control plane network, use QFX3100 Director devices with SFP network modules installed.	QFX3500, QFX3600, and QFX5100-48S, QFX5100-48T, and QFX5100-24Q Node devices **NOTE:** • There can be a maximum of 16 Node devices in the QFX3000-M QFabric system using QFX3600-I as Interconnect devices and 32 Node devices using the QFX5100-24Q as Interconnec devices. **NOTE:** QFX5100-24Q Interconnect devices and QFX3600-I Interconnect devices cannot be mixed on the same QFabric system. • For a copper-based QFX3000-M QFabric system control plane network, use QFX3500 Node devices with a 1000BASE-T management board installed. For a fiber-based control plane network, use QFX3500 Node devices with an SFP management board installed.	QFX5100-24Q or QFX3600-I Interconnect devices **NOTE:** There can be a maximum of four Interconnect devices in the QFX3000-M QFabric system.	Two EX4200 Ethernet or two EX4300 switches **NOTE:** For a copper-based QFX3000-M QFabric system control plane network, use EX4200-24T or EX4300-48T switches with an SFP+ uplink module installed. For a fiber-based control plane network, use EX4200-24F or EX4300-48P switches with an SFP+ uplink module installed.

To complete the system, external Routing Engines (such as the fabric manager Routing Engines, network Node group Routing Engines, and fabric control Routing Engines) run on the Director group and implement QFabric system control plane functions. The control plane network provides the control plane connections between the Node devices, the Interconnect devices, and the Routing Engines running on the Director group.

QFX3000-G QFabric System Features

A QFX3000-G QFabric system provides the following key features:

- Support for up to 128 Node devices and 4 Interconnect devices, which provides a maximum of 6144 10-Gigabit Ethernet ports.
- Low port-to-port latencies that scale as the system size grows from 48 to 6144 10-Gigabit Ethernet ports.
- Support for up to 384,000 total ingress queues at each Node device to the QFabric system Interconnect backplane.
- Support for Converged Enhanced Ethernet (CEE) traffic.

QFX3000-M QFabric System Features

A QFX3000-M QFabric system provides the following key features:

- Support for up to 32 Node devices and 4 QFX5100-24Q Interconnect devices or 16 Node device and 4 QFX3600-I Interconnect devices.

  > **NOTE:** You may not mix QFX5100-24Q Interconnect devices with QFX3600-I Interconnect devices on the same QFX3000-M QFabric system.

- Low port-to-port latencies that scale as the system size grows from 48 to 768 10-Gigabit Ethernet ports.

RELATED DOCUMENTATION

Understanding QFabric System Terminology | 6
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Understanding Routing Engines in the QFabric System | 25
Understanding Interconnect Devices | 27
Understanding Node Devices | 31
Understanding Node Groups | 36
Understanding Partitions | 45

Understanding the Director Group

IN THIS SECTION

Because the Director group provides management services for the QFabric system, it is important to understand the components of the cluster and how the Director group supports the needs of the greater fabric.

Director Group Components

When you build a Director group, consider the following elements and concepts.

- **Director device**—A single management device for the QFabric system. Director devices with a hard drive provide full processing services and are used to build the Director group.
- **Director group**—A set of Director devices. The Director group is essential to the QFabric system, which cannot operate properly without it. The Director group shares and load-balances processing tasks for the QFabric system, performs topology discovery, assigns identifiers to QFabric system components, and manages interfabric communication. The primary devices in a Director group are Director devices that contain hard drives. The Director devices run dual processes in active or standby mode for maximum redundancy.

  When you add additional Director devices to the group, the Director group coordinates their activities and distributes processing loads across all available Director devices. The additional Director devices provide the Director group with additional memory and processing power. Supplementing the Director group with extra Director devices allows the group to scale efficiently and serve the needs of the entire QFabric system as it grows.

Director Group Services

The Director group is a management platform that establishes, monitors, and maintains all components in the QFabric system. It is a set of Director devices that run the Junos operating system (Junos OS) on top of a CentOS foundation. The Director group handles tasks such as QFabric system network topology discovery, Node and Interconnect device configuration and startup, and Domain Name System (DNS), Dynamic Host Configuration Protocol (DHCP), and Network File System (NFS) services. The Director group also runs the software for management applications, hosts and load-balances internal processes for the

QFabric system, maintains configuration and topology databases, and starts additional QFabric system processes as requested.

Another critical role provided by the Director group is the hosting of the virtual Junos Routing Engines. These Routing Engines provide services for the QFabric system to keep it operating smoothly.

RELATED DOCUMENTATION

Understanding Routing Engines in the QFabric System

IN THIS SECTION

Routing Engines perform many important processing tasks in the QFabric system. Knowing where the Routing Engines are located and what services they provide enables you to troubleshoot the QFabric system and ensure that it is running the way it should.

Hardware-Based Routing Engines

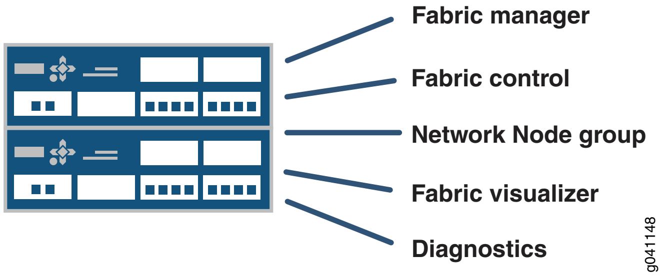
A traditional Juniper Networks Routing Engine is a hardware field-replaceable unit that runs routing protocols, builds the routing and switching tables, sends routing information to the Packet Forwarding Engine, and handles several software processes for the device (such as interface control, chassis component monitoring, system management, and user access). Node devices that are part of server Node groups in the QFabric system that connect to servers or storage devices implement Routing Engine functions locally using this traditional hardware method.

Software-Based External Routing Engines

The QFabric system also uses external Routing Engines that run in software on the Director group. In contrast with traditional Routing Engines, the functions and processes provided by software-based Routing

Engines are segmented, specialized, and distributed across multiple Routing Engine instances running on the Director group. Such separation provides redundancy for these functions and enables the QFabric system to scale. Figure 4 on page 26 shows the external Routing Engine types.

Figure 4: External Routing Engine Types



These special-purpose external Routing Engine instances running on the Director group provide the following major services for the QFabric system:

- **Fabric manager Routing Engine**—Provides services to all devices in the QFabric system, such as system initialization, topology discovery, internal IP address and ID assignment, and interdevice communication. The fabric manager Routing Engine authenticates Interconnect and Node devices, and maintains a database for system components. A single fabric manager Routing Engine instance is generated to manage the entire QFabric system.
- **Fabric control Routing Engine**—Runs the fabric control protocol to share route information between available devices in a partition. A pair of redundant route distribution Routing Engine instances is generated for every partition in the QFabric system, and both instances are active.
- **Diagnostic Routing Engine**—Gathers operational information that allows QFabric system administrators to monitor the health of the QFabric system. A single Routing Engine instance is generated for the entire QFabric system.
- **Network Node group Routing Engine**—Provides Routing Engine functionality for groups of Node devices bundled together as a single Layer 3 routing device, which is used to connect to external networks. A pair of redundant Routing Engine instances is generated for every network Node group in the QFabric system.

RELATED DOCUMENTATION

Understanding the Director Group | 24
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Understanding the QFabric System Hardware Architecture | 19

Understanding Interconnect Devices

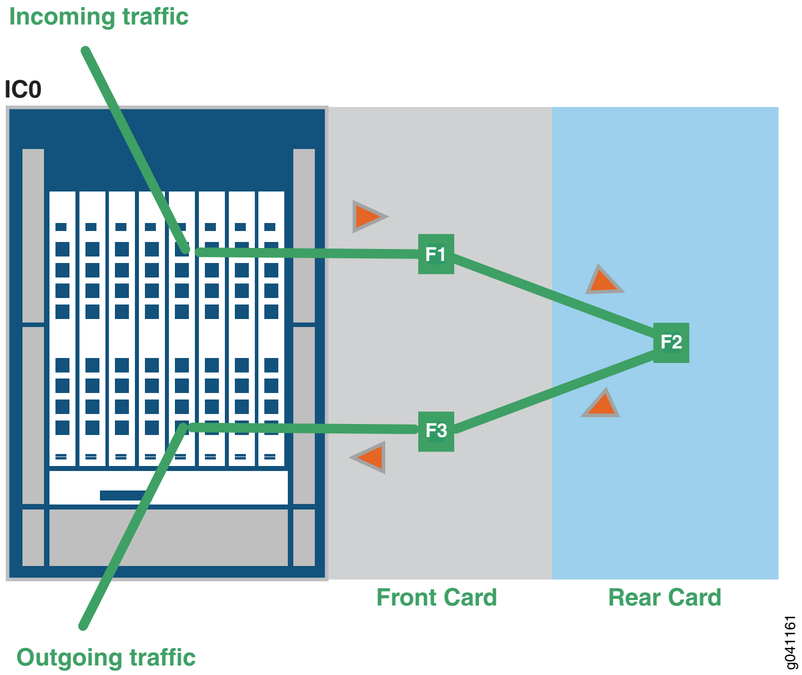
IN THIS SECTION

Interconnect devices in a QFabric system provide a way for the Node devices to connect with one another over a high-speed backplane. By understanding the role of Interconnect devices, you can harness the benefits of low latency, superb scalability, and minimum packet processing offered by a single-tier data center architecture.

Interconnect Device Introduction

Interconnect devices act as the primary fabric for data plane traffic traversing the QFabric system between Node devices. The main task for the Interconnect devices is to transfer traffic between the Node devices as quickly as possible across a high-speed, available path backplane. To reduce latency to a minimum, larger Interconnect devices (such as the QFX3008-I Interconnect device) implement multistage Clos switching to provide nonblocking connections between any of the Node devices in the system. Figure 5 on page 28 shows an example of how Clos switching works in the QFX3008-I Interconnect device.

Figure 5: Clos Switching for QFX3008-I Interconnect Devices

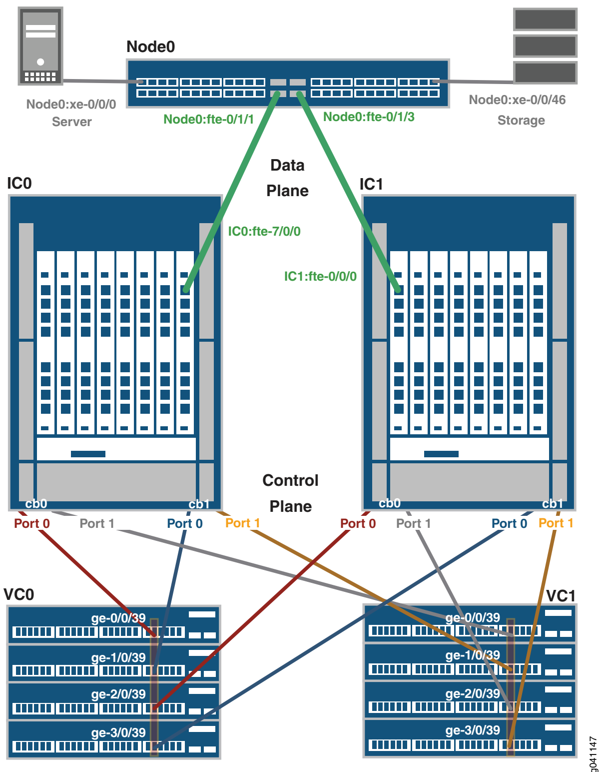


Traffic enters a QSFP+ port from a Node device, and an ingress chipset provides stage F1 processing. For the F2 stage, the frame is sent to a rear card and processed by a midplane chipset. Lastly, an egress chipset on the front card QSFP+ port handles processing tasks for the F3 stage. At each of the three Clos stages, a switching table chooses the best path and determines where to send the frame to reach the next stage. The F1 and F3 stages can be handled by the same front card or different front cards, depending on the best path selected by the fabric. After the frame traverses the Interconnect device backplane, the Interconnect device sends the frame to the egress Node device.

QFX3008-I Interconnect Devices

The QFX3008-I Interconnect device contains eight slots in the front of the chassis. In each slot, you can install a front card containing 16 40-Gbps quad small form-factor pluggable plus (QSFP+) ports. A fully configured system offers a total capacity of 128 QSFP+ connections. These front card ports attach to the high-speed backplane to reach the eight slots in the rear of the chassis, which provide the heavy-duty interconnections for the entire QFX3000-G QFabric system. In addition, four interfaces (two per Control Board) provide Gigabit Ethernet access to the control plane management network. Figure 6 on page 29 shows an example of the data plane and control plane connections for QFX3008-I Interconnect devices.

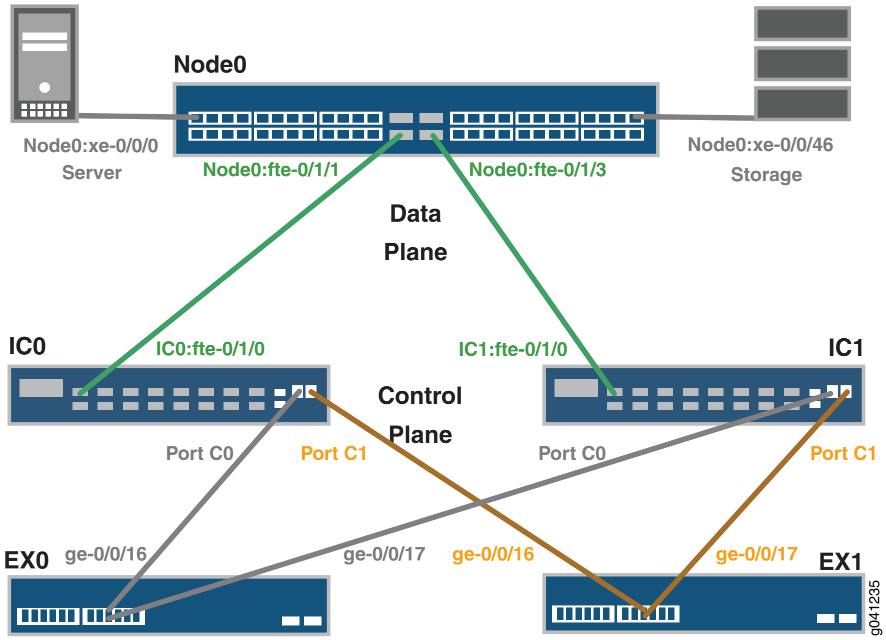
Figure 6: QFX3008-I Data Plane and Control Plane Connections



QFX3600-I Interconnect Devices

The QFX3600-I Interconnect device has 16 40-Gbps quad small form-factor pluggable plus (QSFP+) ports that provide interconnections for the entire QFX3000-M QFabric system. In addition, two management ports provide Gigabit Ethernet access to the control plane management network. Figure 7 on page 30 shows an example of the data plane and control plane connections for a QFX3600-I Interconnect device.

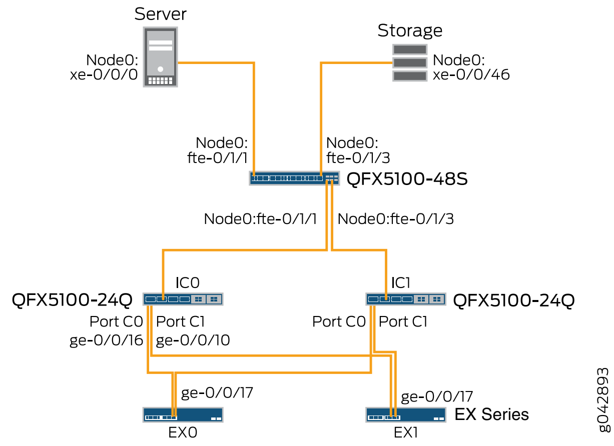
Figure 7: QFX3600-I Data Plane and Control Plane Connections



QFX5100-24Q Interconnect Devices

The QFX5100-24Q switch can be configured to operate either as an Interconnect device or as a Node device in a QFX3000-M QFabric system. The QFX5100-24Q has 24 40-Gbps QSFP+ ports and can hold an additional 8 40-Gbps QSFP+ ports. These QSFP+ ports provide interconnects for the entire QFabric system. QFX5100 devices have a minimum of two management ports: a 10/100/1000BASE-T RJ-45 port and a 1-Gbps SFP ports. If you plan to use all fiber connections, be sure to order the product SKUs have an additional 1-Gbps SFP port that can be used either for fiber or copper connections.

Figure 8: QFX5100-24Q Data Plane and Control Plane Connections



RELATED DOCUMENTATION

Understanding Node Devices

IN THIS SECTION

Node devices in a QFabric system provide a way for servers, storage devices, and external networks to connect to the QFabric system. By understanding the role of Node devices, you can design your QFabric system topology to take advantage of the unique benefits offered by a single-tier data center architecture.

Node Device Introduction

A *Node device* in the QFabric system connects either endpoint systems (such as application servers and storage devices) or external networks to Interconnect devices. It can be used similarly to the way a top-of-rack switch is implemented in a data center. Node devices provide an access point to the QFabric system, allowing data to flow into and out of the QFabric system. Because all Node devices in the QFabric system connect through a backplane of Interconnect devices, in essence all Node devices are connected to one another. This directly connected design model eliminates multiple tiers of aggregation and core devices and provides minimum latency, maximum scalability, and rapid transport of server-to-server traffic and QFabric system-to-external network traffic.

Sets of Node devices can be bundled together into *Node groups*, in which each group operates as a single virtual entity. Node groups that connect to servers and storage devices are known as *server Node groups*, and Node groups that connect to external networks are known as *network Node groups*.

QFX3500 Node Devices

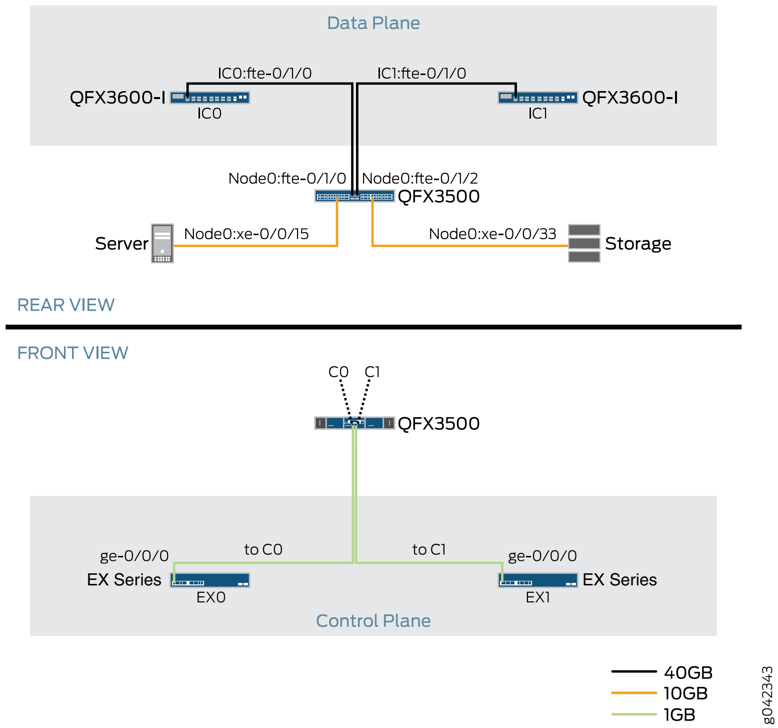
A QFX3500 Node device provides up to 48 10-Gigabit Ethernet interfaces to connect to endpoints or external networks. You can configure 12 of these 48 interfaces to support 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel. You can also configure the remaining 36 interfaces with Gigabit Ethernet.

> **NOTE:** You can configure interface ports **0** through **47** as 10-Gigabit Ethernet ports, **0** through **5** and **42** through **47** as Fibre Channel over Ethernet ports, and **6** through **41** as Gigabit Ethernet ports. However, you cannot configure any Fibre Channel over Ethernet ports as Gigabit Ethernet ports or vice versa.

In addition to these server and network interfaces, there are four uplink interfaces to connect the QFX3500 Node device to Interconnect devices in a QFabric system. These uplinks use 40-Gbps quad small form-factor pluggable plus (QSFP+) interfaces.

The control plane requires two management ports on the QFX3500 chassis to connect the Node device to the control plane network. Figure 9 on page 33 shows an example of the data plane and control plane connections for a QFX3500 Node device.

Figure 9: QFX3500 Data Plane and Control Plane Connections

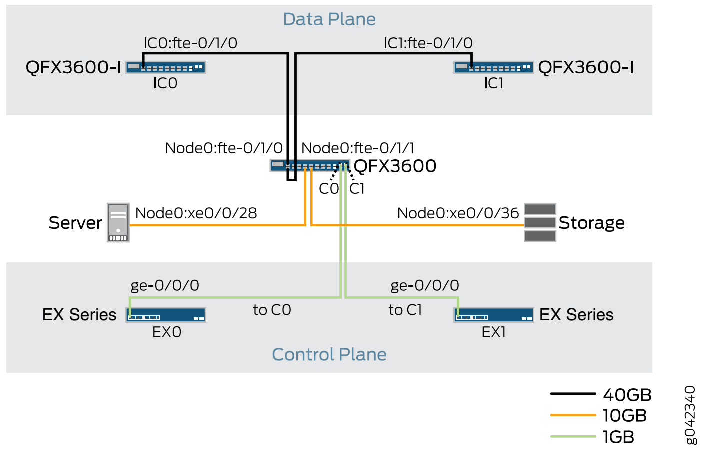


QFX3600 Node Devices

A QFX3600 Node device provides 16 40-Gbps QSFP+ interfaces. By default, 4 interfaces (labeled **Q0** through **Q3**) are configured for 40-Gbps uplink connections between your QFX3600 Node device and your Interconnect device, and 12 interfaces (labeled **Q4** through **Q15**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems or external networks. Optionally, you can choose to configure the first eight interfaces (**Q0** through **Q7**) for uplink connections between your Node device and your Interconnect devices, and interfaces **Q2** through **Q15** for 10-Gigabit Ethernet or 40-Gigabit Ethernet connections to either endpoint systems or external networks.

The control plane requires two management ports on the QFX3600 chassis to connect the Node device to the control plane network. Figure 10 on page 34 shows an example of the data plane and control plane connections for a QFX3600 Node device.

Figure 10: QFX3600 Data Plane and Control Plane Connections



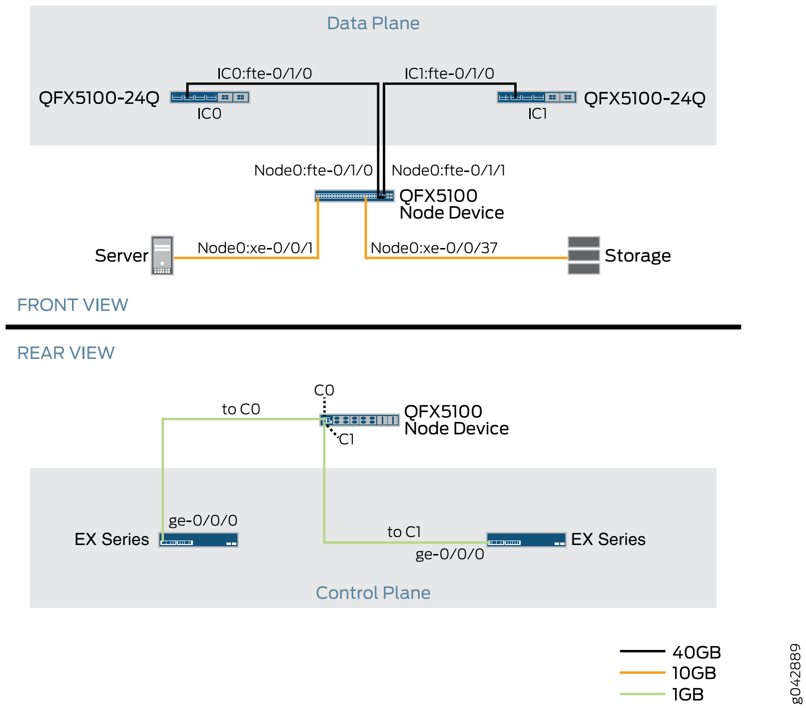
QFX5100 Node Devices

Three models of the QFX5100 line of switches are supported as Node devices on a QFabric system:

- QFX5100-48S
- QFX5100-48T
- QFX5100-24Q

Figure 11 on page 35 shows an example of the data plane and control plane connections for a QFX5100 Node device.

Figure 11: QFX5100 Data Plane and Control Plane Connections



- QFX5100-48S

  A QFX5100-48S Node device provides 48 10-Gigabit Ethernet interfaces to connect to endpoints or external networks and 6 40-Gbps QSFP+ interfaces. By default, 4 of the QSFP+ interfaces (labeled **fte-0/1/0** through **fte-0/1/1**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 2 QSFP+ interfaces (labeled **xle-0/1/4** and **xle-0/1/5**) provide 40-Gigabit Ethernet connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the middle two interfaces (**xle-0/1/8** and **xle-0/1/15**) for10-Gigabit Ethernet or 40-Gigabit Ethernet connections to either endpoint systems or external networks, and you can choose to configure the last two interfaces (**fte-0/1/4** and **fte-0/1/5**) for uplink connections between your Node device and your Interconnect devices.

- QFX5100-48T

  A QFX5100-48T Node device provides 48 10GBASE-T interfaces to connect to endpoints or external networks and 6 40-Gbps QSFP+ interfaces.

  By default, 4 of the QSFP+ interfaces (labeled **fte-0/1/0** through **fte-0/1/3**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 2 QSFP+ interfaces (labeled **xle-0/1/4** and **xle-0/1/5**) provide 40-Gigabit Ethernet connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the middle two interfaces (**xle-0/1/8** and **xle-0/1/15**) for10-Gigabit Ethernet or 40-Gigabit Ethernet connections to either endpoint systems or external networks, and you can choose to configure the last two interfaces (**fte-0/1/4** and **fte-0/1/5**) for uplink connections between your Node device and your Interconnect devices.

- QFX5100-24Q

  A QFX5100-24Q Node device provides 24 QSFP+ interfaces **fte-0/1/0** through **fte-0/1/7**as uplinks and **xle-0/1/8** to **xle-0/1/23** as endpoint systems or external networks.

  The QFX5100-24Q has two expansion bays. With the optional QFX-EM-4Q expansion modules, the QFX5100-24Q can provide an additional 8 40-Gbps interfaces that are channelized into 10G ports. The QFX-EM-4Q expansion modules only support 40 Gigabit XLE interfaces. Valid interfaces are in the range of**xle-0/2/0** to **xle-0/2/3** for the first expansion module and from **xle-0/3/0**to **xle-0/3/3** in the second expansion module.

The control plane requires two management ports on the QFX5100 chassis to connect the Node device to the control plane network.

RELATED DOCUMENTATION

Converting the Device Mode for a QFabric System Component | 326
Configuring Aliases for the QFabric System | 452
Configuring Node Groups for the QFabric System | 476
Configuring the Port Type on QFX3600 Node Devices | 467
Understanding Node Groups | 36
Understanding Interconnect Devices | 27
Understanding the QFabric System Data Plane | 51
Understanding the QFabric System Control Plane | 47
Understanding the QFabric System Hardware Architecture | 19

Understanding Node Groups

IN THIS SECTION

Node groups help you combine multiple Node devices into a single virtual entity within the QFabric system to enable redundancy and scalability at the edge of the data center.

Network Node Groups

A set of one or more Node devices that connect to an external network is called a *network Node group*. The network Node group also relies on two external Routing Engines running on the Director group. These redundant *network Node group Routing Engines* run the routing protocols required to support the connections from the network Node group to external networks.

When configured, the Node devices within a network Node group and the network Node group Routing Engines work together in tandem as a single entity. By default, network Node group Routing Engines are part of the **NW-NG-0** network Node group but no Node devices are included in the group. As a result, you must configure Node devices to be part of a network Node group.

In a QFabric system deployment that requires connectivity to external networks, you can modify the automatically generated network Node group by including its preset name **NW-NG-0** in the Node group configuration. Within a network Node group, you can include a minimum of one Node device up to a maximum of eight Node devices. By adding more Node devices to the group, you provide enhanced scalability and redundancy for your network Node group.

> **NOTE:** The QFabric system creates a single **NW-NG-0** network Node group for the default partition. You cannot configure a second network Node group inside the default partition. The remaining Node devices within the default partition are reserved to connect to servers, storage, or other endpoints internal to the QFabric system. These Node devices either can be retained in the automatically generated server Node groups or can be configured as part of a redundant server Node group.

Server Node Groups

A *server Node group* is a set of one or more Node devices that connect to servers or storage devices. Unlike Node devices that are part of a network Node group and rely on an external Routing Engine, a Node device within a server Node group connects directly to endpoints and implements the Routing Engine functions locally, using the local CPU built into the Node device itself.

There are two different server Node group types:

- **Autogenerated server Node group**—By default, each Node device is placed in its own self-named Node group to connect to servers and storage. No configuration is necessary, but the QFabric system provides no redundancy for this type of Node group.

- **Redundant server Node group**—You can override the default, autogenerated server Node group assignment by manually configuring a *redundant server Node group* that contains a maximum of two Node devices. You can use a redundant server Node group to provide multihoming services to servers and storage, as well as configure aggregated LAG connections that span the two Node devices.

  > **NOTE:** The Node devices in a redundant server Node group must be of the same type, either two QFX3500 Node devices, two QFX3600 Node devices, or two QFX5100 Node devices. You cannot mix and match different Node device models in the same redundant server Node group.

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476
Understanding Node Devices | 31
Understanding Routing Engines in the QFabric System | 25
Understanding the QFabric System Hardware Architecture | 19

Understanding Port Oversubscription on Node Devices

Each Node device in a QFabric system can have a different port oversubscription configuration. For example, you can have a Node device with 3:1 port oversubscription, another with 6:1 oversubscription, and yet another with 1:1 oversubscription.

The port oversubscription ratio on a Node device is based on the total amount of bandwidth from the server-facing connections and the total number of uplink connections to the Interconnect devices.. To determine your oversubscription ratio, multiply the number of server ports by the server-port speed, multiply the number of uplink ports by the uplink-port speed, and divide the total server-facing bandwidth by the total uplink-facing bandwidth. For example, If you use 32 10-Gigabit Ethernet server ports (320 gigabits) and 8 40-Gigabit Ethernet uplink ports (320 gigabits) on a QFX3600 Node device, you can configure 1:1 port oversubscription by connecting the eight uplink ports (labeled Q0 through Q7) from the Node device to the Interconnect devices and splitting the remaining 8 40-Gigabit Ethernet ports into 32 10-Gigabit Ethernet server ports.

Other important factors to consider are:

- When you connect more than one port on a Node device to an Interconnect device, you reduce the overall number of Node devices supported on the QFabric system.

- When you have two Interconnect devices and a single connection from each Node device, you can connect anyremaining ports as access ports not server ports.

Table 7 on page 39 shows the oversubscription ratio for ports on QFX3500 Node devices in default mode based on the number of Interconnect devices and the number of connections from each Node device to each Interconnect device.

Table 7: Oversubscription Ratio on QFX3500 Node Devices

Number of Interconnect Devices	Number of Connections from Each Node Device to Each Interconnect Device	Oversubscription Ratio on Node Device
2	1	6:1
2	2	3:1
4	1	3:1

Table 8 on page 39 shows the oversubscription ratio for ports on QFX3600 Node devices in default modbased on the number of Interconnect devices and the number of connections from each Node device to each Interconnect device.

Table 8: Oversubscription Ratio on QFX3600 Node Devices

Number of Interconnect Devices	Number of Connections from Each Node Device to Each Interconnect Device	Oversubscription Ratio on Node Device
2	1	6:1
2	2	3:1
2	4	1:1
4	1	3:1
4	2	1:1

Table 9 on page 40 shows the oversubscription ratio for ports on QFX5100-48S Node devices and QFX5100-48T Node devices based on the number of Interconnect devices and the number of connections from each Node device to each Interconnect device.

Table 9: Oversubscription Ratio on QFX5100-48S and QFX5100-48T Node Devices

Number of Interconnect Devices	Number of Connections from Each Node Device to Each Interconnect Device	Oversubscription Ratio on Node Device
2	2	3.5:1
2	1	8:1
4	1	3.5:1

Unlike other Node Devices, the QFX5100-24Q supports the QFX-EM-4Q expansion module, that impact the oversubscription ratio. Table 10 on page 40 shows the oversubscription ratio for the base model without expansion modules inserted into the device and with two QFX-EM-4Q modules installed. Other factors that impact the oversubscription ratio include the system mode selected for the device. See Table 11 on page 41 for details on system mode.

Table 10: Oversubscription Ratio on QFX5100-24Q Node Devices

Number of Interconnect Devices	Number of Connections from Each Node Device to Each Interconnect Device	Oversubscription Ratio on Node Device	Oversubscription Ratio on Node Device with Two QFX-EM-4Q Installed
2	1	8:1	12:1
2	2	4:1	6:1
2	4	2:1	3:1
2	8	N/A	1:1
4	1	4:1	6:1
4	2	2:1	3:1
4	4	N/A	1:1

Table 11 on page 41 shows the ports the default port configuration and identifies the ports that can be converted on Node devices. Because the QFX5100-24Q has expansion bays that allow you to add additional types of ports, see Table 12 on page 42 for the supported system modes and default configuration of that Node device.

Table 11: Port Configurations on Node Devices

<table>
<tr><th>Model</th><th>Total Ports</th><th>Fixed FTE Ports</th><th>Ports that can be configured FTE or XLE</th><th>Ports that can be configured XLE or XE</th><th>Default Configuration</th></tr>
<tr><td>QFX3500</td><td>• 48 x 10G
• 4 x 40G</td><td>Q0 through Q3</td><td>NA</td><td>NA</td><td>• 48 x 10G (xe-0/0/0 through xe-0/0/47)
• 4 x 40G (fte-0/1/0 through fte-0/1/3)</td></tr>
<tr><td>QFX3600</td><td>16 x 40G</td><td>Q0 and Q1</td><td>Q2 through Q7</td><td>Q2 through Q15</td><td>• 12 x 40G xle-0/1/4 through xle-0/1/15)
• 4 x 40G (fte-0/1/0 through fte-0/1/3)</td></tr>
<tr><td rowspan="2">QFX5100-48S and QFX5100-48T</td><td rowspan="2">• 48 x 10G
• 6 x 40G</td><td rowspan="2">0and 1</td><td>2 through 5</td><td>2 through 5</td><td rowspan="2">• 2 x 40G (xle-0/1/4 through xle-0/1/5))
• 4 x 40G fte-0/1/0 through fte-0/1/3)
• 48 x 10G (xe-0/0/0 through xe-0/0/47)</td></tr>
<tr><td colspan="2">NOTE:
Port 2 and port 3 can be configured together as either as XE or XLE. Port 4 and port 5 can be independently configured as XE or XLE.</td></tr>
</table>

The QFX5100-24Q can be configured up to 104 10G ports using different system modes to achieve varying levels of port density. See Table 12 on page 42 for the default configurations for each system mode.

Table 12: QFX5100-24Q System Mode Default Port Configuration

System Mode	Total Ports	Fixed FTE Ports	Ports that can be configured FTE or XLE	Ports that can be configured XLE or XE	Disabled	Default Configuration	QFX-EM-4Q Expansion Modules
Default	24 x 40G (base configuration) optional expansion model configuration of two modules: • 4 x 4 x 10G (QFX-EM-4Q)	**0** through **7**	**8** through **15**	**8** through **23** **NOTE:** Of these 16 available ports, only 12 may be channelized.	NA	• 16 x 40G (xle-0/1/8 through xle-0/1/23 • 8 x 40G (fte-0/1/0 through fte-0/1/7)	Ports in the expansion modules are xe by default. The expansion module ports are supported, but cannot be channelized. These ports also cannot be converted to XLE or FTE ports (Xe-0/2/0 through xe-0/2/15 for 1 expansion module and x-0/3/0 and 0/3/15 for a second expansion module)

RELATED DOCUMENTATION

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | 318

Connecting a QFX3600 Node Device to a QFX3008-I Interconnect Device | 316

Connecting a QFX5100 Node Device to a QFX3008-I Interconnect Device | 320

Connecting a QFX3500 Node Device to a QFX3600-I Interconnect Device

Connecting a QFX3600 Node Device to a QFX3600-I Interconnect Device

Connecting a QFX5100 Node Device to a QFX3600-I Interconnect Device

CHAPTER 3

Software Architecture Overview

IN THIS CHAPTER

Understanding the QFabric System Software Architecture

The software architecture for the QFabric system environment has been designed to provide a high-speed, low-latency, nonblocking fabric for data center traffic. This topic explores how the software architecture for a QFabric system supports these goals.

Key components of the QFabric system software architecture include:

- A single administrative view of all QFabric system components provides unified management, configuration, monitoring, and troubleshooting of the QFabric system. This view is provided by the QFX Series Director software running on the Director group. A primary administrator can access the unified view through the default partition.
- A fabric control protocol enables rapid transport of data traffic between QFabric system components. This unique feature of the software architecture distributes route information for each device within the QFabric system, and removes the need to run spanning-tree protocols inside the QFabric system network.
- A fabric management protocol provides rapid transport of control traffic between QFabric system components. This protocol helps identify and initialize QFabric system resources, supports device redundancy, and supports management communication throughout the QFabric system.
- A control plane network that is separate from the data plane network provides high availability for the QFabric system.

The software also provides access to relevant features in the Junos operating system (Junos OS) that support QFabric system functionality. Support is available for most switching features available on EX Series Ethernet switches and many routing features available on M Series, MX Series, and T Series routing platforms.

RELATED DOCUMENTATION

Understanding the Director Software

The Director software provides a single view into the QFabric system so that it can be managed as a single entity. This topic explains how the Director software interacts with the components of the QFabric system to maintain operations from a central location.

Because the QFabric system consists of multiple Director, Node, and Interconnect devices, the architects of the QFabric system determined that it would be useful to manage the entire system as a single logical entity. As a result, the Director software handles administration tasks for the entire QFabric system, such as fabric management and configuration. The Director software runs on the *Director group*, provides a single consolidated view of the QFabric system, and enables the main QFabric system administrator to configure, manage, monitor, and troubleshoot QFabric system components from a centralized location. In the Junos operating system (Junos OS) command-line interface (CLI), you can access the Director software by logging in to the default partition.

The Director software handles the following major tasks for the QFabric system:

- Provides command-line interface (CLI) access to all QFabric system components that you have permission to manage or view.
- Evaluates configuration statements and operational mode commands for their scope and sends requests to the applicable Director, Node, and Interconnect devices. (This operation is sometimes referred to as *scattering*.)

- Consolidates responses from Director, Node, and Interconnect devices, and displays output from the devices in a unified, centralized manner. (This operation is sometimes referred to as *gathering*.)
- Coordinates configuration and operational efforts with a database housed in the Director group to store and retrieve configurations, software images, event logs, and system log messages.
- Facilitates control plane communication between the Node devices, the Routing Engine services running on the Director group, and the Interconnect devices.
- Runs parallel processes on the Director group devices to provide high availability for the QFabric system.
- Coordinates interactions with QFabric system components to provide load balancing of processing tasks across the Director group devices.
- Manages user access and privileges.
- Enables you to configure, manage, monitor, and troubleshoot QFabric system components that are assigned to you.
- Gathers QFabric system inventory and topology details.
- Offers a way to manage Director group devices, including the ability to add and delete Director devices in the group, set and switch mastership in the Director group, and monitor Director group status.
- Provides a centralized way to coordinate software upgrades for QFabric system components.

The Director software provides a backbone of functionality that supports the entire QFabric system. It is an essential component of the QFabric system that enables you to implement the system in a logical and efficient way.

RELATED DOCUMENTATION

Gaining Access to the QFabric System Through the Default Partition | 439
Understanding the Director Group | 24
Understanding the QFabric System Software Architecture | 43

Understanding Partitions

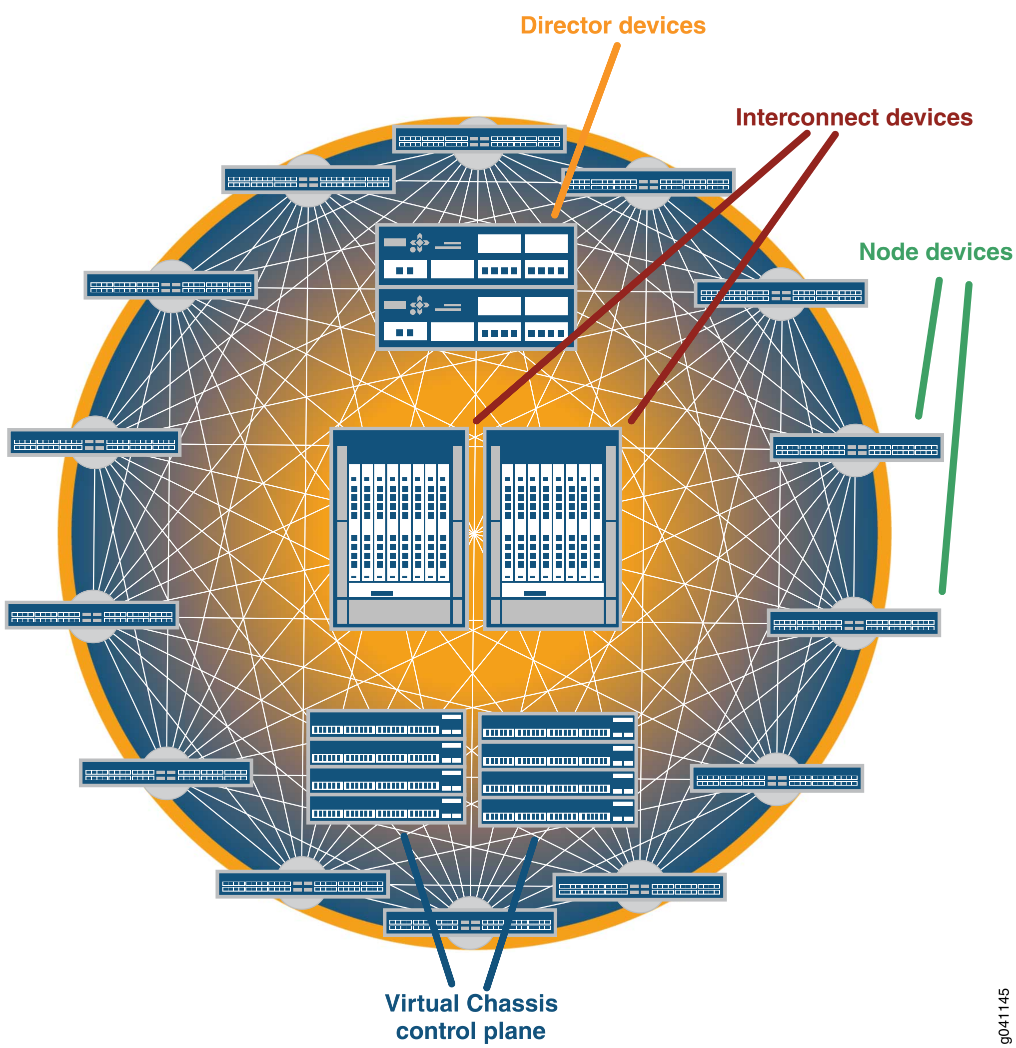
IN THIS SECTION

Partitions provide a way to allocate specified virtual and physical resources within your QFabric system. This topic covers:

QFabric System Default Partition

By default, all equipment and virtual resources in the QFabric system belong to the *default partition*. As a result, the QFabric system in its initial state has a single broadcast domain that is administered by a single main administrator. Figure 12 on page 46 shows a topology with the default settings—a single collection that contains all the devices in the QFabric system.

Figure 12: QFabric System Topology - Default Partition



NOTE: The initial release of the QFabric system supports a single default partition. All equipment and resources belong to the default partition.

A partition provides the following functions:

- Fault isolation and separation from other partitions at the control plane level.
- A separate configuration domain for the Node devices within the partition.
- A Layer 2 domain in which MAC learning takes place, and members of the same VLAN can communicate with each other. To provide network connectivity between partitions, you need to enable Layer 3 routing by way of a routed VLAN interface (RVI).

RELATED DOCUMENTATION

Gaining Access to the QFabric System Through the Default Partition | 439
Understanding the QFabric System Software Architecture | 43
Understanding the QFabric System Hardware Architecture | 19

Understanding the QFabric System Control Plane

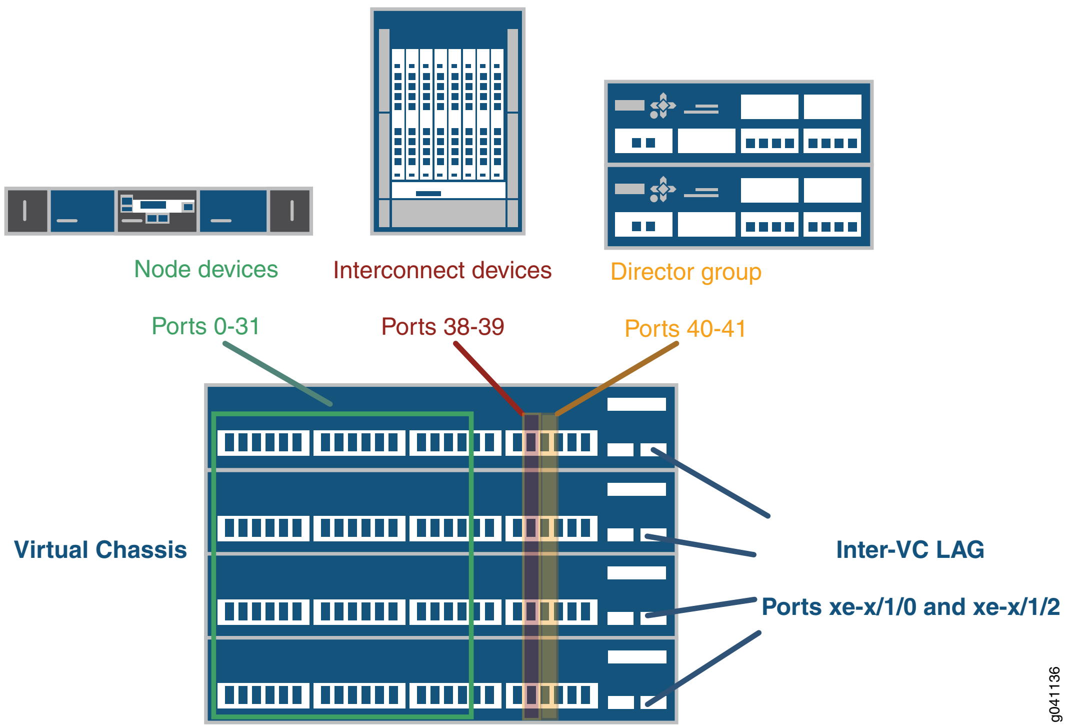
IN THIS SECTION

The control plane in the QFabric system transports management traffic between QFabric system components to facilitate system operations, configuration, and maintenance. This topic covers:

Control Plane Elements

Control traffic within a QFabric system is carried across a redundant, scalable, out-of-band, Ethernet switching network called the *control plane* network. To maintain high availability, the QFabric system control plane is separated from the QFabric system data plane. Figure 13 on page 48 shows a diagram of the QFabric system devices that compose the control plane network.

Figure 13: QFabric System Control Plane Network



The control plane consists of the following elements:

- **Control plane switches**—Provide connectivity to the management interfaces of all QFabric system components in the control plane network, including the Node devices, the Interconnect devices, and the Director group. When you interconnect all QFabric system devices to the control plane switches, the Director group can manage the entire system. Depending on the size and scale of your QFabric system, the control plane switches might be standalone switches or might be groups of switches bundled into a Virtual Chassis (See the Example topics in the Related Documentation section of this topic to learn more about the control plane switch configuration required for your QFabric system.)

  For example, the control plane for the QFX3000-G QFabric system requires two Virtual Chassis containing either four EX4200 switch members or four EX4300 switch members each. The two Virtual Chassis connect to each other across a 10-Gigabit Ethernet LAG link to provide maximum resiliency for the QFabric system control plane. The control plane for the QFX3000-M Qfabric system requires either two EX4200 switches or two EX4300 switches, interconnected and configured in a LAG for redundancy.

  > **NOTE:** You cannot mix EX4200 switches and EX4300 switches in the control plane in a QFabric system.

- **Connections between the management interfaces of the Node devices and the control plane switches**—Enable control plane connectivity from the Node devices to the rest of the QFabric system. You must connect two management interfaces from each Node device to the control plane switches. Connect each interface to a different control plane switch to provide system resiliency.

- **Connections between the management interfaces of the Interconnect devices and the control plane switches**—Enable control plane connectivity from the Interconnect devices to the rest of the QFabric system. You must connect the interfaces in each Interconnect device to the control plane switches. Connect each interface to a different control plane switch to provide system resiliency.

  For example, on QFX3008-I Interconnect devices in a QFX3000-G QFabric system, there are two Control Boards and two interfaces per Control Board, for a total of four connections per Interconnect device. To provide system resiliency, connect one interface from each Control Board to the first control plane Virtual Chassis, and connect the second interface from each Control Board to the second control plane Virtual Chassis.

- **Connections between the network module interfaces of the Director group and the control plane switches**—Enable control plane connectivity from the Director group to the rest of the QFabric system. You must connect some interfaces from the first network module in a Director device to one control plane switch, and connect some interfaces from the second network module in a Director device to the second control plane switch. Also, you must connect the ports from the first network module to the primary control plane switch for each Director device (which may vary depending on the configuration of your Director group).

  For guidance on the QFabric control plane configuration and cabling recommendations, see:

  - Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane on page 333

- Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System on page 387
- *Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane*

- **Routing Engines**—Although they are automatically provisioned, specialized Routing Engines implement services such as default QFabric system infrastructure, device management, route sharing, and diagnostics to support the QFabric system. Routing Engines for control plane functions are virtual entities that run on the Director group.
- **Fabric management protocol**—A link-state protocol runs on the control plane network to identify and initialize QFabric system resources, support device redundancy, and support management communication throughout the QFabric system. The protocol is enabled by default.

Control Plane Services

The QFabric system control plane provides the infrastructure to support the following services for the QFabric system:

- System initialization
- Topology discovery
- Internal IP address and unique ID assignment
- Route information sharing
- Configuration delivery to Node devices
- Interdevice communication between Node devices, Interconnect devices, and the Director group

Many of these services are provided by the external Routing Engines that run in software on the Director group.

RELATED DOCUMENTATION

Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane | 333

Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System | 387

Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane

Understanding the QFabric System Data Plane | 51

Understanding Routing Engines in the QFabric System | 25

Understanding the QFabric System Hardware Architecture | 19

Understanding the QFabric System Data Plane

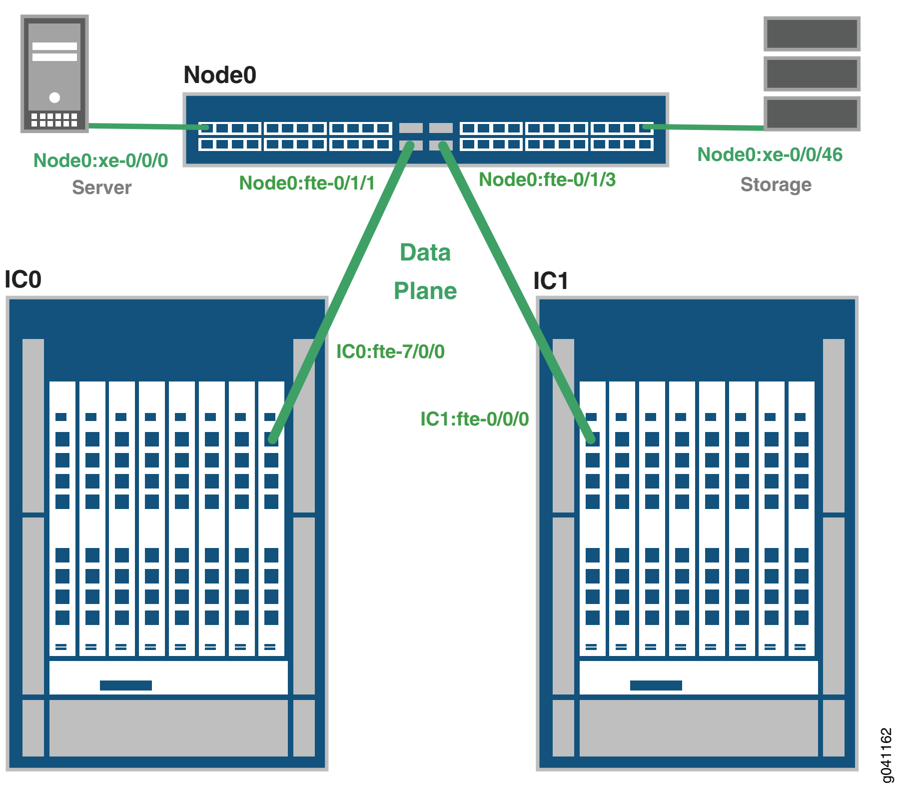
IN THIS SECTION

The data plane in the QFabric system transfers application traffic between QFabric system components rapidly and efficiently. This topic covers:

Data Plane Components

Data traffic within a QFabric system is carried across a redundant, high-performance, and scalable *data plane*. To maintain high availability, the QFabric system data plane is separated physically from the QFabric system control plane and uses a different network. Figure 14 on page 51 shows an example diagram of the QFabric system data plane network.

Figure 14: QFabric System Data Plane Network



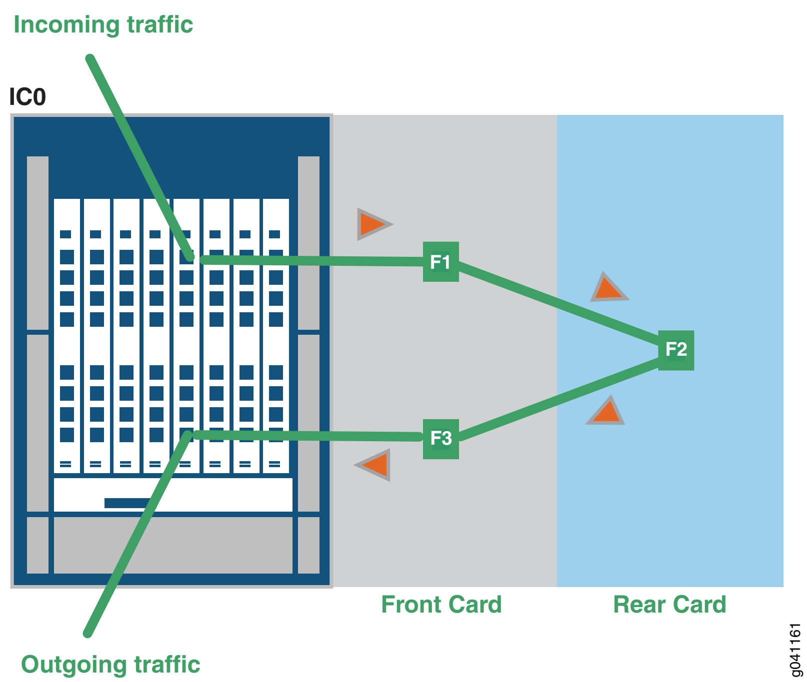
The QFabric system data plane includes the following high-speed data connections and elements:

- 10-Gigabit Ethernet or 2-Gbps, 4-Gbps, or 8-Gbps Fibre Channel connections between QFabric system endpoints (such as servers or storage devices) and the Node devices.
- 40-Gbps quad, small form-factor pluggable plus (QSFP+) connections between the Node devices and the Interconnect devices.
- 10-Gigabit Ethernet connections between external networks and the Node devices contained in the network Node group.
- A fabric control protocol, used to distribute route information to all devices connected to the QFabric system data plane.

QFabric System Fabric

Unlike traditional data centers that employ a multi-tiered hierarchy of switches, a QFabric system contains a single tier of Node devices connected to one another across a backplane of Interconnect devices. The QFabric system fabric is a distributed, multistage network that consists of a fabric queuing and scheduling system implemented in the Node devices, and a distributed cross-connect system implemented in the Interconnect devices. The cross-connect system for the QFX3008-I Interconnect device is shown as an example in Figure 15 on page 52.

Figure 15: QFX3008-I Interconnect Device Cross-Connect System



The design of the cross-connect system provides multistage Clos switching, which results in nonblocking paths for data traffic and any-to-any connectivity for the Node devices. Because all Node devices are connected through the Interconnect device, the QFabric system offers very low port-to-port latencies. In addition, dynamic load balancing and low-latency packet flows provide for scaling the port count and bandwidth capacity of a QFabric system.

RELATED DOCUMENTATION

Understanding the QFabric System Control Plane | 47
Understanding the QFabric System Hardware Architecture | 19

Understanding QFabric Multicast Flow Groups

IN THIS SECTION

In a QFabric system, a hash function is used to select an Interconnect device to forward traffic between two Node devices. Since this hash function is performed on all Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. Some applications, such as financial transactions, require that the redundant multicast streams flow through different Interconnect devices to prevent a single Interconnect device from potentially dropping both streams of multicast traffic during a failure. You can enforce this use of diverse Interconnect devices by using the QFabric flow groups feature.

For an explanation of QFabric system, see "QFabric System Overview" on page 2.

How Do I Implement a Flow Group in a Fabric?

There are two ways to configure a QFabric system, from the CLI and from Network Director. Flow control using flow groups for QFabric systems, however, can be configured from the CLI only, using the **flow-groups** statement.

You create a flow group from the CLI by designating the name of the flow group, the Node devices used by the flow group, and the Interconnect devices used by the nodes in the flow group.

When you configure a flow group, the software assigns a priority to each used Interconnect device. You can override the software settings using the CLI.

Do Flow Groups Impact QFabric System Performance?

Flow group configuration does not affect L3 multicast scaling numbers or performance.

What Platforms Support Flow Groups?

32 bit QFabric-G and QFabric-M platforms support flow groups. For more information about these platforms, see "Understanding QFX3000-G QFabric System Hardware Configurations" on page 107 and *Understanding QFX3000-M QFabric System Hardware Configurations*.

How Do Multicast Flow Groups Work?

Link preferences, which restrict the traffic from ingress Node devices to Interconnect devices, are set to **normal** by default when they are not yet a part of a flow group. When you create a flow group, the link preferences between indicated Interconnect devices and Node devices are automatically changed from **normal** to either **high** or **never**, meaning that any preference determined by the normal algorithm is ignored and the flow is determined by the flow group link settings.

> **NOTE:** You can override the link preference by using the **preference** option of the **flow-groups** CLI statement.

The three link preferences used by the fabric software are:

- high—Use the indicated Interconnect device in the hashing algorithm for the specified flow.
- normal—Use the indicated Interconnect device for backup when Interconnect devices set to **high** fail.
- never—Do not use the indicated Interconnect device in the hashing algorithm for the specified flow.

Interconnect device preference settings are assigned by the software. When you configure a flow group, preferences for some flows are set to **high** and some are set to **never**. This is how flows are enforced. Unassigned Interconnect devices (and Node devices) all belong to a default group and are set to **normal**. When an assigned Interconnect device fails, the corresponding flow looks for a **normal** Interconnect device to use as backup if one is available. This helps prevent loss of data in the event of an Interconnect device failure.

What are QFabric Multicast Flow Group Limitations?

- An Interconnect device can belong to only one flow group.
- A QFabric system can contain up to four flow groups.
- By default, Node devices in a flow group cannot use Interconnect devices in other flow groups. You can override this setting using the **preference** option of the **flow-groups** CLI statement.

RELATED DOCUMENTATION

Segregating QFabric Traffic Flows With Flow Groups | 490
Understanding QFabric System Terminology | 6
Understanding the QFabric System Hardware Architecture | 19
Understanding the QFabric System Software Architecture | 43
Example: Creating a QFabric Flow Group | 492

CHAPTER 4

Software Features

IN THIS CHAPTER

Understanding Software Upgrade on the QFabric System

IN THIS SECTION

The QFabric system software package contains software for the QFabric system infrastructure and for all of the different component devices in the QFabric system: Director group, Interconnect devices, and Node devices.

Operational Software Commands

The **request system software download** CLI command enables you to download the software package to various locations: for example, USB device, remote server, or FTP site.

The following CLI commands enable you to install the software for the Director group, Interconnect devices, Node devices, and the QFabric system infrastructure. You may need to specify the **reboot** option depending on which devices or QFabric infrastructure you are installing the software. The **reboot** option works differently depending on whether you install the software on the QFabric system infrastructure or on a particular device in the QFabric system.

- **request system software add component all**

  This command installs software for the Director group, fabric control Routing Engine, fabric manager Routing Engine, Interconnect devices, and network and server Node groups.

- **request system software add component director-group**

  This command installs software for the Director group and the default partition, which is where you access the QFabric system CLI.

- **request system software add component fabric**

  This command installs the software for the fabric control Routing Engines and the Interconnect devices.

- **request system software add component *node-group-name***

  This command installs software for a server Node group or a network Node group.

Additionally, you can back up your current QFabric configuration file and installation-specific parameters using the **request system software configuration-backup** command. We recommend that you save this file to an external location, like an FTP site or USB device, but you can save it locally.

Operational Reboot Commands

The following commands enable you to reboot the entire QFabric system, various Node devices, or the QFabric system infrastructure:

- **request system reboot all**

  This command reboots the Director group, fabric control Routing Engines, fabric manager Routing Engine, Interconnect devices, and network and server Node groups.

- **request system reboot director-group**

This command reboots the Director group and the default partition, which is where you access the QFabric system CLI.

- **request system reboot fabric**

  This command reboots the fabric control Routing Engines and the Interconnect devices.

- **request system reboot node-group**

  This command reboots a server Node group or a network node group.

RELATED DOCUMENTATION

Upgrading Software on a QFabric System | 625

Understanding Nonstop Software Upgrade for QFabric Systems

The framework that underlies a nonstop software upgrade in a QFabric system enables you to upgrade the system in a step-by-step manner and minimize the impact to the continuous operation of the system. This topic explains how a nonstop software upgrade works in a QFabric system, the steps that are involved, and the procedures that you need to implement to experience the benefits of this style of software upgrade.

Nonstop software upgrade enables some QFabric system components to continue operating while similar components in the system are being upgraded. In general, the QFabric system upgrades redundant components in stages so that some components remain operational and continue forwarding traffic while their equivalent counterparts upgrade to a new version of software.

TIP: Use the following guidelines to decide when to implement a nonstop software upgrade:

TIP: Before you perform a nonstop software upgrade, contact JTAC to perform a pre-upgrade health check on the QFabric system.

- If you need to upgrade all components of the system in the shortest amount of time (approximately one hour) and you do not need to retain the forwarding resiliency of the data plane, issue the **request system software add component all** command to perform a standard software upgrade. All components of the QFabric system upgrade simultaneously and expediently, but this type of upgrade does not provide resiliency or switchover capabilities.
- If you need to minimize service impact, preserve the forwarding operations of the data plane during the upgrade, and are willing to take the extra time required for component switchovers (in many cases, several hours), issue the three nonstop software upgrade commands (**request system software nonstop-upgrade (director-group | fabric | node-group)** described in this topic in the correct order.

NOTE:

- Before you begin a nonstop software upgrade, issue the **request system software download** command to copy the software to the QFabric system.
- Each of the 3 nonstop software upgrade steps must be considered parts of the whole process. You must complete all 3 steps of a nonstop software upgrade in the correct order to ensure the proper operation of the QFabric system.
- Open two SSH sessions to the QFabric CLI. Use one session to monitor the upgrade itself and use a second session to verify that the QFabric system components respond to operational mode commands as expected. For more information on verification of the upgrade, see "Verifying Nonstop Software Upgrade for QFabric Systems" on page 599.
- Issue the **show fabric administration inventory** command to verify that all upgraded components are operational at the end of a step before beginning the next step.
- Once you start the nonstop software upgrade process, we strongly recommend that you complete all 3 steps within 12 hours.

The three steps to a successful nonstop software upgrade must be performed in the following order:

- Director group—The first step upgrades the Director devices, the fabric manager Routing Engine, and the diagnostic Routing Engine. To perform the first step, issue the **request system software**

nonstop-upgrade director-group command. The key actions that occur during a Director group upgrade are:

1. Connecting to the QFabric system by way of an SSH connection. This action establishes a load-balanced CLI session on one of the Director devices in the Director group.
2. The QFabric system downloads and installs the new software in both Director devices.
3. The Director device hosting the CLI session becomes the master for all QFabric system processes running on the Director group, such as the fabric manager and network Node group Routing Engines.
4. The QFabric system installs the new software for the backup fabric manager Routing Engine on the backup Director device.
5. The backup Director device reboots to activate the new software.
6. The master Director device begins a 15 minute sequence that includes a temporary suspension of QFabric services and a QFabric database transfer. You cannot issue operational mode commands in the QFabric CLI during this period.
7. The QFabric system installs the new software for the fabric manager and diagnostic Routing Engines on the Director group master.
8. The QFabric system switches mastership of all QFabric processes from the master Director device to the backup Director device.
9. The master Director device reboots to activate the new software.
10. The CLI session terminates, and logging back in to the QFabric system with a new SSH connection establishes the session on the new master Director device (the original backup).
11. The previous master Director device resumes operation as a backup and the associated processes (such as the fabric manager and network Node group Routing Engines) become backup as well. The fabric control Routing Engine associated with this Director device returns to active status.

> **NOTE:** After the Director group nonstop software upgrade completes, any Interconnect device or Node device that reboots will automatically download the new software, install it, and reboot again. As a result, try not to restart any QFabric system devices before you complete the rest of the nonstop software upgrade steps.

TIP:

- To enable BGP and OSPF to continue operating on the network Node group during a Director group nonstop service upgrade, we recommend that you configure graceful restart for these routing protocols. For more information on graceful restart, see "Configuring Graceful Restart for QFabric Systems" on page 485.

- Wait 15 minutes after the second Director device returns to service and hosts Routing Engine processes before proceeding to step 2—the fabric upgrade. You can verify the operational status of both Director devices by issuing the **show fabric administration inventory director-group status** command. Also, issue the **show fabric administration inventory infrastructure** command to verify when the Routing Engine processes become load balanced (typically, there will be three to four Routing Engines running on each Director device).

- Fabric—The second step upgrades the Interconnect devices and the fabric control Routing Engines. To perform the second step, issue the **request system software nonstop-upgrade fabric** command. The key actions that occur during a fabric upgrade are:

  1. The QFabric system downloads, validates, and installs the new software in all Interconnect devices and fabric control Routing Engines (FC-0 and FC-1).

  2. One fabric control Routing Engine reboots and comes back online.

  3. The other fabric control Routing Engine reboots and comes back online.

  4. The first Interconnect device reboots, comes back online, and resumes the forwarding of traffic.

  5. Subsequent Interconnect devices reboot one at a time, come back online, and return to service.

  NOTE:

  - If the software does not load properly on any one of the fabric components, all components revert back to the original software version.

  - If one of the components in a fabric upgrade does not reboot successfully, issue the **request system reboot fabric** command to reattempt the rebooting process for this fabric component and activate the new software.

- Node group—The third and final step upgrades Node groups. You can choose to upgrade a network Node group, a redundant server Node group, or individual server Node groups. You can upgrade the Node groups one at a time or in groups (known as upgrade groups). However, you must upgrade all Node groups in your QFabric system before you can complete the nonstop software upgrade process. To perform the third step, issue the **request system software nonstop-upgrade node-group** command.

  The key actions that occur during a network Node group upgrade are:

1. The QFabric system copies the new software to each Node device one at a time.
2. The QFabric system validates and then installs the new software in all Node devices simultaneously.
3. The system copies the software to the network Node group Routing Engines.
4. The QFabric system validates and then installs the software in the network Node group Routing Engines one at a time -- first the backup, then the master.
5. The backup network Node group Routing Engine reboots and comes back online.
6. The supporting Node devices reboot and come back online one at a time.

   NOTE: To reduce the total upgrade duration, configure an upgrade group. All Node devices within the upgrade group reboot at the same time.

7. The master network Node group Routing Engine relinquishes mastership to the backup, reboots, and comes back online.

The key actions that occur during a redundant server Node group upgrade are:

1. The QFabric system copies the new software to the backup Node device, then the master Node device.
2. The QFabric system validates and then installs the new software on the backup Node device, then the master Node device.
3. The backup Node device reboots, comes back online, and becomes the master Node device.
4. The previous master Node device reboots and comes back online as a backup Node device.

NOTE: For redundant server Node groups, both Node devices must be online before the upgrade will proceed. If one of the devices is no longer available, remove the Node device from the Node group configuration before you issue the nonstop software upgrade command.

The key actions that occur during a server Node group upgrade for a Node group that contains one member are:

1. The Node device downloads the software package and validates the software.
2. The Node device installs the software and reboots.

NOTE: Because there is no redundancy for Node groups containing a single Node device, traffic loss occurs when the device reboots during the upgrade.

RELATED DOCUMENTATION

Nonstop Software Upgrade Checklist for QFabric Systems | 588

Performing a Nonstop Software Upgrade on the QFabric System | 592

Verifying Nonstop Software Upgrade for QFabric Systems | 599

request system software nonstop-upgrade | 698

request system software add

Configuring Graceful Restart for QFabric Systems | 485

Understanding Statements and Commands on the QFabric System

IN THIS SECTION

Chassis Statements

The following chassis statements enable you to configure various options for your Interconnect devices, Node groups (network and server), and Node devices:

- **interconnect-device**
- **node-group**
- **node-device**

Chassis Commands

The Junos OS CLI contains additions to the existing chassis commands. These additions reflect new options as a result of adding the **interconnect-device**, **node-group**, and **node-device** chassis statements at the **[edit chassis]** hierarchy level.

The following chassis commands enable you to monitor and configure the QFabric system hardware and software options at various hierarchy levels:

- **clear chassis display message**
- **request chassis beacon**

- **request chassis cb** (QFX3000-G QFabric systems only)
- **request chassis fabric** (QFX3000-G QFabric systems only)
- **request chassis fpc**
- **request chassis routing-engine master**
- **set chassis aggregated-devices**
- **set chassis alarm**
- **set chassis container-devices**
- **set chassis craft-lockout**
- **set chassis display**
- **set chassis fpc**
- **set chassis routing-engine**
- **show chassis alarms**
- **show chassis beacon**
- **show chassis environment**
- **show chassis fan** (QFX3000-G QFabric systems only)
- **show chassis fabric**
- **show chassis firmware**
- **show chassis fpc**
- **show chassis hardware**
- **show chassis lcd**
- **show chassis led**
- **show chassis location**
- **show chassis mac-addresses**
- **show chassis nonstop-upgrade**
- **show chassis pic**
- **show chassis routing-engine**
- **show chassis temperature-thresholds**
- **show chassis zones**

RELATED DOCUMENTATION

Understanding NTP on the QFabric System

Network Time Protocol (NTP) enables you to synchronize the time across the network. This is especially helpful for correlating log events and replicating databases and file systems. The QFabric system synchronizes time with servers that are external to the system and operates in client mode only.

To configure NTP, include the **server address** and **authentication-key** statements at the **[edit system ntp]** hierarchy level.

RELATED DOCUMENTATION

Understanding Network Management Implementation on the QFabric System

This topic describes network management features on the QFabric system that are implemented differently than on other devices running Junos OS.

The following network management features are supported on the QFabric system:

- **System log messages**—The QFabric system monitors events that occur on its component devices, distributes system log messages about those events to all external system log message servers (hosts) that are configured, and archives the messages. Component devices include Node devices, Interconnect devices, Director devices, and the Virtual Chassis. You configure system log messages at the **[edit system syslog]** hierarchy level. Use the **show log *filename*** operational mode command to view messages.

- **Simple Network Management Protocol (SNMP) Version 1 (v1) and v2c**—SNMP monitors network devices from a central location. The SNMP implementation on the QFabric system supports the basic SNMP architecture of Junos OS with some limitations, including a reduced set of MIB objects, read-only access for SNMP communities, and limited support for SNMP requests. You configure SNMP at the **[edit snmp]** hierarchy level. Only the **show snmp statistics** operational mode command is supported, but you can issue SNMP requests using external SNMP client applications.
- **Advanced Insight Solutions (AIS)**—AIS provides tools and processes to automate the delivery of support services for the QFabric system. AIS components include Advanced Insight Scripts (AI-Scripts) and Advanced Insight Manager (AIM). You install AI-Scripts using the **request system scripts add** operational mode command. However, the **jais-activate-scripts.slax** file used during installation is preconfigured for the QFabric system and cannot be changed.

> **NOTE:** Do not install Junos Space and AIS on the control plane network EX4200 switches or EX4200 Virtual Chassis in a QFX3000 QFabric system

RELATED DOCUMENTATION

Advanced Insight Scripts (AI-Scripts) Release Notes
Understanding Device and Network Management Features
Overview of Junos OS System Log Messages
Understanding the Implementation of SNMP on the QFabric System | 66
SNMP MIBs Support

Understanding the Implementation of SNMP on the QFabric System

SNMP monitors network devices from a central location. The QFabric system supports the basic SNMP architecture of Junos OS, but its implementation of SNMP differs from that of other devices running Junos OS. This topic provides an overview of the SNMP implementation on the QFabric system.

As in other SNMP systems, the SNMP manager resides on the network management system (NMS) of the network to which the QFabric system belongs. The SNMP agent resides in the QFabric Director software and is responsible for receiving and distributing all traps as well as responding to all the queries of the SNMP manager. For example, traps that are generated by a Node device are sent to the SNMP agent in the Director software, which in turn processes and sends them to the target IP addresses that are defined in the SNMP configuration.

> **NOTE:** In its SNMP implementation, the QFabric system acts as an SNMP proxy server, and requires more time to process SNMP requests than a typical Junos OS device does. The default timeout setting on most SNMP client applications is 3 seconds, which is not enough time for the QFabric system to respond to SNMP requests, so the results of your **mibwalk** command may be incomplete. For this reason, we recommend that you change the SNMP timeout setting to 5 seconds or longer for the QFabric system to complete the responses to your requests.

Support for SNMP on the QFabric system includes:

- Support for the SNMP Version 1 (v1) and v2.

  > **NOTE:** Only SNMPv2 traps are supported on the QFabric system.

- Support for the following standard MIBs:
  - RFC 1155, *Structure and Identification of Management Information for TCP/IP-based Internets*
  - RFC 1157, *A Simple Network Management Protocol (SNMP)*
  - RFC 1212, *Concise MIB Definitions*
  - RFC 1213, *Management Information Base for Network Management of TCP/IP-Based Internets: MIB-II* (partial support, including the system group and interfaces group)
  - RFC 1215, *A Convention for Defining Traps for use with the SNMP*
  - RFC 1901, *Introduction to Community-based SNMPv2*
  - RFC 1905, *Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)*
  - RFC 1907, *Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2)*
  - RFC 2011, *SNMPv2 Management Information Base for the Internet Protocol Using SMIv2*
  - RFC 2012, *SNMPv2 Management Information Base for the Transmission Control Protocol Using SMIv2*
  - RFC 2013, *SNMPv2 Management Information Base for the User Datagram Protocol Using SMIv2*
  - RFC 2233, *The Interfaces Group MIB Using SMIv2*
  - RFC 2571, *An Architecture for Describing SNMP Management Frameworks* (read-only access) (excluding SNMPv3)

- RFC 2572, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* (read-only access) (excluding SNMPv3)
- RFC 2576, *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework* (excluding SNMPv3)
- RFC 2578, *Structure of Management Information Version 2 (SMIv2)*
- RFC 2579, *Textual Conventions for SMIv2*
- RFC 2580, *Conformance Statements for SMIv2*
- RFC 2665, *Definitions of Managed Objects for the Ethernet-like Interface Types*
- RFC 2863, *The Interfaces Group MIB*
- RFC 3410, *Introduction and Applicability Statements for Internet Standard Management Framework* (excluding SNMPv3)
- RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Framework* (excluding SNMPv3)
- RFC 3412, *Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)* (excluding SNMPv3)
- RFC 3413, *Simple Network Management Protocol (SNMP) Applications* (excluding SNMPv3)
- RFC 3416, *Version 2 of the Protocol Operations for the Simple Network Management Protocol (SNMP)*
- RFC 3417, *Transport Mappings for the Simple Network Management Protocol (SNMP)*
- RFC 3418, *Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)*
- RFC 3584, *Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework* (excluding SNMPv3)
- RFC 4188, *Definitions of Managed Objects for Bridges*
- RFC 4293, *Management Information Base for the Internet Protocol (IP)*
- RFC 4363b, *Q-Bridge VLAN MIB*

- Support for the following Juniper Networks enterprise-specific MIBs:
  - Chassis MIB (mib-jnx-chassis.txt)
  - Class-of-Service MIB (mib-jnx-cos.txt)
  - Configuration Management MIB (mib-jnx-cfgmgmt.txt)
  - Fabric Chassis MIB (mib-jnx-fabric-chassis.txt)
  - Interface MIB Extensions (mib-jnx-if-extensions.txt)
  - Power Supply Unit MIB (mib-jnx-power-supply-unit.txt)

  - QFabric MIB (mib-jnx-qf-smi.txt)
  - Utility MIB (mib-jnx-util.txt)

- Support for operational mode commands—Limited to the **show snmp statistics** command. You may issue other SNMP requests, including **get**, **get next**, and **walk** requests, by using external SNMP client applications.

RELATED DOCUMENTATION

SNMP MIBs Support

SNMP Traps Support

Understanding the Implementation of System Log Messages on the QFabric System

This topic provides an overview of system log (syslog) messages as implemented on the QFabric system.

The QFabric system monitors events that occur on its component devices and distributes system log messages about those events to all external system log message servers (hosts) that are configured. Component devices may include Node devices, Interconnect devices, Director devices, and the Virtual Chassis. Messages are stored for viewing only in the QFabric system database. To view the messages, issue the **show log** command.

You configure system log messages by using the **host** and **file** statements at the **[edit system syslog]** hierarchy level. Use the **show log *filename*** operational mode command to view the messages.

NOTE: On the QFabric system, a syslog file named **messages** with a size of 100 MB is configured by default. If you do not configure a filename, you can use the default filename **messages** with the **show log *filename*** command.

All messages with a severity level of **notice** or higher are logged. Messages with a facility level of **interactive-commands** on Node devices are not logged.

The QFabric system supports the following system log message features:

- The **file *filename*** and **host *hostname*** statements at the **[edit system syslog]** hierarchy level are supported. Other statements at that hierarchy level are not supported.
- You can specify the maximum amount of data that is displayed when you issue the **show log *filename*** command by configuring the **file *filename* archive *maximum-file-size*** statement.
- You can specify that one or more system log message servers receive messages, which are sent to each server that is configured.
- If you configured an alias for a device or interface, the alias is displayed in the message for the device or interface.
- The level of detail that is included in a message depends on the facility and severity levels that are configured. Messages include the highest level of detail available for the configured facility and severity levels.
- The unit of time is is measured and displayed in seconds, and not milliseconds. If you attempt to configure the **time-format** option in milliseconds, the log output displays **000**.

Starting in Junos OS Release 13.1, the QFabric system supports these additional syslog features:

- You can filter the output of the **show log *filename*** operational mode command by device type and device ID or device alias when you specify the ***device-type* (*device-id* | *device-alias*)** optional parameters. Device types include **director-device**, **infrastructure-device**, **interconnect-device**, and **node-device**.
- You can specify the syslog structured data output format when you configure the **structured-data** statement at the **[edit system syslog file *filename*]** and **[edit system syslog host *hostname*]** hierarchy levels.

  > **NOTE:** Information displayed in the structured data output for system logs originating from the Director software may not be complete.

- You can filter the types of logs that the Director group collects from a component device when you configure the **filter all *facility severity*** or **filter all match "*regular-expression*"** statements at the **[edit system syslog]** hierarchy level.

Unsupported syslog features include:

- File access to syslog messages
- Monitoring of syslog messages

RELATED DOCUMENTATION

Example: Configuring System Log Messages

Understanding User and Access Management Features on the QFabric System

The QFabric system supports the following user and access management features:

- User authentication
- RADIUS
- Link Layer Discovery Protocol (LLDP)
- SSH
- TACACS+
- Access privilege management

The specific functionality, features, options, syntax, and hierarchy levels of some of the user and access management commands and configuration statements implemented on the QFabric system may differ somewhat from the same commands and configuration statements on standard Junos OS. See the configuration statement or command topic in the documentation set for additional information, and use the help (**?**) command-line function to display specific information as needed.

Some user and access management features are not yet fully supported in the full QFabric architecture, although full support is planned for future releases. The user and access management features currently unsupported on the QFabric system include:

- Full RADIUS server support, including RADIUS accounting
- **accounting-options** configuration statement hierarchy
- **tacplus-options** configuration statement

Understanding QFabric System Login Classes

In some cases (such as device-level troubleshooting), it is useful to log in to individual QFabric system components so you can view and manage issues on a per-device basis. This topic explains the login classes that provide individual component access within a QFabric system.

> **NOTE:** Under normal operating conditions, you should manage the QFabric system as a single entity by using the QFabric system default partition command-line interface (CLI). The default partition CLI provides you with the ability to configure and monitor your entire QFabric system from a central location and should be used as the primary way to manage the system.

The QFabric system offers three special preset login classes that provide different levels of access to individual components within a QFabric system:

- **qfabric-admin**—Provides the ability to log in to individual QFabric system components and manage them. This class is equivalent to setting the following permissions: **access**, **admin**, **clear**, **firewall**, **interface**, **maintenance**, **network**, **reset**, **routing**, **secret**, **security**, **snmp**, **system**, **trace**, and **view**. The *qfabric-admin* class also enables you issue all operational mode commands except **configure**. To provide QFabric system component-level login and management privileges, include the **qfabric-admin** statement at the **[edit system login user *username* authentication remote-debug-permission]** hierarchy level.
- **qfabric-operator**—Provides the privilege to log in to individual QFabric system components and view component operations and configurations. This class is equivalent to setting the following permissions: **trace** and **view**. The *qfabric-operator* class also enables you issue the **monitor** and **show log messages** operational mode commands. To provide limited QFabric system component-level access, include the **qfabric-operator** statement at the **[edit system login user *username* authentication remote-debug-permission]** hierarchy level.
- **qfabric-user**—Prevents access to individual QFabric system components. This class is the default setting for all QFabric system users and is equivalent to the preset Junos OS class of **unauthorized**. To prevent a user from accessing individual QFabric system components, include the **qfabric-user** statement at the **[edit system login user *username* authentication remote-debug-permission]** hierarchy level.

When you perform the initial setup for the Director group, you must specify a username and password for QFabric components. Once configured, this information is stored in the QFabric system and mapped to the QFabric system login classes. Such mapping allows users with the proper login class (**qfabric-admin** or **qfabric-operator**) to log in automatically to a component without being prompted for the username and password.

After you assign the **qfabric-admin** or **qfabric-operator** class to a user, the user can log in to an individual QFabric system component by issuing the **request component login *component-name*** command. You can access Node devices, Interconnect devices, and virtual Junos Routing Engines (diagnostics, fabric control, and fabric manager) one at a time when you issue this command. To leave the CLI prompt of a component and return to the QFabric system default partition CLI, issue the **exit** command from the component's operational mode CLI prompt.

RELATED DOCUMENTATION

Junos OS Login Classes Overview

Understanding Interfaces on the QFabric System

IN THIS SECTION

This topic describes:

Four-Level Interface Naming Convention

When you configure an interface on the QFabric system, the interface name needs to follow a four-level naming convention that enables you to identify an interface as part of either a Node device or a Node group. Include the name of the network or server Node group at the beginning of the interface name.

The four-level interface naming convention is:
device-name:*type-fpc/pic/port*
where *device-name* is the name of the Node device or Node group. The remainder of the naming convention elements are the same as those in the QFX3500 switch interface naming convention.

An example of a four-level interface name is:
node2:*xe-0/0/2*

QSFP+ Interfaces

The QFX3500 Node device provides four 40-Gbps QSFP+ (quad small form-factor pluggable plus) interfaces (labeled **Q0** through **Q3**) for uplink connections between your Node device and your Interconnect devices.

The QFX3600 Node device provides 16 40-Gbps QSFP+ interfaces. By default, 4 interfaces (labeled **Q0** through **Q3**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 12 interfaces (labeled **Q4** through **Q15**) use QSFP+ direct-attach copper (DAC) breakout cables or QSFP+ transceivers with fiber breakout cables to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the first eight interfaces (Q0 through Q7) for uplink connections between your Node device and your Interconnect devices, and interfaces Q2 through Q15 for 10-Gigabit Ethernet or 40-Gigabit Ethernet connections to either endpoint systems or external networks (see “Configuring the Port Type on QFX3600 Node Devices” on page 467). Table 4 on page 15 shows the port mappings for QFX3600 Node devices.

Table 13: QFX3600 Node Device Port Mappings

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q0	Not supported on this port	xle-0/1/0	fte-0/1/0
Q1	Not supported on this port	xle-0/1/1	fte-0/1/1
Q2	xe-0/0/8 xe-0/0/9 xe-0/0/10 xe-0/0/11	xle-0/1/2	fte-0/1/2
Q3	xe-0/0/12 xe-0/0/13 xe-0/0/14 xe-0/0/15	xle-0/1/3	fte-0/1/3
Q4	xe-0/0/16 xe-0/0/17 xe-0/0/18 xe-0/0/19	xle-0/1/4	fte-0/1/4

Table 13: QFX3600 Node Device Port Mappings *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q5	xe-0/0/20 xe-0/0/21 xe-0/0/22 xe-0/0/23	xle-0/1/5	fte-0/1/5
Q6	xe-0/0/24 xe-0/0/25 xe-0/0/26 xe-0/0/27	xle-0/1/6	fte-0/1/6
Q7	xe-0/0/28 xe-0/0/29 xe-0/0/30 xe-0/0/31	xle-0/1/7	fte-0/1/7
Q8	xe-0/0/32 xe-0/0/33 xe-0/0/34 xe-0/0/35	xle-0/1/8	Not supported on this port
Q9	xe-0/0/36 xe-0/0/37 xe-0/0/38 xe-0/0/39	xle-0/1/9	Not supported on this port

Table 13: QFX3600 Node Device Port Mappings *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q10	xe-0/0/40 xe-0/0/41 xe-0/0/42 xe-0/0/43	xle-0/1/10	Not supported on this port
Q11	xe-0/0/44 xe-0/0/45 xe-0/0/46 xe-0/0/47	xle-0/1/11	Not supported on this port
Q12	xe-0/0/48 xe-0/0/49 xe-0/0/50 xe-0/0/51	xle-0/1/12	Not supported on this port
Q13	xe-0/0/52 xe-0/0/53 xe-0/0/54 xe-0/0/55	xle-0/1/13	Not supported on this port
Q14	xe-0/0/56 xe-0/0/57 xe-0/0/58 xe-0/0/59	xle-0/1/14	Not supported on this port

Table 13: QFX3600 Node Device Port Mappings *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
Q15	xe-0/0/60 xe-0/0/61 xe-0/0/62 xe-0/0/63	xle-0/1/15	Not supported on this port

The QFX5100-48S Node device provides 48 10-Gigabit Ethernet interfaces and 6 40-Gbps QSFP+ interfaces. By default, 4 interfaces (labeled **48** through **51**) are configured for 40-Gbps uplink connections between your Node device and your Interconnect devices, and 2 interfaces (labeled **52** and **53**) support 40-Gigabit Ethernet connections to either endpoint systems (such as servers and storage devices) or external networks. Optionally, you can choose to configure the middle two interfaces (**50** and **51**) for 40-Gigabit Ethernet connections to either endpoint systems or external networks, and you can choose to configure the last two interfaces (**52** and **53**) for uplink connections between your Node device and your Interconnect devices (see "Configuring the QSFP+ Port Type on QFX5100 Devices" on page 473). Table 5 on page 18 shows the port mappings for QFX5100-48S Node devices.

Table 14: QFX5100-48S Node Device Port Mappings

Port Number	40-Gigabit Ethernet Interfaces (On PIC 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)
48	Not supported on this PIC	fte-0/1/0
49	Not supported on this PIC	fte-0/1/1
50	xle-0/1/2	fte-0/1/2
51	xle-0/1/3	fte-0/1/3
52	xle-0/1/4	fte-0/1/4
53	xle-0/1/5	fte-0/1/5

Link Aggregation

Link aggregation enables you to create link aggregation groups across Node devices within a network Node group or redundant server Node group. You can include up to eight Ethernet interfaces in a LAG.

You can have up to 48 LAGs within a redundant server Node group, and 128 LAGs in a network Node group. To configure a LAG, include the **aggregated-devices** statement at the **[edit chassis node-group *node-group-name*]** hierarchy level and the **device-count** statement at the **[edit chassis node-group *node-group-name* aggregated-devices ethernet]** hierarchy level. Additionally, include any aggregated Ethernet options (**minimum-links** and **link-speed**) at the **[edit interfaces *interface-name* aggregated-ether-options]** hierarchy level and the **802.3ad** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level. To configure the Link Aggregation Control Protocol (LACP), include the **lacp** statement at the **[edit interfaces aggregated-ether-options]** hierarchy level.

RELATED DOCUMENTATION

Configuring the Port Type on QFX3600 Node Devices | **467**

Configuring the QSFP+ Port Type on QFX5100 Devices | **473**

Understanding Layer 3 Features on the QFabric System

The QFabric system supports the following Layer 3 features:

- Static routes, which enable you to manually configure and enter routes directly into the routing table.
- Routed VLAN Interfaces, which are a special type of Layer 3 virtual interface that enable you to forward packets between VLANs without using a router to connect the VLANs. Using this approach to connect VLANs reduces complexity and avoids the costs associated with purchasing, installing, managing, powering, and cooling another device.
- Routing protocols for routing traffic. The following routing protocols are supported on QFabric systems:
  - Border Gateway Protocol (BGP), which is an exterior gateway protocol (EGP) for routing traffic between autonomous systems (ASs).
  - Open Shortest Path First (OSPF) protocol, which is an interior gateway protocol (IGP) for routing traffic within an autonomous system (AS). QFabric systems support OSPFv1 and OSPFv2.

NOTE:

- When you configure routing protocols on the QFabric system, you must use interfaces from the Node devices assigned to the network Node group. If you try to configure routing protocols on interfaces from the Node devices assigned to server Node groups, the configuration commit operation fails.
- You can configure routing protocols by including statements at the **[edit protocols]** hierarchy level. If you want to isolate customer traffic on your network, you can configure virtual router routing instances at the **[edit routing-instances]** hierarchy level, and configure routing protocols for each virtual router routing instance by including statements at the **[edit routing-instances *routing-instance-name* protocols]** hierarchy level.

RELATED DOCUMENTATION

Understanding Virtual Router Routing Instances

Understanding Telnet on the QFabric System

This topic describes the support for the Telnet protocol on QFabric systems.

Telnet service is available for devices running Junos OS, including QFX Series devices. However, on QFabric systems, Telnet support is limited and the following conditions apply:

- You can telnet from a QFabric system to external devices that are connected to the QFabric system by way of the network Node group. To connect to these external devices, issue the **telnet** command from the QFabric default partition CLI.
- You cannot use the Telnet protocol to connect from the QFabric system default partition CLI to individual components. To access system components, you must issue the **request component login** command instead.

RELATED DOCUMENTATION

request component login | 664

telnet

Understanding Security Features on the QFabric System

The QFabric system supports the following security features:

- Firewall filters provide rules that define whether to accept or discard packets that are transiting an interface. If a packet is accepted, you can configure additional actions to perform on the packet, such as class-of-service (CoS) marking (grouping similar types of traffic together and treating each type of traffic as a class with its own level of service priority) and traffic policing (controlling the maximum rate of traffic sent or received).
- Policing (rate-limiting) traffic allows you to control the maximum rate of traffic sent or received on an interface and to provide multiple priority levels or classes of service. You use policers to apply limits to traffic flow and set consequences for packets that exceed these limits—usually applying a higher loss priority—so that if packets encounter downstream congestion, they can be discarded first. Policers apply only to unicast packets.
- MAC limiting protects against flooding of the Ethernet switching table (also known as the MAC forwarding table or Layer 2 forwarding table). You enable this feature on Layer 2 interfaces (ports). MAC limiting sets a limit on the number of MAC addresses that can be learned on a single Layer 2 access interface or on all the Layer 2 access interfaces on the switch. Junos OS provides two MAC limiting methods:
  - Maximum number of MAC addresses—You configure the maximum number of dynamic MAC addresses allowed per interface. When the limit is exceeded, incoming packets with new MAC addresses can be ignored, dropped, or logged. You can also specify that the interface be shut down or temporarily disabled.
  - Allowed MAC—You configure specific “allowed” MAC addresses for the access interface. Any MAC address that is not in the list of configured addresses is not learned, and the switch logs an appropriate message. Allowed MAC binds MAC addresses to a VLAN so that the address does not get registered outside the VLAN. If an allowed MAC setting conflicts with a dynamic MAC setting, the allowed MAC setting takes precedence.
- Storm control causes a switch to monitor traffic levels and take a specified action when a specified traffic level—called the storm control level—is exceeded, thus preventing packets from proliferating and degrading service. You can configure switches to drop broadcast and unknown unicast packets, shut down interfaces, or temporarily disable interfaces when the storm control level is exceeded.

To understand more about QFX Series devices Licensing, see Software Features That Require Licenses for QFX Series. Please refer to the Juniper Licensing Guide for general information about License Management. Please refer to the product Data Sheets for details, or contact your Juniper Account Team or Juniper Partner.

RELATED DOCUMENTATION

Overview of Policers

Overview of Firewall Filters
Understanding MAC Limiting and MAC Move Limiting for Port Security
Understanding Storm Control

Understanding Port Mirroring and Analyzers

IN THIS SECTION

Port Mirroring Overview

Port mirroring copies packets entering or exiting a port or entering a VLAN and sends the copies to a local interface for local monitoring or to a VLAN for remote monitoring. Use port mirroring to send traffic to applications that analyze traffic for purposes such as monitoring compliance, enforcing policies, detecting intrusions, monitoring and predicting traffic patterns, correlating events, and so on.

Port mirroring is needed for traffic analysis on a switch because a switch normally sends packets only to the port to which the destination device is connected. You configure port mirroring on the switch to send copies of unicast traffic to a local interface or a VLAN and run an analyzer application on a device connected to the interface or VLAN. You configure port mirroring by using the **analyzer** statement.

Keep performance in mind when configuring port mirroring. For example, If you mirror traffic from multiple ports, the mirrored traffic may exceed the capacity of the output interface. We recommend that you limit the amount of copied traffic by selecting specific interfaces instead of using the **all** keyword. You can also limit the amount of mirrored traffic by using a firewall filter to send specific traffic to a port mirroring instance. Mirroring only the necessary packets reduces the possibility of a performance impact.

You can use port mirroring to copy any of the following:

- All packets entering or exiting an interface (in any combination)—For example, you can send copies of the packets entering some interfaces and the packets exiting other interfaces to the same local interface or VLAN. If you configure port mirroring to copy packets exiting an interface, traffic that originates on that switch or Node device (in a QFabric system) is not copied when it egresses. Only switched traffic is copied on egress. (See the limitation on egress mirroring below.)

- All packets entering a VLAN—You cannot use port mirroring to copy packets exiting a VLAN.
- Firewall-filtered sample—Sample of packets entering a port or VLAN. Configure a firewall filter to select certain packets for mirroring.

> **NOTE:** Firewall filters are not supported on egress ports; therefore, you cannot specify policy-based sampling of packets exiting an interface.

Port Mirroring Instance Types

To configure port mirroring, you configure an instance of one of the following types:

- Analyzer instance: You must specify the input and output for the instance. This instance type is useful for ensuring that all traffic transiting an interface or VLAN is mirrored and sent to the analyzer device.
- Port-mirroring instance: You do not specify an input for this instance type. Instead, you, create a firewall filter that specifies the required traffic and directs it to the mirror. This instance type is useful for controlling which types of traffic should be mirrored. When you use a port-mirroring instance, you can direct traffic to it in the following ways:
  - Specify the name of the port-mirroring instance in the firewall filter using the **port-mirror-instance *instance-name*** action. You should use this approach if there are multiple port-mirroring instances defined.
  - Configure the filter to send the mirrored packets to the output interface defined in the instance using the **port-mirror** action. You can use this approach if there is only one port-mirroring instance defined.

Port-Mirroring Terminology

Table 15 on page 82 lists the terms used in the documentation about port mirroring and provides definitions.

Table 15: Port Mirroring Terms and Definitions

Term	Description
Analyzer instance	Port-mirroring configuration that includes a name, source interfaces or source VLAN, and a destination for mirrored packets (either a local access interface or a VLAN).

Table 15: Port Mirroring Terms and Definitions *(continued)*

Port mirroring instance **NOTE:** Port mirroring instance feature is not supported on NFX150 devices.	A port-mirroring configuration that does not specify an input.. A firewall filter must be used to send traffic to the port mirror. Use the action **port-mirror-instance *instance-name*** in the firewall filter configuration to send packets to the port mirror.
Output interface (also known as monitor interface)	Access interface to which packet copies are sent and to which a device running an analyzer application is connected. The following limitations apply to an output interface: • Cannot also be a source port. • Cannot be used for switching. • Cannot be an aggregated Ethernet interface (LAG). • Does not participate in Layer 2 protocols, such as Spanning Tree Protocol (STP). • Loses any existing VLAN associations when you configure it as an analyzer output interface. If the capacity of the output interface is insufficient to handle the traffic from the source ports, overflow packets are dropped.
Output IP address	IP address of the device running an analyzer application. The device can be on a remote network. When you use this feature, the mirrored packets are GRE-encapsulated. The analyzer device must be able to de-encapsulate GRE-encapsulated packets, or the GRE-encapsulated packets must be de-encapsulated before reaching the analyzer device. (You can use a network sniffer to de-encapsulate the packets.) • An output IP address cannot be in the same subnetwork as any of the switch’s management interfaces. • If you create virtual routing instances and also create an analyzer configuration that includes an output IP address, the output address belongs to the default virtual routing instance (inet.0 routing table).

Table 15: Port Mirroring Terms and Definitions *(continued)*

Output VLAN (also known as monitor or analyzer VLAN)	VLAN to which copies are sent and to which a device running an analyzer application is connected. The analyzer VLAN can span multiple switches. The following limitations apply to an output VLAN: • Cannot be a private VLAN or VLAN range. • Cannot be shared by multiple **analyzer** statements. • An output VLAN interface cannot be a member of any other VLAN. • An output VLAN interface cannot be an aggregated Ethernet interface (LAG). • On some switches, only one interface can be a member of the analyzer VLAN. This limitation does not apply on the QFX10000 switch if traffic is mirrored on ingress. In this case, multiple QFX10000 interfaces can belong to the output VLAN, and traffic is mirrored to all of those interfaces. If traffic is mirrored on egress on a QFX10000 switch, only one interface can be a member of the analyzer VLAN.
Input interface (also known as mirrored or monitored interface)	Interface that provides traffic to be mirrored. This traffic can be entering or exiting the interface. (Ingress or egress traffic can be mirrored.) An input interface cannot also be an output interface for an analyzer.
Monitoring station	Computer running an analyzer application.
Local port mirroring	Port-mirroring configuration in which the mirrored packets are sent to an interface on the same switch.
Remote port mirroring	Flooding mirrored packets to an output (analyzer) VLAN that you create to receive mirror traffic or sending the mirrored packets to a remote IP address. (You cannot send mirrored packets to a remote IP address on a QFabric system.)
Policy-based mirroring	Mirroring of packets that match the match a firewall filter term. The action **analyzer *analyzer-name*** is used in the firewall filter to send the packets to the analyzer.

Port Mirroring and STP

The behavior of STP in a port-mirroring configuration depends on the version of Junos OS you are using:

- Junos OS 13.2X50, Junos OS 13.2X51-D25 or earlier, Junos OS 13.2X52: If you enable STP, port mirroring might not work because STP might block the mirrored packets.
- Junos OS 13.2X51-D30, Junos OS 14.1X53: STP is disabled for mirrored traffic. You must ensure that your topology prevents loops for this traffic.

Port Mirroring Constraints and Limitations

IN THIS SECTION

Local and Remote Port Mirroring

The following constraints and limitations apply to local and remote port mirroring:

- You can create a total of four port-mirroring configurations.
- You can create a total of four port-mirroring configurations on each Node group in a QFabric system, subject to the following constraints:
  - As many as four of the configurations can be for local port mirroring.
  - As many as three of the configurations can be for remote port mirroring.
- Regardless of whether you are configuring a standalone switch or a Node group, the following limits apply:
  - There can be no more than two configurations that mirror ingress traffic. (If you configure a firewall filter to send traffic to a port mirror—that is, you use the **analyzer** action modifier in a filter term—this counts as an ingress mirroring configuration for switch or Node group on which the filter is applied.)
  - There can be no more than two configurations that mirror egress traffic.

  > **NOTE:** On QFabric systems, there is no system-wide limit on the total number of mirror sessions.

- You can configure no more than one type of output in one port-mirroring configuration. That is, you can use no more than one of the following to complete a **set analyzer *name* output** statement:
  - **interface**
  - **ip-address**
  - **vlan**
- If you configure Junos OS to mirror egress packets, do not configure more than 2000 VLANs on a standalone switch or QFabric system. If you do so, some VLAN packets might contain incorrect VLAN IDs. This applies to any VLAN packets—not only the mirrored copies.

- The **ratio** and **loss-priority** options are not supported.
- Packets with physical layer errors are filtered out and are not sent to the output port or VLAN.
- If you use sFlow monitoring to sample traffic, it does not sample the mirror copies when they exit from the output interface.
- You cannot mirror packets exiting or entering the following ports:
  - Dedicated Virtual Chassis interfaces
  - Management interfaces (me0 or vme0)
  - Fibre Channel interfaces
  - Integrated routing and bridging (IRB) interfaces (also known as routed VLAN interfaces, or RVIs)
- An aggregated Ethernet interface cannot be an output interface if the input is a VLAN or if traffic is sent to the analyzer by a firewall filter.
- When packet copies are sent out the output interface, they are not modified for any changes that are normally applied on egress, such as CoS rewriting.
- An interface can be the input interface for only one mirroring configuration. Do not use the same interface as the input interface for multiple mirroring configurations.
- CPU-generated packets (such as ARP, ICMP, BPDU, and LACP packets) cannot be mirrored on egress.
- VLAN-based mirroring is not supported for STP traffic.
- (QFabric systems only) If you configure a QFabric analyzer to mirror egress traffic and the input and output interfaces are on different Node devices, the mirrored copies have incorrect VLAN IDs. This limitation does not apply if you configure a QFabric analyzer to mirror egress traffic and the input and output interfaces are on the *same* Node device. In this case the mirrored copies have the correct VLAN IDs (as long as you do not configure more than 2000 VLANs on the QFabric system).
- True egress mirroring is defined as mirroring the exact number of copies and the exact packet modifications that went out the egress switched port. Because the processor on QFX5xxx (including QFX5100, QFX5110, QFX5120, QFX5200, and QFX5210) and EX4600 (including EX4600 and EX4650) switches implements egress mirroring in the ingress pipeline, those switches do not provide accurate egress packet modifications, so egress mirrored traffic can carry incorrect VLAN tags that differ from the tags in the original traffic.
- If you configure a port-mirroring instance to mirror traffic exiting from an interface that performs VXLAN encapsulation, the source and destination MAC addresses of the mirrored packets will not be the same as those of the original traffic.
- Mirroring on member interfaces of a LAG is not supported.
- Egress VLAN mirroring is not supported.

Remote Port Mirroring Only

The following constraints and limitations apply to remote port mirroring:

- If you configure an output IP address, the address cannot be in the same subnetwork as any of the switch's management interfaces.
- If you create virtual routing instances and also create an analyzer configuration that includes an output IP address, the output address belongs to the default virtual routing instance (inet.0 routing table).
- An output VLAN cannot be a private VLAN or VLAN range.
- An output VLAN cannot be shared by multiple **analyzer** statements.
- An output VLAN interface cannot be a member of any other VLAN.
- An output VLAN interface cannot be an aggregated Ethernet interface.
- If the output VLAN has more than one member interface, then traffic is mirrored only to the first member of the VLAN, and other members of the same VLAN do not carry any mirrored traffic.
- If you attempt to configure more than one analyzer session for remote port mirroring to an IP address (GRE encapsulation) and the IP addresses of the analyzers are reachable through the same interface, then only one analyzer session is configured.

Port Mirroring Constraints on OCX Series Switches

The following constraints and limitations apply to port mirroring on OCX Series switches:

- You can create a total of four port-mirroring configurations. The following constraints also apply:
  - There can be no more than two configurations that mirror ingress traffic.
  - There can be no more than two configurations that mirror egress traffic.
- If you use sFlow monitoring to sample traffic, it does not sample the mirror copies when they exit from the output interface.
- You can create only one port-mirroring session.
- You cannot mirror packets exiting or entering the following ports:
  - Dedicated Virtual Chassis interfaces
  - Management interfaces (me0 or vme0)
  - Fibre Channel interfaces
  - Routed VLAN interfaces or IRB interfaces
- An aggregated Ethernet interface cannot be an output interface.
- Do not include an 802.1Q subinterface that has a unit number other than 0 in a port mirroring configuration. Port mirroring does not work with subinterfaces if their unit number is not 0. (You configure 802.1Q subinterfaces using the **vlan-tagging** statement.)

- When packet copies are sent out the output interface, they are not modified for any changes that are normally applied on egress, such as CoS rewriting.
- An interface can be the input interface for only one mirroring configuration. Do not use the same interface as the input interface for multiple mirroring configurations.
- CPU-generated packets (such as ARP, ICMP, BPDU, and LACP packets) cannot be mirrored on egress.
- VLAN-based mirroring is not supported for STP traffic.

SEE ALSO

Understanding Port Mirroring

Example: Mirroring Employee Web Traffic with a Firewall Filter

Configuring Port Mirroring

RELATED DOCUMENTATION

Configuring Port Mirroring

Examples: Configuring Port Mirroring for Local Analysis

Examples: Configuring Port Mirroring for Local Analysis

Example: Configuring Port Mirroring for Remote Analysis

Troubleshooting Port Mirroring

Understanding Fibre Channel Fabrics on the QFabric System

A Fibre Channel (FC) fabric on a QFabric system is a construct that you configure on a QFX3500 Node device when the Node device is in FCoE-FC gateway mode. The FC fabric on a QFabric Node device is not the same as an FC fabric on a storage area network (SAN). The FC fabric on a QFabric Node device is local to that particular node device. We call the FC fabric on a QFabric Node device a *local FC fabric* to differentiate it from an FC fabric on the SAN.

> **NOTE:** The QFX3600 Node device does not support FC or FCoE features.

A local FC fabric does not span Node devices and does not span the fabric Interconnect device. Local FC fabrics are entirely contained on a single Node device. A local FC fabric creates associations that connect

FCoE devices that have converged network adapters (CNAs) on the Ethernet network to an FC switch or FCoE forwarder (FCF) on the FC network. A local FC fabric consists of:

- A unique fabric name.
- A unique fabric ID.
- One or more FCoE VLAN interfaces that include one or more 10-Gigabit Ethernet interfaces connected to FCoE devices. The FCoE VLANs transport traffic between the FCoE servers and the FCoE-FC gateway. Each FCoE VLAN must carry only FCoE traffic. You cannot mix FCoE traffic and standard Ethernet traffic on the same VLAN.

  The 10-Gigabit Ethernet interfaces that connect to FCoE devices must include a native VLAN to transport FIP traffic because FIP VLAN discovery and notification frames are exchanged as untagged packets.

  Each FCoE VLAN interface can present multiple VF_Port interfaces to the FCoE network.
- One or more native FC interfaces. The native FC interfaces transport traffic between the gateway and the FC switch or FCF.

  > **TIP:** If the network does not use a dual-rail architecture for redundancy, configure more than one native FC interface for each local FC fabric to create redundant connections between the FCoE devices and the FC network. If one physical link goes down, any sessions it carried can log in again and connect to the FC network on a different interface.

All of the FC and FCoE traffic that belongs to a local FC fabric on a Node device must enter and exit that Node device. This means that the FC switch or FCF and the FCoE devices in the Ethernet network must be connected to the same Node device. The interfaces that connect to the FC switch and the interfaces that connect to the FCoE devices must be included in the local FC fabric. You cannot configure a local FC fabric that spans more than one Node device.

Traffic flows from FC and FCoE devices that are not in the same local FC fabric remain separate and cannot communicate with each other through the FCoE-FC gateway.

> **NOTE:** The QFabric system enforces commit checks to ensure that local FC fabrics and FCoE VLANs on FCoE-FC gateways do not span more than one Node device.

RELATED DOCUMENTATION

Overview of Fibre Channel

Understanding an FCoE-FC Gateway

Understanding FCoE-FC Gateway Functions

Understanding Interfaces on an FCoE-FC Gateway

Understanding CoS Fabric Forwarding Class Sets

IN THIS SECTION

Fabric forwarding class sets (fabric fc-sets) are similar to the fc-sets (priority groups) you configure on Node devices. The major differences are:

1. Fabric fc-sets group traffic for transport across the QFX3008-I or QFX3600-I Interconnect device (the fabric). Node device fc-sets group traffic on a Node device for transport across that Node device.

2. Fabric fc-sets are global. They apply to the entire fabric. Node device fc-sets apply only to the Node device on which they are configured.

3. Fabric fc-sets are mapped directly to Interconnect device output queues; in this way, they behave similarly to forwarding classes on a Node device.

   Fabric fc-sets map to Interconnect device fabric output queues statically—you cannot configure the mapping of fabric fc-sets to fabric output queues. All traffic in a fabric fc-set maps to the same output queue.

   Node device fc-sets include forwarding classes that map to Node device output queues, and you can configure the mapping of forwarding classes to output queues (or you can use the default mapping). Because output queues are mapped to forwarding classes, different classes of traffic in a Node device fc-set can be mapped to different output queues.

Node device fc-sets consist of forwarding classes containing traffic that requires similar CoS treatment. (Forwarding classes are default forwarding classes or user-defined forwarding classes.) You can configure CoS for each fc-set to determine how the traffic of its forwarding classes is scheduled on a Node device.

When traffic exits a Node device interface and enters an Interconnect device fabric interface, the Interconnect device uses the same forwarding classes to group traffic. The forwarding classes are mapped to global fabric fc-sets for transport across the fabric. Like fc-sets on a Node device, fabric fc-sets also contain traffic that requires similar CoS treatment. Also like fc-sets on a Node device, you can configure CoS on fabric fc-sets.

Fabric fc-sets reside on the Interconnect device and are global to the QFabric system. Fabric fc-sets apply to all traffic that traverses the fabric. The mapping of forwarding classes to fabric fc-sets is global and applies to all forwarding classes with traffic that traverses the fabric from all connected Node devices. You can change the mapping of forwarding classes to fabric fc-sets. All mapping changes you make are global. For example, if you change the fabric fc-set to forwarding class mapping of the default best-effort forwarding class, then every Node device's best-effort forwarding class traffic that traverses the fabric is mapped to that fabric fc-set. The CoS you configure on a fabric fc-set applies to all the traffic that belongs to that fabric fc-set, from all connected Node devices.

This topic describes:

Default Fabric Forwarding Class Sets

Interconnect devices have 12 default fabric fc-sets, including five visible default fabric fc-sets, four for unicast traffic and one for multidestination (multicast, broadcast, and destination lookup failure) traffic.

There are also seven hidden default fabric fc-sets. There are three hidden default fabric fc-sets for multidestination traffic that you can use if you want to map different multidestination forwarding classes to different multidestination fabric fc-sets. There are four hidden default fabric fc-sets for lossless traffic that you can use to map different lossless forwarding classes (priorities) to different lossless fabric fc-sets. Table 16 on page 92 shows the default fabric fc-sets:

Table 16: Default Fabric Forwarding Class Sets

Fabric Forwarding Class Set Name	Characteristics
fabric_fcset_be	Transports best-effort unicast traffic across the fabric.
fabric_fcset_strict_high	Transports unicast traffic that has been configured with **strict-high** priority and in the **network-control** forwarding class across the fabric. This fabric fc-set receives as much bandwidth across the fabric as it needs to service the traffic in the group up to the entire fabric interface bandwidth. For this reason, exercise caution when mapping traffic to this fabric fc-set to avoid starving other traffic.
fabric_fcset_noloss1	Transports unicast traffic in the default **fcoe** forwarding class across the fabric.
fabric_fcset_noloss2	Transports unicast traffic in the default **no-loss** forwarding class across the fabric.
fabric_fcset_noloss3	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for lossless forwarding classes.
fabric_fcset_noloss4	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for lossless forwarding classes.
fabric_fcset_noloss5	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for lossless forwarding classes.
fabric_fcset_noloss6	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for lossless forwarding classes.

Table 16: Default Fabric Forwarding Class Sets *(continued)*

Fabric Forwarding Class Set Name	Characteristics
fabric_fcset_multicast1	Transports multidestination traffic in the **mcast** forwarding class across the fabric. This fabric fc-set is valid only for multidestination forwarding classes.
fabric_fcset_multicast2	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for multidestination forwarding classes.
fabric_fcset_multicast3	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for multidestination forwarding classes.
fabric_fcset_multicast4	(Hidden) No traffic is assigned by default to this fabric fc-set. Unless traffic is mapped to this fabric fc-set, this fabric fc-set remains hidden. This fabric fc-set is valid only for multidestination forwarding classes.

The five default forwarding classes (**best-effort**, **fcoe**, **no-loss**, **network-control**, and **mcast**) are mapped to the fabric fc-sets by default as shown in Table 17 on page 93.

Table 17: Default Forwarding Class to Fabric Forwarding Class Set Mapping

Forwarding Class	Fabric Forwarding Class Set	Fabric Output Queue	Maximum MTU Supported for Lossless Operation
best-effort	fabric_fcset_be	0	NA
network-control	fabric_fcset_strict_high	7	NA
fcoe	fabric_fcset_noloss1	1	9K
no-loss	fabric_fcset_noloss2	2	9K
mcast	fabric_fcset_multicast1	8	NA
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_noloss3	3	9k

Table 17: Default Forwarding Class to Fabric Forwarding Class Set Mapping *(continued)*

Forwarding Class	Fabric Forwarding Class Set	Fabric Output Queue	Maximum MTU Supported for Lossless Operation
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_noloss4	4	9k
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_noloss5	5	9k
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_noloss6	6	9k
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_multicast2	9	NA
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_multicast3	10	NA
No forwarding classes are mapped by default to this hidden fabric fc-set.	fabric_fcset_multicast4	11	NA

The maximum fiber cable length between the QFabric system Node device and the QFabric system Interconnect device is 150 meters.

TIP: If you explicitly configure lossless forwarding classes, we recommend that you map each user-configured lossless forwarding class to an unused fabric fc-set (fabric_fcset_noloss3 through fabric_fcset_noloss6) on a one-to-one basis: one lossless forwarding class mapped to one lossless fabric fc-set.

The reason for one-to-one mapping is to avoid fate sharing of lossless flows. Because each fabric fc-set is mapped statically to an output queue, when you map more than one forwarding class to a fabric fc-set, all of the traffic in all of the forwarding classes that belong to the fabric fc-set uses the same output queue. If that output queue becomes congested due to congestion caused by one of the flows, the other flows are also affected. (They share fate because the flow that congests the output queue affects flows that are not experiencing congestion.)

If you want to map different multidestination forwarding classes to different multidestination fabric fc-sets, use one or more of the hidden multidestination fabric fc-sets.

NOTE: The global mapping of forwarding classes to fabric fc-sets is independent of the mapping of forwarding classes to Node device fc-sets. Global mapping of forwarding classes to fabric fc-sets occurs only on the Interconnect device. The Node device mapping of forwarding classes to fc-sets does not affect the global mapping of forwarding classes to fabric fc-sets on the Interconnect device, and vice versa.

When you define new forwarding classes on a Node device, you explicitly map those forwarding classes to Node device fc-sets. However, new (user-created) forwarding classes are mapped by default to fabric fc-sets. (You can override the default mapping if you want to configure the forwarding class to fabric fc-set mapping explicitly, as described in the next section.)

By default:

- All best-effort traffic forwarding classes that you create are mapped to the **fabric_fcset_be** fabric fc-set.
- All lossless traffic forwarding classes that you create are mapped to the **fabric_fcset_noloss1** or **fabric_fcset_noloss2** fabric fc-set.

  NOTE: To avoid fate sharing, we recommend that you configure one-to-one mapping of user-configured lossless forwarding classes to lossless fabric fc-sets instead of using the default mapping. You can also use firewall filters to mitigate fate sharing by separating flows that belong to the same forwarding class as the traffic traverses the Interconnect device (see *Understanding How to Mitigate Fate Sharing on a QFabric System Interconnect Device by Remapping Traffic Flows (Forwarding Classes)* for more information.)

- All multidestination traffic forwarding classes that you create are mapped to the **fabric_fcset_multicast1** fabric fc-set.
- All **strict-high** priority traffic and **network-control** forwarding classes that you create are mapped to the **fabric_fcset_strict_high** fabric fc-set.

Fabric Forwarding Class Set Configuration and Implementation

IN THIS SECTION

You can map forwarding classes to fabric fc-sets and configure CoS scheduling for fabric fc-sets. This section describes:

Mapping Forwarding Classes to Fabric Forwarding Class Sets

If you do not want to use the default mapping of forwarding classes to fabric fc-sets, you can map forwarding classes to fabric fc-sets in the same way as you map forwarding classes to Node device fc-sets. To do this, use exactly the same statement that you use to map forwarding classes to fc-sets, but instead of specifying a Node device fc-set name, specify a fabric fc-set name.

> **NOTE:** The global mapping of forwarding classes to fabric fc-sets does not affect the mapping of forwarding classes to Node device fc-sets. The global forwarding class mapping to fabric fc-sets pertains to the traffic only when it enters, traverses, and exits the fabric. The forwarding class mapping to fc-sets on a Node device is valid within that Node device.
>
> Mapping forwarding classes to fabric fc-sets does not affect the scheduling configuration of the forwarding classes or fc-sets on Node devices. Fabric fc-set scheduling pertains to traffic only when it enters, traverses, and exits the Interconnect device fabric.
>
> If you change the mapping of a forwarding class to a fabric fc-set, the new mapping is global and applies to all traffic in that forwarding class, regardless of which Node device forwards the traffic to the Interconnect device.

- To assign one or more forwarding classes to a fabric fc-set:

  `[edit class-of-service]`
  `user@switch#` **set forwarding-class-sets *fabric-forwarding-class-set-name* class *forwarding-class-name***

  For example, to map a user-defined forwarding class named **best-effort-2** to the fabric fc-set **fabric_fcset_be**:

  `[edit class-of-service]`
  `user@switch#` **set forwarding-class-sets fabric_fcset_be class best-effort-2**

> **NOTE:** Because fabric fc-set configuration is global, in this example all forwarding classes with the name **best-effort-2** on all of the Node devices connected to the fabric use the **fabric_fcset_be** fabric fc-set to transport traffic across the fabric.

Fabric Forwarding Class Set Implementation

The following rules apply to fabric fc-sets:

- You cannot create new fabric fc-sets. Only the twelve default fabric fc-sets are available.
- You cannot delete a default fabric fc-set.
- You cannot attach a fabric fc-set to a Node device interface. Fabric fc-sets are used only on the Interconnect device fabric, not on Node devices.
- You can map only multidestination forwarding classes to multidestination fabric fc-sets.
- You cannot map multidestination forwarding classes to unicast fabric fc-sets.
- You cannot map unicast forwarding classes to multidestination fabric fc-sets.

QFabric System CoS

When traffic enters and exits the same QFabric system Node device, CoS works the same as it works on a standalone switch.

However, when traffic enters a QFabric system Node device, crosses the Interconnect device, and then exits a different Node device, CoS is applied differently:

1. Traffic entering the ingress Node device receives the CoS configured at the Node ingress (packet classification and congestion notification profile for PFC).

2. When traffic goes from the ingress Node device to the Interconnect device, the fabric fc-set CoS is applied to the traffic.

3. When traffic goes from the Interconnect device to the egress Node device, the egress Node device applies CoS at the egress port (egress queue scheduling, WRED, and IEEE 802.1p or DSCP code-point rewrite).

Traffic that traverses the Interconnect device can use the default CoS fabric scheduling or you can configure two-tier hierarchical CoS scheduling explicitly on fabric fc-sets as described in *Understanding CoS Scheduling Across the QFabric System*.

Support for Flow Control and Lossless Transport Across the Fabric

The Interconnect device incorporates flow control mechanisms to support lossless transport during periods of congestion on the fabric. To support the priority-based flow control (PFC) feature on the Node devices, the fabric interfaces use LLFC to support lossless transport for up to six IEEE 802.1p priorities when the following two configuration constraints are met:

1. The IEEE 802.1p priority used for the traffic that requires lossless transport is mapped to a lossless forwarding class on the Node devices.

2. The lossless forwarding class must be mapped to a lossless fabric fc-set on the Interconnect device (**fabric_fcset_noloss1**, **fabric_fcset_noloss2**, **fabric_fcset_noloss3**, **fabric_fcset_noloss4**, **fabric_fcset_noloss5**, or **fabric_fcset_noloss6**).

When traffic meets the two configuration constraints, the fabric propagates the back pressure from the egress Node device across the fabric to the ingress Node device during periods of congestion. However, to achieve end-to-end lossless transport across the switch, you must also configure a congestion notification profile to enable PFC on the Node device ingress ports.

For all other combinations of IEEE 802.1p priority to forwarding class mapping and all other combinations of forwarding class to fabric fc-set mapping, the congestion control mechanism is normal packet drop. For example:

- **Case 1**—If the IEEE 802.1p priority **5** is mapped to the lossless **fcoe** forwarding class, and the **fcoe** forwarding class is mapped to the **fabric_fcset_noloss1** fabric fc-set, then the congestion control mechanism is PFC.
- **Case 2**—If the IEEE 802.1p priority **5** is mapped to the lossless **fcoe** forwarding class, and the **fcoe** forwarding class is mapped to the **fabric_fcset_be** fabric fc-set, then the congestion control mechanism is packet drop.
- **Case 3**—If the IEEE 802.1p priority **5** is mapped to the lossless **no-loss** forwarding class, and the **no-loss** forwarding class is mapped to the **fabric_fcset_noloss2** fabric fc-set, then the congestion control mechanism is PFC.
- **Case 4**—If the IEEE 802.1p priority **5** is mapped to the lossless **no-loss** forwarding class, and the **no-loss** forwarding class is mapped to the **fabric_fcset_be** fabric fc-set, then the congestion control mechanism is packet drop.
- **Case 5**—If the IEEE 802.1p priority **5** is mapped to the **best-effort** forwarding class, and the **best-effort** forwarding class is mapped to the **fabric_fcset_be** fabric fc-set, then the congestion control mechanism is packet drop.
- **Case 6**—If the IEEE 802.1p priority **5** is mapped to the **best-effort** forwarding class, and the **best-effort** forwarding class is mapped to the **fabric_fcset_noloss1** fabric fc-set, then the congestion control mechanism is packet drop.

NOTE: Lossless transport across the fabric also must meet the following two conditions:

1. The maximum cable length between the Node device and the Interconnect device is a 150 meters of fiber cable.

2. The maximum frame size is 9216 bytes.

If the MTU is 9216 KB, in some cases the QFabric system supports only five lossless forwarding classes instead of six lossless forwarding classes because of headroom buffer limitations.

The number of IEEE 802.1p priorities (forwarding classes) the QFabric system can support for lossless transport across the Interconnect device fabric depends on several factors:

- Approximate fiber cable length—The longer the fiber cable that connects Node device fabric (FTE) ports to the Interconnect device fabric ports, the more data the connected ports need to buffer when a pause is asserted. (The longer the fiber cable, the more frames are traversing the cable when a pause is asserted. Each port must be able to store all of the “in transit” frames in the buffer to preserve lossless behavior and avoid dropping frames.)
- MTU size—The larger the maximum frame sizes the buffer must hold, the fewer frames the buffer can hold. The larger the MTU size, the more buffer space each frame consumes.
- Total number of Node device fabric ports connected to the Interconnect device—The higher the number of connected fabric ports, the more headroom buffer space the Node device needs on those fabric ports to support the lossless flows that traverse the Interconnect device. Because more buffer space is used on the Node device fabric ports, less buffer space is available for the Node device access ports, and a lower total number of lossless flows are supported.

The QFabric system supports six lossless priorities (forwarding classes) under most conditions. The priority group headroom that remains after allocating headroom to lossless flows is sufficient to support best-effort and multidestination traffic.

Table 18 on page 100 shows how many lossless priorities the QFabric system supports under different conditions (fiber cable lengths and MTUs) in cases when the QFabric system supports fewer than six lossless priorities. The number of lossless priorities is the same regardless of how many Node device FTE ports are connected to the Interconnect device. However, the higher the number of FTE ports connected to the Interconnect device, the lower the number of total lossless flows supported. In all cases that are not shown in Table 18 on page 100, the QFabric system supports six lossless priorities.

NOTE: The system does not perform a configuration commit check that compares available system resources with the number of lossless forwarding classes configured. If you commit a configuration with more lossless forwarding classes than the system resources can support, frames in lossless forwarding classes might be dropped.

Table 18: Lossless Priority (Forwarding Class) Support for Node Devices When Fewer than Six Lossless Priorities Are Supported

MTU in Bytes	Fiber Cable Length in Meters (Approximate)	Maximum Number of Lossless Priorities (Forwarding Classes) on the Node Device
9216 (9K)	100	5
9216 (9K)	150	5

NOTE: The total number of lossless flows decreases as resource consumption increases. For a Node device, the higher the number of FTE ports connected to the Interconnect device, the larger the MTU, and the longer the fiber cable length, the fewer total lossless flows the QFabric system can support.

Viewing Fabric Forwarding Class Set Information

You can display information about fabric fc-sets using the same CLI command you use to display information about Node device fc-sets:

`user@switch>` **show class-of-service forwarding-class-set**

```
Forwarding class set: fabric_fcset_be, Type: fabric-type, Forwarding class set
index: 1
  Forwarding class                              Index
  best-effort                                     0

Forwarding class set: fabric_fcset_mcast1, Type: fabric-type, Forwarding class set
 index: 5
  Forwarding class                              Index
  mcast                                           8

Forwarding class set: fabric_fcset_mcast2, Type: fabric-type, Forwarding class set
```

```
 index: 6

Forwarding class set: fabric_fcset_mcast3, Type: fabric-type, Forwarding class set
 index: 7

Forwarding class set: fabric_fcset_mcast4, Type: fabric-type, Forwarding class set
 index: 8

Forwarding class set: fabric_fcset_noloss1, Type: fabric-type, Forwarding class
set index: 2
  Forwarding class                       Index
  fcoe                                     1

Forwarding class set: fabric_fcset_noloss2, Type: fabric-type, Forwarding class
set index: 3
  Forwarding class                       Index
  no-loss                                  2

Forwarding class set: fabric_fcset_noloss3, Type: fabric-type, Forwarding class
set index: 9

Forwarding class set: fabric_fcset_noloss4, Type: fabric-type, Forwarding class
set index: 10

Forwarding class set: fabric_fcset_noloss5, Type: fabric-type, Forwarding class
set index: 11

Forwarding class set: fabric_fcset_noloss6, Type: fabric-type, Forwarding class
set index: 12

Forwarding class set: fabric_fcset_strict_high, Type: fabric-type, Forwarding class
 set index: 4
  Forwarding class                       Index
  network-control                          3
```

Table 19 on page 101 describes the meaning of the **show class-of-service forwarding-class-set** output fields when you display fabric fc-set information.

Table 19: show class-of-service forwarding-class-set Command Output Fields

Field Name	Field Description
Forwarding class set	Name of the fabric forwarding class set.

Table 19: show class-of-service forwarding-class-set Command Output Fields *(continued)*

Field Name	Field Description
Type	Type of forwarding class set: • Fabric-type—Fabric fc-set • Normal-type—Node device fc-set
Forwarding class set index	Index of this forwarding class set.
Forwarding class	Name of a forwarding class.
Index	Index of the forwarding class.

Summary of Fabric Forwarding Class Set and Node Device Forwarding Class Set Differences

Table 20 on page 102 summarizes the differences between fabric fc-sets and fc-sets:

Table 20: Summary of Differences Between Fabric fc-sets and Local fc-sets

Characteristic	Fabric fc-set	Local fc-set
Location	QFX3008-I or QFX3600-I Interconnect device (the fabric).	QFabric Node device.
Global or local	Global, valid for the entire fabric.	Local to the Node device on which the fc-set is configured.
Ability to create (define) a new fc-set	No. Use the 12 default fabric fc-sets provided.	Yes.
Ability to configure CoS	User-configurable using fabric fc-set scheduler maps.	User-configurable using traffic control profiles.
Ability to map forwarding classes to an fc-set	Yes. Mapping is global and applies to all forwarding classes across the Interconnect device fabric (traffic from all connected Node devices).	Yes. Mapping is local to a Node device and applies only to the forwarding classes on the Node device.

RELATED DOCUMENTATION

Understanding CoS Forwarding Class Sets (Priority Groups)

Understanding CoS Scheduling Across the QFabric System

Understanding CoS Scheduling on QFabric System Node Device Fabric (fte) Ports

Understanding Default CoS Scheduling on QFabric System Interconnect Devices (Junos OS Release 13.1 and Later Releases)

Understanding How to Mitigate Fate Sharing on a QFabric System Interconnect Device by Remapping Traffic Flows (Forwarding Classes)

Defining CoS Forwarding Class Sets

Example: Configuring Forwarding Class Sets

Example: Configuring CoS Scheduling Across the QFabric System

show class-of-service forwarding-class-set

2

PART

Installation

CHAPTER 5

Before You Begin

IN THIS CHAPTER

QFX3000-G QFabric System Installation Overview

A QFX3000-G QFabric system is formed by interconnecting QFX3500, QFX3600, and QFX5100 Node devices, QFX3008-I Interconnect devices, and QFX3100 Director devices. Two Virtual Chassis, composed of four EX4200 switches each, are used to interconnect the control plane and management network. For more information about the role of each device in the QFX3000-G QFabric system see "Understanding QFX3000-G QFabric System Hardware Configurations" on page 107.

Before you begin to install the QFX3000-G QFabric system:

- Read *General Safety Guidelines and Warnings*, with particular attention to *Chassis Lifting Guidelines for a QFX3008-I Interconnect Device*.
- Review "Planning a QFX3000-G QFabric System Deployment" on page 109 and the topics it references. The installation should not begin until you have completed the site preparation checklists for each device type:
  - *Site Preparation Checklist for a QFX3100 Director Device*
  - *Site Preparation Checklist for a QFX3008-I Interconnect Device*

- *Site Preparation Checklist for a QFX5100 Device*
- *Site Preparation Checklist for a QFX3600 or QFX3600-I Device*
- *Site Preparation Checklist for a QFX3500 Device*
- *Site Preparation Checklist for EX4200 Switches*

To install a QFX3000-G QFabric system:

1. Install all the devices in their permanent location, connect the devices to earth ground, and connect power to the devices. See:
   - Installing and Connecting a QFX3100 Director Device on page 153
   - Installing and Connecting a QFX3008-I Interconnect Device on page 165
   - Installing and Connecting a QFX5100 Device on page 207
   - Installing and Connecting a QFX3600 or QFX3600-I Device on page 226
   - Installing and Connecting a QFX3500 Device on page 247
   - *Installing and Connecting an EX4200 Switch*
2. Ensure that each Node device is set to Node device mode. By default, the devices work as standalone switches. You perform this step using the console (**CON**) port on each Node device. Leave the Node devices powered on. See "Converting the Device Mode for a QFabric System Component" on page 326.
3. Cable two Virtual Chassis of four EX4200 switches each. See *Understanding Virtual Chassis Hardware Configuration on an EX4200 Switch* and *Virtual Chassis Cabling Configuration Examples for EX4200 Switches*.
4. Interconnect the two Virtual Chassis using the 10-Gigabit Ethernet SFP+ uplink ports. These ports will later be configured in a LAG. See "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
5. Interconnect the two QFX3100 Director devices for control plane redundancy. See "Connecting QFX3100 Director Devices in a Director Group" on page 269.
6. Connect each QFX Series device to each Virtual Chassis for control plane interconnection. See:
   - Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network on page 272
   - Connecting a QFX3008-I Interconnect Device to a Copper-Based QFX3000-G QFabric System Control Plane Network on page 276
   - Connecting a QFX5100 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network on page 285

- Connecting a QFX3600 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network on page 280
- Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network on page 283

7. Connect each Node device to each QFX3008-I Interconnect Device for data plane interconnection. See:

   - Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device on page 318
   - Connecting a QFX3600 Node Device to a QFX3008-I Interconnect Device on page 316
   - Connecting a QFX5100 Node Device to a QFX3008-I Interconnect Device on page 320

8. Configure each Virtual Chassis using the recommended configuration described in "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333. Leave the Virtual Chassis powered on.

9. Power on each QFX3008-I Interconnect device. See "Powering On a QFX3008-I Interconnect Device" on page 205.

10. Power on the QFX3100 Director devices and complete the initial configuration for the QFX3000-G QFabric system described in "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

RELATED DOCUMENTATION

QFabric System Initial and Default Configuration Information | 323

Understanding QFX3000-G QFabric System Hardware Configurations

The QFX3000-G QFabric system is made up of multiple hardware components:

- EX4200 switches—Eight EX4200 switches are required for a QFX3000-G QFabric system. The EX4200 switches are divided into two Virtual Chassis configurations with four switches each.
  - Up to 192 Gigabit Ethernet RJ-45 ports on each Virtual Chassis provide control plane and management network interconnection.

- Four 10-Gigabit Ethernet uplink ports on each Virtual Chassis interconnect the two Virtual Chassis configurations.

- QFX3100 Director devices—Two QFX3100 Director devices are required for a QFX3000-G QFabric system. Together, the two Director devices are called a *Director group*.
  - Six Gigabit Ethernet RJ-45 or six small-form factor pluggable (SFP) ports on each QFX3100 Director device provide connection to the control plane and management network through the Virtual Chassis.
  - Two Gigabit Ethernet RJ-45 or two SFP ports on each QFX3100 Director device interconnect two Director devices in a Director group.
  - One Gigabit Ethernet RJ-45 management port on each QFX3100 Director device provides connection to the management network through your out-of-band management network.

- QFX3500 , QFX3600, and QFX5100-48S, QFX5100-48T, and QFX5100-24Q Node devices—Up to 128 Node devices can be connected to the QFX3000-G QFabric system.
  - **NOTE:** Up to eight Node devices can be configured as a *network Node group* to connect to external networks. See “Understanding Node Groups” on page 36.
  - Four 40-Gbps quad small form-factor pluggable plus (QSFP+) uplink ports on each QFX3500 or QFX5100 Node device connect to the data plane network through the QFX3008-I Interconnect devices. Models QFX5100-48S, QFX5100-48T, and QFX5100-24Q are supported as a QFX5100 Node device.
  - Two to eight 40-Gbps QSFP+ uplink ports on each QFX3600 or QFX5100 Node device connect to the data plane network through the QFX3008-I Interconnect devices.

    NOTE: On QFX3600 the four QSFP+ ports (**Q0** through **Q3** are configured as uplink ports by default.

  - Two Gigabit Ethernet RJ-45 or two SFP ports on each Node device provide connection to the control plane and management network through the Virtual Chassis.

NOTE: All models of the QFX5100 have at least one RJ-45 port **C0** and an SFP cage (**C1**). Some QFX5100 SKUs have an additional SFP cage. The SFP cages can be configured for either 1 GbE copper or fiber SFP transceivers. For details on the number of management ports on QFX5100 SKUs, see *QFX5100 Device Models*.

- QFX3008-I Interconnect devices—Two QFX3008-I Interconnect devices are required for a QFX3000-G QFabric system. Up to four QFX3008-I Interconnect devices can be used in a QFX3000-G QFabric sysem.
  - Up to 128 40-Gbps QSFP+ ports on each QFX3008-I Interconnect device connect the QFX3500 and QFX3600 Node devices to the data plane network across fiber-optic cables and a high-speed backplane.
  - Up to eight Gigabit Ethernet SFP+ interfaces (four per Control Board) connect each QFX3008-I Interconnect device to the control plane and management network through the Virtual Chassis.

RELATED DOCUMENTATION

QFX3000-G QFabric System Installation Overview | 105

Planning a QFX3000-G QFabric System Deployment

A QFX3000-G QFabric system is formed by interconnecting QFX3500, QFX3600, or QFX5100 Node devices, QFX3008-I Interconnect devices, and QFX3100 Director devices. Two Virtual Chassis, composed of four EX4200 or four EX4300 switches each, are used to interconnect the control plane and management network.

NOTE: The EX4200 and EX4300 Virtual Chassis may not be intermixed in the same QFabric system.

Before installing a QFabric system, you must consider the following factors:

- The number of devices in the QFabric system and their location.
  - You must have two QFX3100 Director devices operating in a Director group.
  - You can have up to four QFX3008-I Interconnect devices.
  - You can interconnect up to 128 QFX Series Switches as Node devices. Supported models are:

- QFX5100-24Q
- QFX5100-48S
- QFX5100-48T
- QFX3600
- QFX3500

- The number of Node devices you require depends on the following factors:
  - The number of access ports you need for connections to either endpoint systems (such as servers and storage devices) or external networks.
  - The oversubscription ratio you need on the access ports.
  - The number of access ports supported on each Node device based on that oversubscription ratio.
  - The number of connections from a Node device to an interconnect device.

Table 21 on page 110 shows the number of 10-Gigabit Ethernet access ports supported on Node devices based on the oversubscription ratio you need on the access ports.

Table 21: Number of 10-Gigabit Ethernet Access Ports Supported on Node Devices Based on Oversubscription Ratio

Oversubscription Ratio on Access Ports	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX3500 Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX3600 Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX5100-24Q Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX5100-48S and QFX5100-48T Node Device
1:1 (no oversubscription)	1:1 oversubscription is not supported	32	64	1:1 oversubscription is not supported
2:1	N/A	N/A	64	NA
3:1	48	48	80 ports with 2 QFX-EM-4Q expansion modules	3:1 oversubscription not supported
3.5:1	3.5:1 oversubscription is not supported	3.5:1 oversubscription is not supported	3.5:1 oversubscription not supported	56

Table 21: Number of 10-Gigabit Ethernet Access Ports Supported on Node Devices Based on Oversubscription Ratio *(continued)*

Oversubscription Ratio on Access Ports	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX3500 Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX3600 Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX5100-24Q Node Device	Number of 10-Gigabit Ethernet Access Ports Supported on a QFX5100-48S and QFX5100-48T Node Device
4:1	N/A	N/A	64	N/A
6:1	48	56	96 ports with 2 QFX-EM-4Q expansion modules using 4 uplinks to the Interconnect device	6:1 oversubscription not supported

To calculate the required number of Node devices (N_n) for your QFabric system, divide the number of access ports you need for connections to either endpoint systems or external networks (N_p) by the number of access ports supported on each Node device (N_a) based on the required oversubscription ratio, and round up the resulting value. For example, if you need 300 10-Gigabit Ethernet access ports at 3:1 oversubscription, and your Node device supports 48 10-Gigabit Ethernet access ports at 3:1 oversubscription, you require 7 Node devices as shown below:

$N_n = N_p/N_a$

$N_n = 300/48$

$N_n = 6.25$ (rounded up to 7)

The number of Interconnect devices you require depends on the number of Node devices and the oversubscription ratio required on the access ports of the Node devices. See Table 22 on page 112 to determine the number of Interconnect devices you require. For example, if you plan to install 60 Node devices and require 3:1 oversubscription ratio on the Node devices, you must install 2 Interconnect devices.

Table 22: Maximum Number of Node Devices Supported Based on Oversubscription Ratio and Number of Interconnect Devices

Oversubscription Ratio	QFX Series Node Devices	Number of QFX3008-I Interconnect Devices	Maximum Number of Node Devices
1:1	QFX3600	2	32
		4	64
2:1	QFX5100-24Q	2	32
		4	64
3:1	• QFX3500 • QFX3600	2	64
		4	128
3.5:1	QFX5100-48S or QFX5100-48T	2	64
4:1	QFX5100-24Q	4	128 with 2 QFX-EM-4Q
		4	64
6:1	• QFX3600 • QFX3500 • QFX5100-24Q with 2 QFX-EM-4Q	• 2 • 2 • 2	• 128 • 128 • 64

For information about the size and strength of racks for the devices, see the following topics:

- *Rack Requirements for a QFX3100 Director Device*
- *Rack Requirements for a QFX3008-I Interconnect Device*
- *Rack Requirements for a QFX5100 Device*
- *Rack Requirements for a QFX3600 or QFX3600-I Device*
- *Rack Requirements for a QFX3500 Device*
- *Rack Requirements for EX4200 Switches*

For the dimensions and weights of the devices, see the following topics:

- *Chassis Physical Specifications for a QFX3100 Director Device*
- *Chassis Physical Specifications for a QFX3008-I Interconnect Device*

- *Chassis Physical Specifications for a QFX5100 Device*
- *Chassis Physical Specifications for QFX3600 and QFX3600-I Devices*
- *Chassis Physical Specifications for a QFX3500 Chassis*
- *Chassis Physical Specifications for EX4200 Switches*

- Cabling requirements for the control plane and management network—The control plane and management network are interconnected using standard 1000BASE-T Ethernet over copper wiring. Each network segment can be a maximum length of 100 m (328 ft). See "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124.
- Cabling requirements for the data plane—The data plane is interconnected using standard 40GBASE-SR Ethernet QSFP+ optical transceivers over fiber-optic wiring. If you use OM3 optical fiber, each network segment can be a maximum of 100 m (328 ft). If you use OM4 optical fiber, each network segment can be a maximum of 150 m (492 ft). However, keep in mind that each network segment in the control plane and management network is limited to a maximum length of 100 m (328 ft). See "Determining Transceiver Support for QFabric Systems" on page 123.

  The data plane cabling requirements depend on the number of connections required from each Node device to Interconnect devices based on the oversubscription ratio you need on the access ports of the Node device. Table 23 on page 113 shows the number of connections required from each Node device to Interconnect devices based on the oversubscription ratio you need on the Node device.

Table 23: Number of Connections Required Between Node and Interconnect Devices Based on Oversubscription Ratio

Oversubscription Ratio	QFX Series Switch Model	Number of Connections from Each Node Device to Interconnect Devices
1:1	QFX3600	8
	QFX5100-24Q	16
3:1	• QFX3600 • QFX3500	4
3.5:1	• QFX5100-48S • QFX5100-48T	4
6:1	• QFX3600 • QFX3500	2
	QFX5100-24Q with 2 QFX-EM-4Q	4

- Power supply—You must plan the installation site to meet the power requirements of all the devices in the QFX3000-G QFabric system. For information on power requirements and configuration options for each device, see the following topics:
  - AC Power Specifications for a QFX3100 Director Device on page 126
  - AC Power Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays on page 129
  - AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays on page 129
  - AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays on page 130
  - AC Power Specifications for a QFX3600 or QFX3600-I Device on page 136
  - AC Power Specifications for a QFX3500 Device on page 137
  - AC Power Specifications for a QFX5100 Device on page 137
  - Power Specifications for EX4200 Switches on page 146
- For more information about the site preparation requirements for each device, see the following topics:
  - *Site Preparation Checklist for a QFX3100 Director Device*
  - *Site Preparation Checklist for a QFX3008-I Interconnect Device*
  - *Site Preparation Checklist for a QFX3600 or QFX3600-I Device*
  - *Site Preparation Checklist for a QFX3500 Device*
  - *Site Preparation Checklist for a QFX5100 Device*
  - *Site Preparation Checklist for EX4200 Switches*

RELATED DOCUMENTATION

QFX3000-G QFabric System Installation Overview | **105**

Understanding QFX3000-G QFabric System Hardware Configurations | **107**

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3100 Director Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3008-I Interconnect Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Clearance Requirements for Airflow and Hardware Maintenance for EX4200 Switches

General Site Guidelines

Efficient device operation requires proper site planning and maintenance and proper layout of the equipment, rack or cabinet (if used), and wiring closet.

To plan and create an acceptable operating environment for your device and prevent environmentally caused equipment failures:

- Keep the area around the chassis free from dust and conductive material, such as metal flakes.
- Follow prescribed airflow guidelines to ensure that the cooling system functions properly and that exhaust from other equipment does not blow into the intake vents of the device.
- Follow the prescribed electrostatic discharge (ESD) prevention procedures to prevent damaging the equipment. Static discharge can cause components to fail completely or intermittently over time.
- Install the device in a secure area, so that only authorized personnel can access the device.

Site Electrical Wiring Guidelines

Table 24 on page 115 describes the factors you must consider while planning the electrical wiring at your site.

> **WARNING:** You must provide a properly grounded and shielded environment and use electrical surge-suppression devices.

Table 24: Site Electrical Wiring Guidelines

Site Wiring Factor	Guidelines
Signaling limitations	If your site experiences any of the following problems, consult experts in electrical surge suppression and shielding: • Improperly installed wires cause radio frequency interference (RFI). • Damage from lightning strikes occurs when wires exceed recommended distances or pass between buildings. • Electromagnetic pulses (EMPs) caused by lightning damage unshielded conductors and electronic devices.

Table 24: Site Electrical Wiring Guidelines *(continued)*

Site Wiring Factor	Guidelines
Radio frequency interference	To reduce or eliminate RFI from your site wiring, do the following: • Use a twisted-pair cable with a good distribution of grounding conductors. • If you must exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal when applicable.
Electromagnetic compatibility	If your site is susceptible to problems with electromagnetic compatibility (EMC), particularly from lightning or radio transmitters, seek expert advice. Some of the problems caused by strong sources of electromagnetic interference (EMI) are: • Destruction of the signal drivers and receivers in the device • Electrical hazards as a result of power surges conducted over the lines into the equipment

Environmental Requirements and Specifications for a QFX3100 Director Device

The device must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.
- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

Table 25 on page 116 provides the required environmental conditions for normal device operation.

Table 25: QFX3100 Director Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing

Table 25: QFX3100 Director Device Environmental Tolerances *(continued)*

Description	Tolerance
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) • Short-term operation ensured in temperature range of 23° F through 131° F (–5° C through 55° C) **NOTE:** As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)

NOTE: Install QFX Series devices only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3100 Director Device

Installing and Connecting a QFX3100 Director Device | 153

Environmental Requirements and Specifications for a QFX3008-I Interconnect Device

The QFX3008-I Interconnect device chassis must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.
- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

Table 26 on page 118 provides the required environmental conditions for normal device operation.

Table 26: QFX3008-I Interconnect Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) • Short-term operation ensured in temperature range of 23° F through 122° F (–5° C through 50° C) **NOTE:** As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3008-I Interconnect Device

Installing and Connecting a QFX3008-I Interconnect Device | 165

Environmental Requirements and Specifications for a QFX3500 Device

The device must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.

- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

Table 27 on page 119 provides the required environmental conditions for normal device operation.

Table 27: QFX3500 Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) • Short-term operation ensured in temperature range of 23° F through 131° F (–5° C through 55° C) **NOTE:** As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Installing and Connecting a QFX3500 Device | **247**

Environmental Requirements and Specifications for QFX3600 and QFX3600-I Devices

The QFX3600 and QFX3600-I devices must be installed in a rack or cabinet housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the device cooling system.
- Maintain ambient airflow for normal device operation. If the airflow is blocked or restricted, or if the intake air is too warm, the device might overheat, leading to the device temperature monitor shutting down the device to protect the hardware components.

Table 28 on page 120 provides the required environmental conditions for normal device operation.

Table 28: QFX3600 and QFX3600-I Device Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 10,000 feet (3048 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 85%, noncondensing
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) • Short-term operation ensured in temperature range of 23° F through 131° F (–5° C through 55° C) **NOTE:** As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

Installing and Connecting a QFX3600 or QFX3600-I Device | 226

Environmental Requirements and Specifications for a QFX5100 Device

The switch must be installed in a rack or cabinet. It must be housed in a dry, clean, well-ventilated, and temperature-controlled environment.

Follow these environmental guidelines:

- The site must be as dust-free as possible, because dust can clog air intake vents and filters, reducing the efficiency of the switch cooling system.
- Maintain ambient airflow for normal switch operation. If the airflow is blocked or restricted, or if the intake air is too warm, the switch might overheat, leading to the switch temperature monitor shutting down the device to protect the hardware components.

Table 29 on page 121 provides the required environmental conditions for normal switch operation.

Table 29: QFX5100 Switch Environmental Tolerances

Description	Tolerance
Altitude	No performance degradation to 6,562 feet (2000 meters)
Relative humidity	Normal operation ensured in relative humidity range of 5% through 90%, noncondensing • Short-term operation ensured in relative humidity range of 5% through 93%, noncondensing **NOTE:** As defined in NEBS GR-63-CORE, Issue 3, short-term events can be up to 96 hours in duration but not more than 15 days per year.
Temperature	• Normal operation ensured in temperature range of 32° F through 104° F (0° C through 40° C) **NOTE:** Customers with QFX5100-48T switches should ensure the room temperature does not exceed a 2° C increase or decrease per minute. • Nonoperating storage temperature in shipping container: –40° F through 158° F (–40° C through 70° C)
Seismic	Designed to comply with Zone 4 earthquake requirements per NEBS GR-63-CORE, Issue 3.

NOTE: Install QFX Series devices only in restricted areas, such as dedicated equipment rooms and equipment closets, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.

RELATED DOCUMENTATION

Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device

Installing and Connecting a QFX5100 Device | **207**

CHAPTER 6

Ports and Connectors

IN THIS CHAPTER

Determining Transceiver Support for QFabric Systems

You can find information about the optical transceivers supported on your Juniper device by using the Hardware Compatibility Tool. In addition to transceiver and connection type, the optical and cable characteristics–where applicable–are documented for each transceiver. The Hardware Compatibility Tool enables you to search by product, displaying all the transceivers supported on that device, or category, by interface speed or type. The list of supported transceivers for QFabric Systems is located at https://pathfinder.juniper.net/hct/product/.

CAUTION: If you face a problem running a Juniper Networks device that uses a third-party optic or cable, the Juniper Networks Technical Assistance Center (JTAC) can help you diagnose the source of the problem. Your JTAC engineer might recommend that you check the third-party optic or cable and potentially replace it with an equivalent Juniper Networks optic or cable that is qualified for the device.

RELATED DOCUMENTATION

Front Panel of a QFX3100 Director Device

Rear Cards in a QFX3008-I Interconnect Device

Port Panel of QFX5100-48S and QFX5100-48SH Devices

Port Panel of QFX5100-48T and QFX5100-48TH Devices

Port Panel of a QFX5100-24Q Device

Front Panel of a QFX3600 Device

Front Panel of a QFX3500 Device

Cable Specifications for Copper-Based Control Plane Connections for the QFabric System

QFX Series devices support using RJ-45 patch cables to interconnect the copper-based QFabric system control plane. The RJ-45 patch cables connect to 1000BASE-T ports on the network modules in the QFX3100 Director device and the management ports in the QFX3500 Node device, QFX3600 Node device, and QFX3600-I Interconnect device.

QFX5100 Node devices and the QFX5100-24Q Interconnect devices connect using a 1000BASE-T port **C1** and a 1000BASE-T SFP module (Juniper model number QFX-SFP-1GE-T) installed in the the SFP management Ethernet cage **C0**. Some QFX5100 SKUs have an additional SFP management port (second **C0**).

In the QFX3008-I Interconnect device Control Board, the RJ-45 patch cables are used with 1000BASE-T SFP modules (Juniper model number QFX-SFP-1GE-T) installed in the SFP+ ports.

NOTE: For information about the QFX-SFP-1GE-T SFP module, see the Hardware Compatibility Tool.

Table 30 on page 124 lists the specifications for the cables that connect the QFabric system control plane.

Table 30: Cable Specifications for Copper-Based Control Plane Connections for the QFabric System

Port on QFX Series Device	Cable Specification	Maximum Length	Device Receptacle
• QFX3100 Director device network module ports • QFX3008-I Interconnect device Control Board management ports (with 1000BASE-T SFP module) • QFX3600-I Interconnect device management (**C0** and **C1**) ports • QFX5100 Interconnect device management **C0** and **C1** (with 1000BASE-T SFP module) • QFX3600 Node device management (**C0** and **C1**) ports • QFX3500 Node device management (**C0** and **C1**) ports • QFX5100 Node device management **C0** and **C1** (with 1000BASE-T SFP module)	Category 5 cable or equivalent suitable for 1000BASE-T operation with RJ-45 connectors	328 feet (100 meters)	RJ-45

RELATED DOCUMENTATION

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | 272

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX3600-I Interconnect Device to a Copper-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | 283

Connecting a QFX3600 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | 280

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX3600 Node Device to a Copper-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX5100 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | 285

Connecting a QFX5100 Node Device to a QFX3600-I Interconnect Device

CHAPTER 7

Power

IN THIS CHAPTER

AC Power Specifications for a QFX3100 Director Device

Table 31 on page 127 describes the AC power specifications for a QFX3100 Director device.

Table 31: AC Power Specifications for a QFX3100 Director Device

Item	Specifications
AC input voltage	Operating range: 100–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• 5 A at 100 VAC • 2 A at 240 VAC
Typical power consumption	476 W
Maximum power consumption	220 W

RELATED DOCUMENTATION

AC Power Supply in a QFX3100 Director Device
AC Power Cord Specifications for a QFX3100 Director Device | 127

AC Power Cord Specifications for a QFX3100 Director Device

Detachable AC power cords are supplied with the QFX3100 Director device. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

CAUTION: The supplied AC power cord for the switches is intended for use with the QFX3100 Director device only and not for any other use.

NOTE: In North America, AC power cords must not exceed 4.5 meters (approximately 14.75 feet) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the QFX3100 Director device are in compliance.

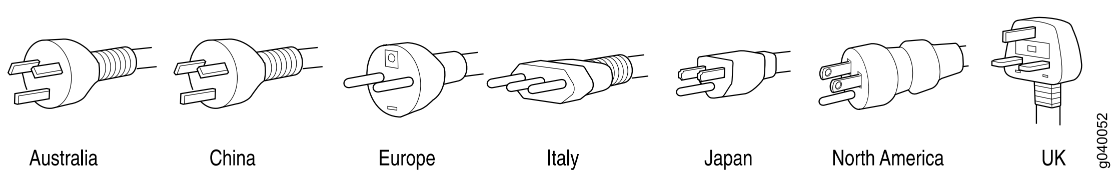
Table 32 on page 128 lists AC power cord specifications provided for each country or region.

Table 32: AC Power Cord Specifications for a QFX3100 Director Device

Country or Region	Electrical Specifications	Plug Standards
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3112-1993
China	250 VAC, 10 A, 50 Hz	GB2099.1 1996 and GB1002 1996 (CH1-10P)
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS 8303
Korea	250 VAC, 10A, 50 Hz	CEE 7/4
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15
Switzerland	250 VAC, 10A, 50 Hz	SEV 1011 SEV 6534/2
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363A

Figure 16 on page 128 illustrates the plug on the power cord for some of the countries or regions listed in Table 32 on page 128.

Figure 16: AC Plug Types



RELATED DOCUMENTATION

AC Power Supply in a QFX3100 Director Device

General Safety Guidelines and Warnings

General Electrical Safety Guidelines and Warnings

Prevention of Electrostatic Discharge Damage

AC Power Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays

Table 33 on page 129 lists the AC power system specifications for a QFX3008-I Interconnect device using single-phase wiring trays.

Table 33: AC Power Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays

Item	Specifications
AC input voltage	200–240 VAC
AC input line frequency	50–60 Hz
AC system current rating	16 A per appliance inlet (48 A per wiring tray)
AC system input power	9000 W (3000 W per power supply)

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device

AC Power Supply LEDs on a QFX3008-I Interconnect Device

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays | 131

AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays

Table 34 on page 129 lists the AC power system specifications for a QFX3008-I Interconnect device using three-phase delta wiring trays.

Table 34: AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays

Item	Specifications
AC input voltage	200–240 VAC
AC input line frequency	50–60 Hz

Table 34: AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays *(continued)*

Item	Specifications
AC system current rating	40 A
AC system input power	13,333 W

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device

AC Power Supply LEDs on a QFX3008-I Interconnect Device

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays | **133**

AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays

Table 35 on page 130 lists the AC power system specifications for a QFX3008-I Interconnect device using three-phase wye wiring trays.

Table 35: AC Power Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays

Item	Specifications
AC input voltage	380 VAC
AC input line frequency	50–60 Hz
AC system current rating	24 A
AC system input power	13,333 W

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device

AC Power Supply LEDs on a QFX3008-I Interconnect Device

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays | 134

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays

Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the device. AC power cords connect each wiring tray to the power distribution panel.

Three detachable AC power cords, each 2.5 m (approximately 8 ft) long, are required for each single-phase wiring tray. Depending on your configuration, these power cords are supplied with your device. The appliance coupler at the female end of the cord inserts into one of the three appliance inlets on the faceplate of the single-phase wiring tray. The coupler is type C19 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source receptacle that is standard for your geographical location.

WARNING: The QFX3008-I Interconnect device is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

WARNING: The AC power cord for the device is intended for use with the device only and not for any other use.

WARNING: Translation from Japanese: The attached power cable is only for this product. Do not use the cable for another product.

注意

附属の電源コードセットはこの製品専用です。
他の電気機器には使用しないでください。

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CAUTION: Power cords and cables must not block access to device components or drape where people could trip on them.

NOTE: In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the router are in compliance.

Table 36 on page 132 provides specifications for the AC power cord provided for each region supported.

Table 36: AC Power Cord Specifications for a Single-Phase Wiring Tray

Country/Region	Electrical Specifications	Plug Standards
Australia	250 VAC, 15 A, 50 Hz	AS/NZS 3112 Type SAA/3/15
China	250 VAC, 16 A, 50 Hz	GB 1002 Type PRC/3/16
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 16 A, 50 Hz	CEE (7) VII Type VIIG
Italy	250 VAC, 16 A, 50 Hz	CEI 23-16 Type I/3/16
Japan	250 VAC, 16 A, 50 Hz	NEMA 6-20 Type N6/20
		NEMA L6-20 Type NEMA Locking
	125VAC, 15A, 50 Hz	NEMA 5-20 Type N5/20
North America	250 VAC, 16 A, 50 Hz	NEMA 6-20 Type N6/20
		NEMA L6-20 Type NEMA Locking
	125 VAC, 20 A, 50 Hz	NEMA 5-20 Type N5/20
South Korea	250 VAC, 16 A, 50 Hz	CEE(7) VII Type VIIG
Switzerland	250 VAC, 16 A, 50 Hz	SEV 5934-2 Type 23G
United Kingdom	250 VAC, 13 A, 50 Hz	BS 1363/A Type BS89/13

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device

General Electrical Safety Guidelines and Warnings

AC Power Electrical Safety Guidelines

AC Power Disconnection Warning

Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays | 188

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays

Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the device. An AC power cord connects each wiring tray to the power distribution panel.

WARNING: The QFX3008-I Interconnect device is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

CAUTION: Power cords and cables must not block access to device components or drape where people could trip on them.

Each three-phase AC wiring tray has a metal wiring compartment that contains the AC terminal block and ground. There are two types of three-phase wiring trays: *delta* (three-wire) and *wye* (four-wire). The *delta* AC terminal block consists of three input terminals labeled **L1**, **L2**, and **L3**, from top to bottom in the common three-phase naming convention.

You must provide cords appropriate for your geographical location. The AC power cord wires insert into the AC terminal block on the wiring tray.

The power cords you provide must comply with the specifications listed in Table 37 on page 134.

> **NOTE:** In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3).

Table 37: Three-Phase Delta AC Power Cord Specifications

Electrical Rating	Plug Type	Plug Color	Cord or Cable Type
250 VAC, 60 A	International Electrotechnical Commission (IEC) 60309	Blue	The cord or cable must be HAR compliant, IEC 60245 (designation 60245 IEC 53) or IEC 60227 (designation 60227 IEC 53); or meet one of the following standards (North America): SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO, SP-2, SPE-2, SPT-2, NISP-2, NISPE-2, NISPT-2, SP-3, SPE-3, SPT-3, SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, S, SE, SO, SOO, ST, STO, STOO

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device
Wiring Tray in a QFX3008-I Interconnect Device
AC Power Electrical Safety Guidelines
AC Power Disconnection Warning
General Electrical Safety Guidelines and Warnings
Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays | 196

AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays

Most sites distribute power through a main conduit that leads to frame-mounted power distribution panels, one of which can be located at the top of the rack that houses the device. An AC power cord connects each wiring tray to the power distribution panel.

WARNING: The QFX3008-I Interconnect device is pluggable type A equipment installed in a restricted-access location. It has a separate protective earthing terminal provided on the chassis in addition to the grounding pin of the power supply cord. This separate protective earthing terminal must be permanently connected to earth.

CAUTION: Power cords and cables must not block access to device components or drape where people could trip on them.

Each three-phase AC wiring tray has a metal wiring compartment that contains the AC terminal block and ground. There are two types of three-phase wiring trays: *delta* (three-wire) and *wye* (four-wire). The *wye* AC terminal block consists of four input terminals labeled **N**, **L1**, **L2**, and **L3**, from top to bottom in the common three-phase naming convention.

You must provide cords appropriate for your geographical location. The AC power cord wires insert into the AC terminal block on the wiring tray.

The power cords you provide must comply with the specifications listed in Table 38 on page 135.

NOTE: In North America, AC power cords must not exceed 4.5 m (approximately 14.75 ft) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3).

Table 38: Three-Phase Delta AC Power Cord Specifications

Electrical Rating	Plug Type	Plug Color	Cord or Cable Type
400 VAC, 32 A	International Electrotechnical Commission (IEC) 60309	Red	The cord or cable must be HAR compliant, IEC 60245 (designation 60245 IEC 53) or IEC 60227 (designation 60227 IEC 53); or meet one of the following standards (North America): SV, SVE, SVO, SVOO, SVT, SVTO, SVTOO, SP-2, SPE-2, SPT-2, NISP-2, NISPE-2, NISPT-2, SP-3, SPE-3, SPT-3, SJ, SJE, SJO, SJOO, SJT, SJTO, SJTOO, S, SE, SO, SOO, ST, STO, STOO

RELATED DOCUMENTATION

AC Power Supply in a QFX3008-I Interconnect Device
Wiring Tray in a QFX3008-I Interconnect Device
AC Power Electrical Safety Guidelines
AC Power Disconnection Warning
General Electrical Safety Guidelines and Warnings
Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays | 200

AC Power Specifications for a QFX3600 or QFX3600-I Device

Table 39 on page 136 describes the AC power specifications for a QFX3600 or QFX3600-I device.

Table 39: AC Power Specifications for a QFX3600 or QFX3600-I Device

Item	Specification
AC input voltage	Operating range: • 100–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• 4 A at 100VAC • 2 A at 240 VAC
Typical power consumption	255 W
Maximum power consumption	345 W

RELATED DOCUMENTATION

AC Power Cord Specifications for a QFX Series Device | 138
AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device
General Safety Guidelines and Warnings
General Electrical Safety Guidelines and Warnings

AC Power Specifications for a QFX3500 Device

Table 40 on page 137 describes the AC power specifications for a QFX3500 device.

Table 40: AC Power Specifications for a QFX3500 Device

Item	Specification
AC input voltage	Operating range: • 100–127 VAC • 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• 7.8 A at 100–127 VAC • 3.8 A at 200–240 VAC
Typical power consumption	230 W
Maximum power consumption	365 W

RELATED DOCUMENTATION

AC Power Cord Specifications for a QFX Series Device | 138

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

General Safety Guidelines and Warnings

General Electrical Safety Guidelines and Warnings

AC Power Specifications for a QFX5100 Device

Table 41 on page 137 describes the AC power specifications for a QFX5100 device.

Table 41: AC Power Specifications for a QFX5100 Device

Item	Specification
AC input voltage	Operating range: • 100 / 240 VAC
AC input line frequency	50–60 Hz (all product SKUs)

Table 41: AC Power Specifications for a QFX5100 Device *(continued)*

Item	Specification
AC input current rating	• 4.5 A at 100–120 VAC • 2.0 A at 200–240 VAC
Typical power consumption	
QFX5100-24Q	230 W
QFX5100-48S and QFX5100-48SH	230 W
QFX5100-48T and QFX5100-48TH	322 W
QFX5100-96S	315 W
Maximum power consumption	
QFX5100-24Q	365 W
QFX5100-48S and QFX5100-48SH	365 W
QFX5100-48T and QFX5100-48TH	395 W
QFX5100-96S	470 W

RELATED DOCUMENTATION

AC Power Cord Specifications for a QFX Series Device | 138

AC Power Supply for a QFX5100 Device

General Safety Guidelines and Warnings

General Electrical Safety Guidelines and Warnings

AC Power Cord Specifications for a QFX Series Device

Detachable AC power cords are shipped with the chassis, if you include them as part of your order. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 14.75 feet (approximately 4.5 meters) in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52, and Canadian Electrical Code (CEC) Section 4-010(3). The cords that can be ordered for the QFX Series switches are in compliance.

Table 42 on page 140 lists AC power cord specifications provided for each country or region.

Table 42: AC Power Cord Specifications

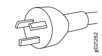
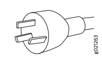
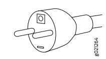
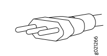
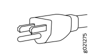
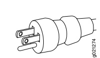
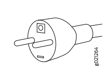
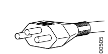
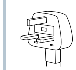
Country/Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
Australia	250 VAC, 10 A, 50 Hz	AS/NZ 3109-1996	CG_CBL-C13-06-AU	CBL-EX-PWR-C13-AU	
China	250 VAC, 10 A, 50 Hz	GB 1002-1996	CG_CBL-C13-06-CH	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII	CG_CBL-C13-06-EU	CBL-EX-PWR-C13-EU	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16/VII	CG_CBL-C13-06-IT	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	JIS C8303	CG_CBL-C13-06-JP	CBL-EX-PWR-C13-JP	
North America	(QFX10002-36Q, QFX10002-72Q only) 125 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz (all models) 250 VAC, 13 A, 60 Hz	CAN/CSA No. 49-92 NEMA L6-15 NEMA 6-15	CG_CBL-C13-06-US	CBL-EX-PWR-C13-US CBL-PW-C13-250-US CBL-PWR-C13-250-US	
South Korea	250 VAC, 10 A, 60 Hz 250 VAC, 13 A, 60 Hz	KSC 8305; K60884-1	CG_CBL-C13-06-KR	CBL-EX-PWR-C13-KR	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 SEV 1991; EN 60320 C13	CG_CBL-C13-06-SZ	CBL-EX-PWR-C13-SZ	
United Kingdom		BS 1363/A	CG_CBL-C13-06-UK	CBL-EX-PWR-C13-UK	

Table 42: AC Power Cord Specifications *(continued)*

Country/Region	Electrical Specifications	Plug Standards	Shipped Juniper Model Number	Spare Juniper Model Number	Graphic
	250 VAC, 10 A, 50 Hz				

AC Power Supply Specifications for EX4300 Switches

EX4300 switches support 350 W, 715 W, and 1100 W AC power supplies.

The tables in this topic provides power supply specification of AC power supplies used in an EX4300 switch:

- Table 43 on page 141: 350 W AC power supply specifications
- Table 44 on page 142: 715 W AC power supply specifications
- Table 45 on page 142: 1100 W AC power supply specifications

Table 43: 350 W AC Power Supply Specifications for an EX4300 Switch

Item	Specification
AC input voltage	• Low-voltage line: 100–120 VAC • High-voltage line: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line: 4 A • High-voltage line: 2 A
Output power	350 W

NOTE: The 32-port EX4300 switches support only 350 W AC power supplies with front-to-back airflow direction.

Table 44: 715 W AC Power Supply Specifications for an EX4300 Switch

Item	Specification
AC input voltage	• Low-voltage line: 100–120 VAC • High-voltage line: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line: 11 A • High-voltage line: 5 A
Output power	715 W

Table 45: 1100 W AC Power Supply Specifications for an EX4300 Switch

Item	Specification
AC input voltage	• Low-voltage line: 115–120 VAC • High-voltage line: 200–240 VAC
AC input line frequency	50–60 Hz
AC input current rating	• Low-voltage line: 12 A • High-voltage line: 6 A
Output power	1100 W

RELATED DOCUMENTATION

AC Power Supply in EX4300 Switches

AC Power Supply LEDs in EX4300 Switches

AC Power Cord Specifications for an EX4300 Switch

Each AC power supply has a single AC appliance inlet that requires a dedicated AC power feed. A detachable AC power cord is supplied with each AC power supply. The 350 W AC and the 715 W AC power supplies are shipped with AC power cords with the C13 coupler type and the 1100 W AC power supplies and 1400 W AC power supplies are shipped with AC power cord with the C15 coupler type as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

NOTE: In North America, AC power cords must not exceed 14.75 ft (4.5 m) in length, to comply with National Electrical Code (NEC) Section 400-8 (NFPA 75, 5-2.2) and Canadian Electrical Code (CEC) Section 4-010(3).

The tables in this topic list the AC power cords specifications provided for different power supplies for each country or region.

- Table 46 on page 143—Power cords for 350 W AC for EX4300 switches except EX4300-48MP and EX4300-48MP-S switches and 715 W AC power supplies for EX4300 switches
- Table 47 on page 145—Power cords for 1100 W AC power supplies for EX4300 switches and 1400 W AC power supplies for EX4300-48MP and EX4300-48MP-S Switches

Table 46: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches

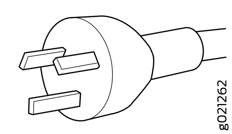
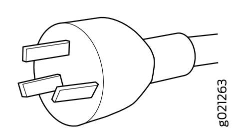
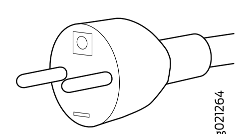
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR	No graphic available
Australia	250 VAC, 10 A, 50 Hz	AS/NZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU	
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR	No graphic available
China	250 VAC, 10 A, 50 Hz	GB 1002-1996 Type PRC/3	CBL-EX-PWR-C13-CH	
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C13-EU	
India	250 VAC, 10 A, 50 Hz	IS 1293 Type IND/3	CBL-EX-PWR-C13-IN	No graphic available

Table 46: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches *(continued)*

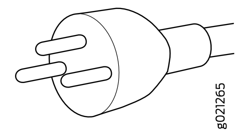
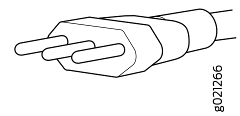
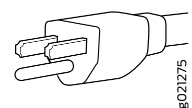
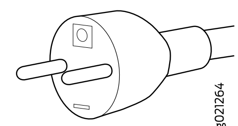
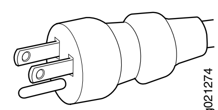
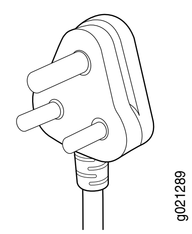
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL	
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-EX-PWR-C13-IT	
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	SS-00259 Type VCTF	CBL-EX-PWR-C13-JP	
Korea	250 VAC, 10 A, 50 Hz or 60 Hz	CEE (7) VII Type VIIGK	CBL-EX-PWR-C13-KR	
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15 Type N5-15	CBL-EX-PWR-C13-US	
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-EX-PWR-C13-SA	
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ	No graphic available

Table 46: AC Power Cord Specifications for 350 W Power Supplies for EX4300 Switches Except EX4300-48MP and EX4300-48MP-S Switches and 715 W AC Power Supplies for EX4300 Switches *(continued)*

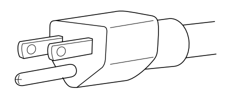
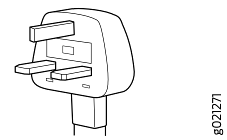
Country/ Region	Electrical Specifications	Plug Standards	Juniper Model Number	Graphic
Taiwan	125 VAC, 10 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW	
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C13-UK	

Table 47: AC Power Cord Specifications for 1100 W AC Power Supplies for EX4300 Switches and 1400 W AC Power Supplies for EX4300-48MP and EX4300-48MP-S Switches

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-PWR-C15M-HITEMP-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112-2000 Type SAA/3	CBL-PWR-C15M-HITEMP-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-PWR-C15M-HITEMP-BR
China	250 VAC, 10 A, 50 Hz	GB2099, GB1002 Type PRC/3	CBL-PWR-C15M-HITEMP-CH
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-EU
Israel	250 VAC, 10 A, 50 Hz	SI 32 Type IL/3G	CBL-PWR-C15M-HITEMP-IL
India	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-IN
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-PWR-C15M-HITEMP-IT
Japan	125 VAC, 15 A, 50 Hz or 60 Hz	JIS 8303 Type 498GJ	CBL-PWR-C15M-HITEMP-JP
Korea	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-PWR-C15M-HITEMP-KR
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/3	CBL-PWR-C15M-HITEMP-SA

Table 47: AC Power Cord Specifications for 1100 W AC Power Supplies for EX4300 Switches and 1400 W AC Power Supplies for EX4300-48MP and EX4300-48MP-S Switches *(continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
North America	125 VAC, 15 A, 60 Hz	NEMA 5-15 Type N5/15	CBL-PWR-C15M-HITEMP-US
Switzerland	250 VAC, 10 A, 50 Hz	SEV 1011 / 6534-2 Type 12G	CBL-PWR-C15M-HITEMP-SZ
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-PWR-C15M-HITEMP-UK

CAUTION: The AC power cord for the EX4300 switch is intended for use with this switch only. Do not use the cord with any other product.

CAUTION: Power cords must not block access to switch components.

RELATED DOCUMENTATION

Connecting AC Power to an EX4300 Switch

Power Specifications for EX4200 Switches

This topic describes power specifications for power supplies for EX4200 switches.

Table 48 on page 147 provides the AC power supply electrical specifications for EX4200 switches.

Table 49 on page 147 provides the DC power supply electrical specifications for EX4200 switches.

NOTE: This topic uses the term PoE to refer to both PoE and PoE+ unless there is a need to distinguish between the two.

Table 48: AC Power Supply Electrical Specifications

Item	Specification
AC input voltage	100 through 240 VAC
AC input line frequency	50 through 60 Hz
AC system current rating	• 4 A (for switches with 8 ports equipped for Power over Ethernet (PoE) or the switch with 24 100Base-FX/1000Base-SX SFP ports) • 7 A (for switches with 24 ports equipped for PoE) • 12 A (for switches with 48 ports equipped for PoE)

Table 49: DC Power Supply Electrical Specifications

Item	Specification
DC input voltage	36 through 72 VDC
DC input current	7 A maximum
Power supply output	190 W
Output holdup time	1 ms minimum

NOTE: The DC power supply in EX4200 switches does not support Power over Ethernet (PoE); you can use either an external power injector or an AC power supply to supply power to PoE devices that you connect to the switch.

NOTE: For DC power supplies, we recommend that you provide at least 7.5 A at 48 VDC and use a facility circuit breaker rated for 10 A minimum. Doing so enables you to operate the switch in any configuration without upgrading the power infrastructure, and ensures that the switch functions at full capacity using multiple power supplies.

AC Power Cord Specifications for EX4200 Switches

A detachable AC power cord is supplied with the AC power supplies. The coupler is type C13 as described by International Electrotechnical Commission (IEC) standard 60320. The plug at the male end of the power cord fits into the power source outlet that is standard for your geographical location.

CAUTION: The AC power cord provided with each power supply is intended for use with that power supply only and not for any other use.

NOTE: In North America, AC power cords must not exceed 4.5 meters in length, to comply with National Electrical Code (NEC) Sections 400-8 (NFPA 75, 5-2.2) and 210-52 and Canadian Electrical Code (CEC) Section 4-010(3). The cords supplied with the switch are in compliance.

Table 50 on page 148 gives the AC power cord specifications for the countries and regions listed in the table.

Table 50: AC Power Cord Specifications

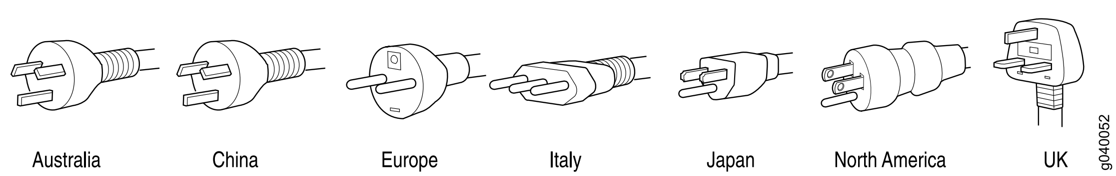
Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Argentina	250 VAC, 10 A, 50 Hz	IRAM 2073 Type RA/3	CBL-EX-PWR-C13-AR
Australia	250 VAC, 10 A, 50 Hz	AS/NZZS 3112 Type SAA/3	CBL-EX-PWR-C13-AU
Brazil	250 VAC, 10 A, 50 Hz	NBR 14136 Type BR/3	CBL-EX-PWR-C13-BR
China	250 VAC, 10 A, 50 Hz	GB 1002-1996 Type PRC/3	CBL-EX-PWR-C13-CH
Europe (except Italy, Switzerland, and United Kingdom)	250 VAC, 10 A, 50 Hz	CEE (7) VII Type VIIG	CBL-EX-PWR-C13-EU
India	250 VAC, 10 A, 50 Hz	IS 1293 Type IND/3	CBL-EX-PWR-C13-IN
Israel	250 VAC, 10 A, 50 Hz	SI 32/1971 Type IL/3G	CBL-EX-PWR-C13-IL
Italy	250 VAC, 10 A, 50 Hz	CEI 23-16 Type I/3G	CBL-EX-PWR-C13-IT
Japan	125 VAC, 12 A, 50 Hz or 60 Hz	SS-00259 Type VCTF	CBL-EX-PWR-C13-JP

Table 50: AC Power Cord Specifications *(continued)*

Country/Region	Electrical Specifications	Plug Standards	Juniper Model Number
Korea	250 VAC, 10 A, 50 Hz or 60 Hz	CEE (7) VII Type VIIGK	CBL-EX-PWR-C13-KR
North America	125 VAC, 13 A, 60 Hz	NEMA 5-15 Type N5-15	CBL-EX-PWR-C13-US
South Africa	250 VAC, 10 A, 50 Hz	SABS 164/1:1992 Type ZA/13	CBL-EX-PWR-C13-SA
Switzerland	250 VAC, 10 A, 50 Hz	SEV 6534-2 Type 12G	CBL-EX-PWR-C13-SZ
Taiwan	125 VAC, 11 A and 15 A, 50 Hz	NEMA 5-15P Type N5-15P	CBL-EX-PWR-C13-TW
United Kingdom	250 VAC, 10 A, 50 Hz	BS 1363/A Type BS89/13	CBL-EX-PWR-C13-UK

Figure 17 on page 149 illustrates the plug on the power cord for some of the countries or regions listed in Table 50 on page 148.

Figure 17: AC Plug Types



DC Power Specifications for a QFX3600 or QFX3600-I Device

Table 51 on page 149 describes the DC power specifications for a QFX3600 or QFX3600-I device.

Table 51: DC Power Specifications for a QFX3600 or QFX3600-I Device

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	8 A maximum at nominal operating voltage (–48 VDC)

Table 51: DC Power Specifications for a QFX3600 or QFX3600-I Device *(continued)*

Item	Specifications
Typical power consumption	341 W
Maximum power consumption	252 W

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

DC Power Specifications for a QFX3500 Device

Table 52 on page 150 describes the DC power specifications for a QFX3500 device.

Table 52: DC Power Specifications for a QFX3500 Device

Item	Specifications
DC input voltage	• Minimum operating voltage: –40 VDC • Nominal operating voltage: –48 VDC • Operating voltage range: –40 VDC through –72 VDC
DC input current rating	7 A maximum at nominal operating voltage (–48 VDC)
Typical power consumption	250 W
Maximum power consumption	385 W

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

DC Power Specifications for a QFX5100 Device

Table 53 on page 151 describes the DC power specifications for DC product SKUs of the QFX5100 device.

Table 53: DC Power Specifications for a QFX5100 Device

Item	Product SKUs	Specifications
DC input voltage	QFX5100-24Q QFX5100-48S QFX5100-48T	• Rated operating voltage: –48 VDC to -60 VDC • Operating voltage range: -40 VDC through –72 VDC
	QFX5100-96S	• Rated operating voltage: VDC -48 VDC to -60 VDC • Operating voltage range: –40 VDC through -72 VDC
DC input current rating	QFX5100-24Q QFX5100-48S QFX5100-48T QFX5100-96S	10 A maximum
Typical power consumption	QFX5100-48S QFX5100-48T QFX5100-24Q	300 W
	QFX5100-96S	315 W
Maximum power consumption	QFX5100-24Q QFX5100-48S QFX5100-48T	385 W
	QFX5100-96S	470 W

RELATED DOCUMENTATION

DC Power Supply in a QFX5100 Device

DC Power Supply LEDs on a QFX5100 Device

DC Power Supply Specifications for EX4300 Switches

Table 52 on page 150 lists the power supply specifications for a DC power supply used in an EX4300 switch.

Table 54: DC Power Supply Specifications for an EX4300 Switch

Item	Specifications
DC input voltage	• Nominal operating voltage: –48 VDC • Operating voltage range: –48 VDC through –60 VDC
DC input current rating	4 A maximum at nominal operating voltage (–48 VDC)
Output power	550 W

RELATED DOCUMENTATION

DC Power Supply in EX4300 Switches

DC Power Supply LEDs in EX4300 Switches

CHAPTER 8

Installing a QFX3100 Director Device

IN THIS CHAPTER

Installing and Connecting a QFX3100 Director Device

To install and connect a QFX3100 Director device:

1. Follow instructions in "Unpacking a QFX3100 Director Device" on page 154.

2. Mount the QFX3100 Director device by following instructions appropriate for your site:

   - "Mounting a QFX3100 Director Device on Two Posts in a Rack or Cabinet" on page 156 (using the mounting brackets provided)

   - "Mounting a QFX3100 Director Device on Four Posts in a Rack or Cabinet" on page 158 (using the mounting brackets provided)

3. Follow instructions in "Connecting AC Power to a QFX3100 Director Device" on page 160 to connect power.

4. See "QFX3000-G QFabric System Installation Overview" on page 105 for information about the steps to install and configure your QFX3000-G QFabric system. See *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

RELATED DOCUMENTATION

Unpacking a QFX3100 Director Device

The QFX3100 Director devices are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> **CAUTION:** QFX3100 Director devices are maximally protected inside the shipping carton. Do not unpack the Director devices until you are ready to begin installation.

To unpack a QFX3100 Director device (see Figure 18 on page 155):

1. Move the shipping carton to a staging area as close to the installation site as possible but where you have enough room to remove the system components.
2. Position the carton so that the arrows are pointing up.
3. Open the top flaps on the shipping carton.
4. Remove the accessory box and verify the contents against the parts inventory.
5. Pull out the packing material holding the QFX3100 Director device in place.
6. Verify the components received against the inventory provided in Table 55 on page 155.
7. Save the shipping carton and packing materials in case you need to move or ship the device later.

Figure 18: Unpacking a QFX3100 Director Device

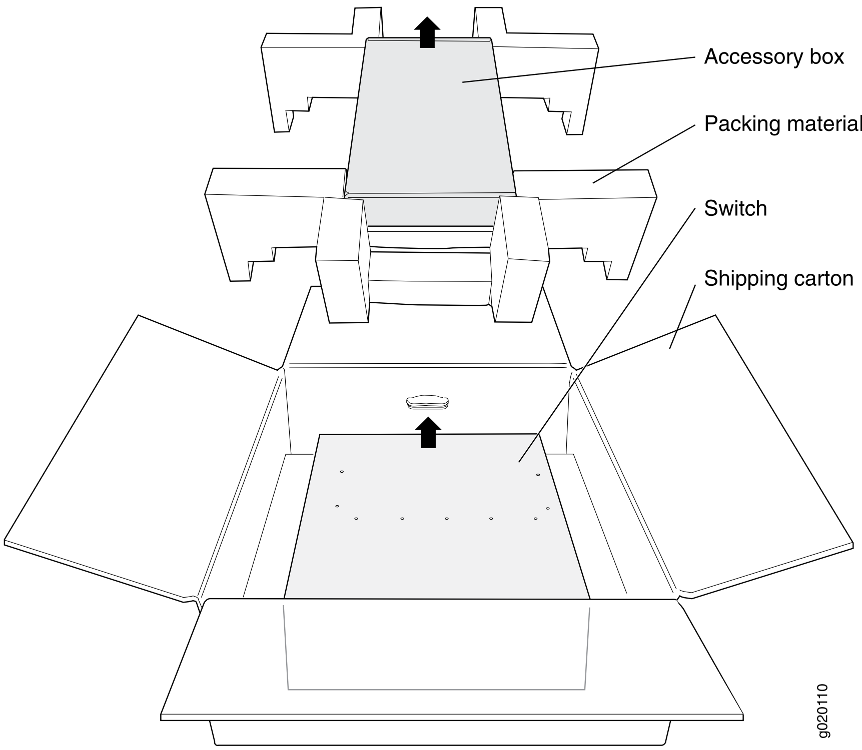


Table 55: Inventory of Components Provided with a QFX3100 Director Device

Component	Quantity
QFX3100 Director device	1
Fan module (installed)	3
AC power supply module (installed)	2
4-port Ethernet network module (installed)	2
Hard disk drive (HDD) module (installed)	2
Mounting screws	8
Two-post rack-mount kit	1
Four-post rack-mount kit	1

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | 153

Mounting a QFX3100 Director Device on Two Posts in a Rack or Cabinet

You can mount a QFX3100 Director device on two posts of a 19-in. rack or cabinet by using the mounting brackets provided with the device. (The remainder of this topic uses "rack" to mean "rack or cabinet.")

You can mount the QFX3100 Director device on four posts of a four-post rack by using the side rail brackets provided with the device. See "Mounting a QFX3100 Director Device on Four Posts in a Rack or Cabinet" on page 158.

Before mounting the device on two posts in a rack:

- Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3100 Director Device*.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read *General Safety Guidelines and Warnings*.
- Remove the device from the shipping carton (see "Unpacking a QFX3100 Director Device" on page 154).

Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap (provided)
- Phillips (+) screwdriver, number 2
- Four mid-mount mounting brackets and mounting screws (provided)
- Screws to secure the chassis to the rack (not provided)

> **NOTE:** One person must be available to lift the QFX3100 Director device while another secures it to the rack.

> **CAUTION:** If you are mounting multiple units on the rack, mount the heaviest unit at the bottom and mount the others from bottom to top in order of decreasing weight.

To mount the QFX3100 Director device on two posts in a rack:

1. Place the QFX3100 Director device on a flat, stable surface.

2. Align one mid-mount bracket to the mid-mount bracket holes near the center of the side of the QFX3100 Director device. Ensure that the bracket is aligned with the mounting holes and that the bracket face is facing the rack post.

3. Attach the mounting bracket to the QFX3100 Director device.

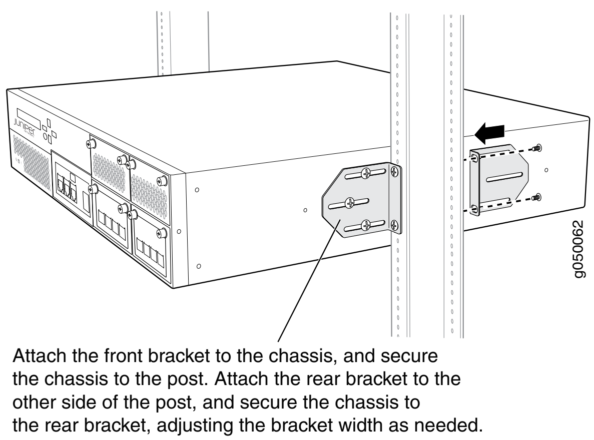
4. Mount the attached mounting bracket to the rack post. Tighten all screws.

5. Attach the mounting bracket on the opposite end of the same side to the QFX3100 Director device and mount it to the rack post. Tighten all screws.

6. Repeat this procedure for the mounting brackets on the opposite side of the QFX3100 Director device. Tighten all screws.

7. Ensure that the QFX3100 Director device chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side. See Figure 19 on page 157.

Figure 19: Mounting the QFX3100 Director Device on Two Posts in a Rack



RELATED DOCUMENTATION

Mounting a QFX3100 Director Device on Four Posts in a Rack or Cabinet

You can mount a QFX3100 Director device on four posts of a 19-in. rack or cabinet by using the adjustable rear mounting brackets provided. (The remainder of this topic uses “rack” to mean “rack or cabinet.”)

Before mounting the QFX3100 Director device on four posts in a rack:

- Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3100 Director Device*.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read *General Safety Guidelines and Warnings*.
- Remove the QFX3100 Director device from the shipping carton (see “Unpacking a QFX3100 Director Device” on page 154).

Ensure that you have the following parts and tools available:

- Electrostatic discharge (ESD) grounding strap (provided).
- Phillips (+) screwdriver, number 2.
- Screws to secure the chassis and mounting brackets to the rack (not provided).
- One pair of adjustable rear mounting brackets (provided). These mounting brackets support the rear of the chassis, and must be installed.
- Screws to attach the mounting brackets to the chassis (provided).

CAUTION: If you are mounting multiple units on a rack, mount the heaviest unit at the bottom of the rack and mount the other units from the bottom of the rack to the top in decreasing order of the weight of the units.

To mount the QFX3100 Director device on four posts in a rack:

1. Place the QFX3100 Director device on a flat, stable surface.

2. Measure the distance between the front and rear rack rails. Using this measurement, attach the adjustable rear mounting brackets on the chassis using the provided screws.

3. Flip the hinged rack-mounting plates at the end of the brackets outward.

NOTE: The device weighs approximately 41.2 lb (18.73 kg). Installing the QFX3100 Director device in a rack or cabinet requires one person to lift it and a second person to secure it to the rack.

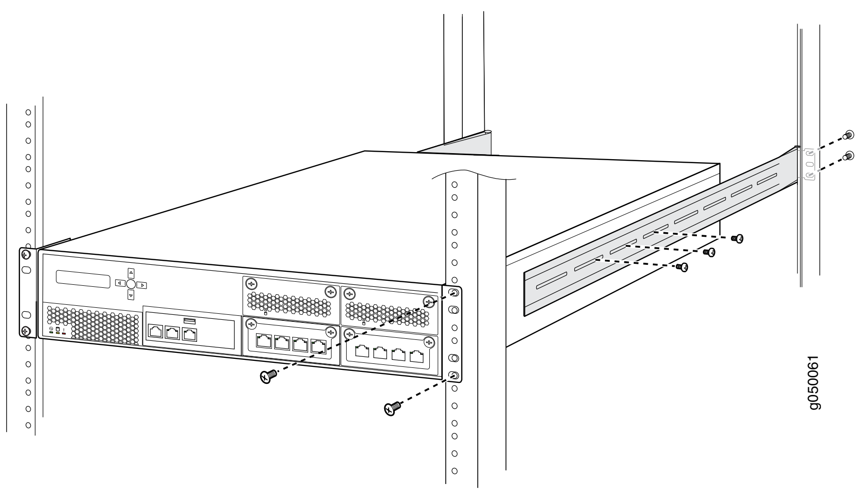
4. Have one person grasp both sides of the device, lift it, and position it in the rack, aligning the bracket holes with the holes in the rack.

5. Have a second person install a mounting screw—and cage nut and washer if your rack requires them—in each of the four bracket holes to secure the device to the front rack rails.

6. While still supporting the chassis, have the second person install a mounting screw—and cage nut and washer if your rack requires them—in each of the four bracket holes on the adjustable rear mounting brackets to secure the device to the rear rack rails.

7. Ensure that the chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack. See Figure 20 on page 159.

Figure 20: Mounting a QFX3100 Director Device on Four Posts in a Rack or Cabinet



RELATED DOCUMENTATION

Connecting Earth Ground to an EX Series Switch

Connecting AC Power to a QFX3100 Director Device | 160

Installing and Connecting a QFX3100 Director Device | 153

Rack-Mounting and Cabinet-Mounting Warnings

Connecting AC Power to a QFX3100 Director Device

The power supply in a QFX3100 Director device is a hot-removable and hot-insertable field-replaceable unit (FRU) located on the far right side of the rear panel. You can remove and replace a single power supply without powering off the QFX3100 Director device or disrupting QFX3100 Director device functions.

Before you begin connecting AC power to a QFX3100 Director device:

- Install the power supply in the chassis. See *Installing a Power Supply in a QFX3100 Director Device (includes video)*.

> **NOTE:** Each power supply must be connected to a dedicated power source outlet to ensure power supply redundancy.

Ensure that you have the following parts and tools available:

- A power cord appropriate for your geographical location

To connect AC power to a QFX3100 Director device (see Figure 21 on page 161):

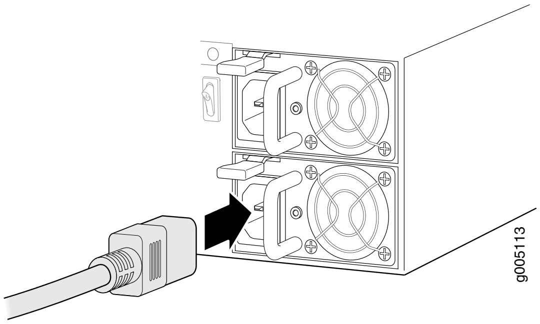
1. Ensure that the power supplies are fully inserted in the QFX3100 Director device.

2. Locate the power cords shipped with the QFX3100 Director device; the cords have plugs appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3100 Director Device" on page 127.

   > **WARNING:** Ensure that the power cord does not block access to QFX3100 Director device components or drape where people can trip on it.

3. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate (see Figure 21 on page 161).

Figure 21: Connecting an AC Power Cord to an AC Power Supply in a QFX3100 Director Device



4. If the AC power source outlet has a power switch, set it to the OFF (O) position.

5. Insert the power cord plug into an AC power source outlet.

6. If the AC power source outlet has a power switch, set it to the ON (|) position.

7. Repeat these steps for the second AC power supply.

8. Press the power switch on the rear panel of the QFX3100 Director device to power on the device.

> **NOTE:** Momentarily pressing the power switch causes the system to power on or causes a power event to the operating system, which causes a graceful shutdown. Pressing the power switch for 4 seconds or longer causes an abrupt power shutdown.

9. Verify that the power LED on the power supply is lit and is on steadily.

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | 153

AC Power Supply in a QFX3100 Director Device

Connecting a QFX Series Device to a Management Console

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

> **NOTE:** If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the QFX Series, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the QFX Series to a management console (see Figure 22 on page 162 and Figure 23 on page 162):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).

2. Connect the other end of the Ethernet cable into the console server (see Figure 22 on page 162) or management console (see Figure 23 on page 162).

Figure 22: Connecting the QFX Series to a Management Console Through a Console Server

Figure 23: Connecting the QFX Series Directly to a Management Console

RELATED DOCUMENTATION

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

Powering On a QFX3100 Director Device

Before you power on the QFX3100 Director device, ensure that:

- All required QFX3100 Director device components are installed.
- You understand how to protect the QFX3100 Director device from electrostatic damage. See *Prevention of Electrostatic Discharge Damage*.

Ensure that you have the following parts and tools available to power on the QFX3100 Director device:

- An external management device such as a PC to monitor the startup process—For connecting a management device to the console port, see "Connecting a QFX Series Device to a Management Console" on page 161. For connecting a management device to the management port, see "Connecting a QFX3100 Director Device to a Network for Out-of-Band Management" on page 275.

> **NOTE:** You cannot use the management (**MGMT**) port to perform the initial configuration of the QFX3100 Director device. You must configure the management ports before you can successfully connect to the QFX3100 Director device using these ports. See "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

When you power on the QFX3100 Director devices in the Director group for the first time the first device to be powered on assumes the Director Group 0 (*dg0*) role. The second device to be powered on assumes the Director Group 1 (*dg1*`) role.

To power on the QFX3100 Director device:

1. Ensure that the power supplies are fully inserted in the QFX3100 Director device and that each of their handles is flush against the faceplate.

2. Ensure that the source power cord is inserted securely into the appliance inlet for each AC power supply.

3. Switch on the site circuit breakers.

4. Press the power switch on the rear panel of the QFX3100 Director device to power on the device.

   > **NOTE:** Pressing the power switch momentarily either causes the system to power on or causes a graceful shutdown. Pressing the power switch for 4 seconds or longer causes an abrupt power shutdown.

5. Observe the power supply faceplate LEDs. If the power supply is installed correctly and functioning normally, the AC power supply LED is green.

6. On the external management device, monitor the startup process to ensure that the system boots properly.

> **NOTE:** After you power on a power supply, wait for at least 60 seconds before you turn it off. After you power off a power supply, wait for at least 60 seconds before you turn it back on.

RELATED DOCUMENTATION

Powering Off a QFX3100 Director Device

AC Power Supply in a QFX3100 Director Device

AC Power Cord Specifications for a QFX3100 Director Device | **127**

CHAPTER 9

Installing a QFX3008-I Interconnect Device

IN THIS CHAPTER

Installing and Connecting a QFX3008-I Interconnect Device

Before you begin, ensure that the installation site meets the requirements described in *Site Preparation Checklist for a QFX3008-I Interconnect Device*.

To install and connect a QFX3008-I Interconnect device:

1. Follow the instructions in “Unpacking a QFX3008-I Interconnect Device” on page 166.

2. Install the mounting hardware on your four-post or two-post rack or cabinet by following the instructions in “Installing QFX3008-I Interconnect Device Mounting Hardware on Four-Post Racks or Cabinets” on page 170 or “Installing QFX3008-I Interconnect Device Mounting Hardware on Two-Post Racks” on page 178.

3. Mount the device by following the instructions in "Mounting a QFX3008-I Interconnect Device on a Rack or Cabinet Using a Mechanical Lift" on page 182.

4. Connect the QFX3008-I Interconnect device to earth ground.

   See "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186.

5. Connect power to the device.

   See "Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays" on page 188, "Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 196, and "Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 200.

6. (Optional) Install the cable management system or lockable front doors, by following the instructions in *Installing the Cable Management System on a QFX3008-I Interconnect Device* and *Installing the Lockable Front Doors on a QFX3008-I Interconnect Device*.

7. See "QFX3000-G QFabric System Installation Overview" on page 105 for information about the next steps to install and configure your QFX3000 QFabric system.

RELATED DOCUMENTATION

Rack Requirements for a QFX3008-I Interconnect Device

Cabinet Requirements for a QFX3008-I Interconnect Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3008-I Interconnect Device

Chassis Lifting Guidelines for a QFX3008-I Interconnect Device

Unpacking a QFX3008-I Interconnect Device

After you prepare the installation site as described in *Site Preparation Checklist for a QFX3008-I Interconnect Device*, you may unpack the device.

> **NOTE:** The device is maximally protected inside the shipping box. Do not unpack it until you are ready to begin installation.

Before you begin, ensure that you have the following parts and tools available to unpack the QFX3008-I Interconnect Device:

- Phillips (+) screwdriver, number 2
- A 5/16-in. open-end or socket wrench to remove the bracket bolts from the shipping pallet
- A box cutter or packing knife to slice open the tape that seals the top of the box

The device ships in a cardboard box that has a two-layer wooden pallet base with foam cushioning between the layers. The device chassis is bolted to the pallet base. Quick Start installation instructions and a cardboard accessory box are also included in the shipping crate.

To unpack the device:

1. Move the shipping box to a staging area as close to the installation site as possible. Make sure there is enough space to remove components from the chassis if necessary. While the chassis is bolted to the pallet, you can use a forklift or pallet jack to move it.

2. Remove the cardboard cover, foam padding, and accessory box.

3. Unpack the accessory box and lay out the contents so that they are ready for use.

4. Verify that your order includes all appropriate parts. See "Parts Inventory (Packing List) for a QFX3008-I Interconnect Device" on page 168.

5. Use a 5/16-in. open-end or socket wrench and a number 2 Phillips screwdriver to remove the four sets of bracket bolts and screws that secure the chassis to the shipping pallet. Store the brackets and bolts inside the accessory box.

6. Save the shipping box, pallet, and packing materials in case you need to move or ship the device at a later time.

RELATED DOCUMENTATION

Mounting a QFX3008-I Interconnect Device on a Rack or Cabinet Using a Mechanical Lift | 182

Parts Inventory (Packing List) for a QFX3008-I Interconnect Device

The device shipment includes a packing list. Check the parts you receive in the shipping crate against the items on the packing list. The packing list specifies the part number and description of each part in your order. The parts shipped depend on the configuration you order.

If any part on the packing list is missing, contact your customer service representative or contact Juniper Networks customer care from within the U.S. or Canada by telephone at 1-888-314-5822. For international-dial or direct-dial options in countries without toll-free numbers, see https://www.juniper.net/support/requesting-support.html .

Table 56 on page 168 lists the parts and their quantities in the packing list for a QFX3008-I Interconnect device.

Table 56: Parts List for QFX3008-I Interconnect Device Configurations

Component	Quantity
Chassis, including the midplane and rack-mounting brackets	1
Cable manager	1 (optional)
Lockable front door	1 (optional)
Control Boards	2
16-port QSFP+ front cards	1–8
Rear cards	8
Power supplies	6
Wiring trays	2
Top fan tray	1
Bottom fan tray and front panel display	1
Side fan trays	8
Front air filter	1
Side air filters	8

Table 56: Parts List for QFX3008-I Interconnect Device Configurations *(continued)*

Component	Quantity
Cover panels for slots without installed components	Front card cover panels: 0–7

Table 57 on page 169, Table 58 on page 169, and Table 59 on page 170 list the parts contained in the accessory box.

Table 57: QFX3008-I Interconnect Device Accessory Kit Contents

Item	Quantity
Chassis grounding lug	1
UNC ¼-20 screws to attach the chassis grounding lug to the protective earth terminal on the chassis	2
Electrostatic discharge (ESD) grounding strap	1
RJ-45 cable and RJ-45 to DB-9 adapter for console port connection	1
QFX3008-I Interconnect Device Quick Start	1
End User License Agreement (EULA)	1
RoHS Compliance and Warranty Information Card	1

Table 58: QFX3008-I Interconnect Device Rack Install Accessory Kit Contents

Item	Quantity
Four-post rack mounting shelf	1
Rear support bracket for four-post rack mounting	1
UNC 8/32 flat-head screws to attach the four-post rack mounting shelf to the rear support bracket	6
Rear anchor bracket for four-post rack mounting	2
UNC ¼-20 screws to attach the rear anchor bracket to the protective earth terminal on the chassis	2
M6 screws to attach the rear anchor bracket to the protective earth terminal on the chassis	2
Large mounting shelf for two-post rack mounting	1

Table 58: QFX3008-I Interconnect Device Rack Install Accessory Kit Contents *(continued)*

Item	Quantity
Small mounting shelf for two-post rack mounting	1
Adjustable center-mounting flanges for two-post rack mounting	2
UNC 10/32 screws to attach center-mounting flanges to the chassis	12

Table 59: QFX3008-I Interconnect Device Wiring Tray Accessory Kit Part Contents

Item	Quantity
Strain relief connector	2 (delta or wye three-phase wiring trays only)
90-degree connector	2 (delta or wye three-phase wiring trays only)
Power cords	6 (single-phase wiring trays only)

RELATED DOCUMENTATION

Unpacking a QFX3008-I Interconnect Device | 166

QFX3008-I Interconnect Device Overview

Installing QFX3008-I Interconnect Device Mounting Hardware on Four-Post Racks or Cabinets

Before you install the QFX3008-I Interconnect device in a four-post rack or cabinet, you must first install mounting hardware and remove the center-mounting brackets from the chassis.

NOTE: In a rack, the device uses 21 U. You can mount two QFX3008-I Interconnect devices on a 42 U rack provided that the racks meet the strength requirements to support the combined weight of the devices. If you are mounting two QFX3008-I Interconnect devices on a rack, mount the first device on the bottom of the rack.

There are two styles of mounting hardware for the QFX3008-I Interconnect device. One style of mounting hardware uses a large shelf that spans the four rack posts and rests on a rear support bracket. The other style of mounting hardware uses a large shelf on the front posts, a smaller shelf on the rear posts, and spacer bars mounted to the rack posts to ensure proper alignment of rack-mounting screws. Figure 24 on page 172 and Figure 25 on page 175 depict the different styles of mounting hardware.

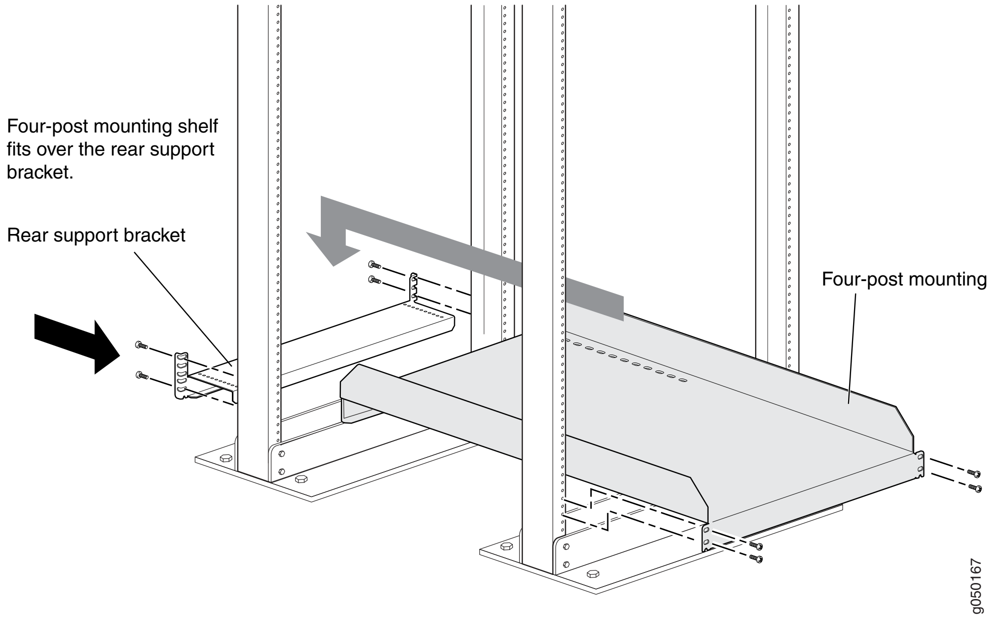
Depending on which style of mounting hardware you have, perform one of the first two tasks, then remove the center-mounting brackets from the chassis:

Installing Four-Post Mounting Shelf and Rear Support Bracket for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

IN THIS SECTION

Figure 24 on page 172 depicts the four-post mounting shelf and rear support bracket mounting hardware. If the mounting hardware included with your QFX3008-I Interconnect device instead includes spacer bars and two shelves, see "Installing Spacer Bars and Shelves for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting" on page 174.

Figure 24: Installing Four-Post Mounting Shelf and Rear Support Bracket for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting



For a four-post rack or cabinet, Table 60 on page 172 specifies the holes in which you insert mounting screws (an **X** indicates a mounting hole location), and cage nuts if needed. The hole distances are relative to one of the standard "U" divisions on the rack.

Table 60: Four-Post Mounting Shelf and Rear Support Bracket Hole Locations

Hole	Distance Above U Division		Four-Post Mounting Shelf	Rear Support Bracket
6	3.25 in. (8.3 cm)	1.86 U		**X**
5	2.63 in. (6.7 cm)	1.5 U		**X**
4	2 in. (5.1 cm)	1.14 U		**X**
3	1.5 in. (3.8 cm)	0.86 U	**X**	**X**
2	0.88 in. (2.2 cm)	0.5 U	**X**	**X**
1	0.25 in. (0.6 cm)	0.14 U	**X**	**X**

Installing Cage Nuts for the Four-Post Mounting Shelf and Support Bracket for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

For racks without threaded holes, you must install cage nuts on the rack or cabinet rails in the locations specified in Table 60 on page 172 (an **X** indicates a mounting hole location).

Before you begin, ensure that you have 18 cage nuts appropriate for your rack or cabinet.

To install the cage nuts in the proper locations:

1. On the front rack or cabinet, install cage nuts in the holes specified in Table 60 on page 172 for the large shelf.

2. On the rear rack or cabinet, install cage nuts in the holes specified in Table 60 on page 172 for the support bracket.

Installing the Rear Support Bracket for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

To mount the chassis on a four-post rack or cabinet, you must first install the four-post mounting shelf and rear support bracket on the rack or cabinet.

Before you begin, ensure that you have the following parts and tools available to install the rear support bracket:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws (not provided)
- 12 mounting screws appropriate for your rack to attach the rear support bracket to the rack (not provided)

To install the rear support bracket:

1. On the rear of each rear rack rail, partially insert a mounting screw 1 U below where you intend to install the chassis.

2. Install the rear support bracket on the rear of the rear rack rails. Rest the bottom slot of the rear support bracket on a mounting screw. The rear support bracket extends toward the center of the rack.

3. Partially insert screws into the open holes in the rear support bracket. Tighten all the screws.

Installing the Four-Post Mounting Shelf for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

To mount the chassis on a four-post rack or cabinet, you must first install the four-post rack mounting shelf and rear support bracket on the rack or cabinet.

Before you begin, ensure that you have the following parts and tools available to install the four-post rack mounting shelf:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws (not provided)
- Six mounting screws appropriate for your rack to attach the four-post rack mounting shelf to the rack (not provided)
- UNC 8/32 flat-head screws to attach the four-post rack mounting shelf to the rear support bracket (provided)

To install the four-post rack mounting shelf:

1. On the front of each front rack rail, partially insert a mounting screw 1 U below where you intend to install the chassis.

2. Install the four-post rack mounting shelf on the front rack rails. Rest the front of the four-post rack mounting shelf on the mounting screws you installed on the front rack rails. Rest the back of the four-post rack mounting shelf on top of the rear support bracket.

3. Partially insert screws into the open holes in the four-post rack mounting shelf. Tighten all the screws.

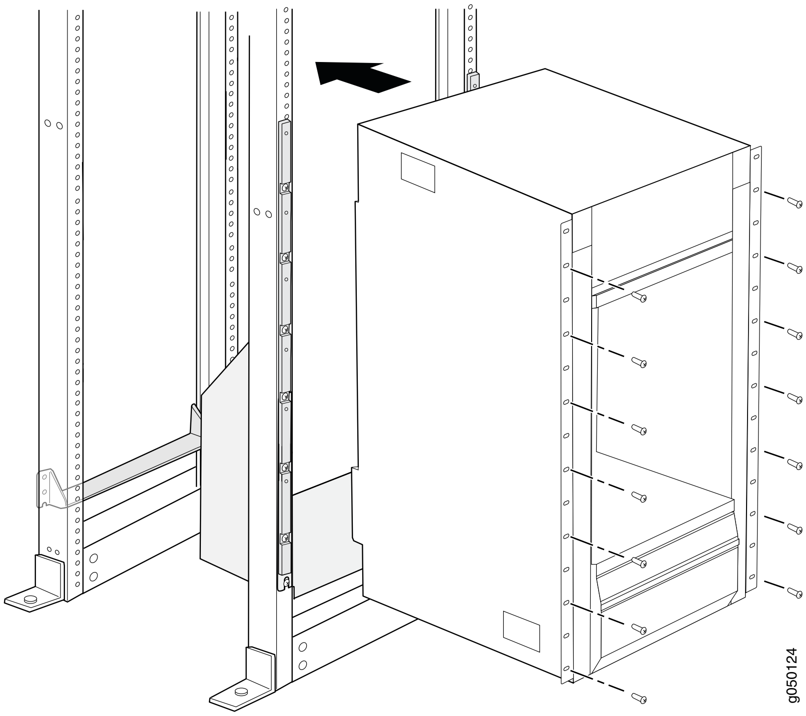
4. Fasten the four-post mounting shelf to the rear support bracket by partially inserting the flat-head screws provided in the accessory kit into the open holes on top of the four-post mounting shelf. Several holes are provided on top of the shelf. Two holes on each side of the shelf will align with the holes in the rear support bracket. Tighten all the screws.

Installing Spacer Bars and Shelves for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

IN THIS SECTION

Figure 25 on page 175 depicts the spacer bars and small and large shelf mounting hardware. If the mounting hardware included with your QFX3008-I Interconnect device instead includes a large shelf that spans the four posts, and rear support bracket, see "Installing Four-Post Mounting Shelf and Rear Support Bracket for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting" on page 171.

Figure 25: Installing Spacer Bar and Shelves for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting



For a four-post rack or cabinet, Table 61 on page 175 specifies the holes in which you insert mounting screws (an **X** indicates a mounting hole location), and cage nuts if needed. The hole distances are relative to one of the standard “U” divisions on the rack. For reference, the bottom of all mounting shelves is at 0.04 in. (0.02 U) above a U division.

Table 61: Four-Post Rack or Cabinet Mounting Hole Locations

Hole	Distance Above U Division		Large Shelf	Spacer Bars	Small Shelf
51	29.51 in. (74.9 cm)	16.86 U		**X**	
42	24.26 in. (61.6 cm)	13.86 U		**X**	
33	19.01 in. (48.3 cm)	10.86 U		**X**	
30	17.26 in. (43.8 cm)	9.86 U	**X**		
24	13.76 in. (34.9 cm)	7.86 U		**X**	
15	8.51 in. (21.6 cm)	4.86 U		**X**	
6	3.26 in. (8.3 cm)	1.86 U		**X**	

Table 61: Four-Post Rack or Cabinet Mounting Hole Locations *(continued)*

Hole	Distance Above U Division		Large Shelf	Spacer Bars	Small Shelf
3	1.51 in. (3.8 cm)	0.86 U			**X**
2	0.88 in. (2.2 cm)	0.50 U	**X**		**X**
1	0.25 in. (0.6 cm)	0.14 U			**X**

Installing Cage Nuts for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

For racks without threaded holes, you must install cage nuts on the rack or cabinet rails in the locations specified in Table 61 on page 175 (an **X** indicates a mounting hole location).

Before you begin, ensure that you have 22 cage nuts appropriate for your rack or cabinet.

To install the cage nuts in the proper locations:

1. On the front rack or cabinet, install cage nuts in the holes specified in Table 61 on page 175 for the large shelf and the spacer bars.

2. On the rear rack or cabinet, install cage nuts in the holes specified in Table 61 on page 175 for the small shelf.

Installing the Small Mounting Shelf for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

To mount the chassis on a four-post rack or cabinet, you must first install the mounting shelves and spacer bars on the rack or cabinet.

Before you begin, ensure that you have the following parts and tools available to install the small mounting shelf:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws
- Six mounting screws appropriate for your rack to attach the small mounting shelf to the rack

To install the small mounting shelf:

1. On the back of each rear rack rail, partially insert a mounting screw into the lowest hole specified in Table 61 on page 175 for the small shelf.

2. Install the small shelf on the back rack rails. Rest the bottom slot of each ear on a mounting screw. The small shelf installs on the back of the rear rails, extending toward the center of the rack. The bottom of the small shelf should align with the bottom of the large shelf.

3. Partially insert screws into the open holes in the ears of the small shelf. Tighten all the screws.

Installing the Large Mounting Shelf and Spacer Bars for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

To mount the chassis on a four-post rack or cabinet, you must first install the mounting shelves and spacer bars on the rack or cabinet.

Before you begin, ensure that you have the following parts and tools available to install the large mounting shelf and spacer bars:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws
- 16 mounting screws appropriate for your rack to attach the large mounting shelf and spacer bars to the rack

To install the large mounting shelf and spacer bars:

1. On the front of each front rack rail, partially insert a mounting screw into the lowest hole specified in Table 61 on page 175 for the large shelf.

2. Install the large shelf on the front rack rails. Rest the bottom slot of each ear on a mounting screw.

3. Partially insert a mounting screw into the top hole in each ear of the large shelf. Tighten all the screws.

4. The device is shipped with each spacer bar attached to the rear of each front-mounting flange. Remove each spacer bar by removing the seven screws that fasten the spacer bar to the front-mounting bracket.

5. Place one of the spacer bars over an ear of the installed large shelf. Position the notch in the rear of the spacer bar so the upper part of the bar is flush with the rack rail and the lower part is flush with the ear of the shelf.

6. Insert a mounting screw into each of the nonthreaded holes in the recesses of the spacer bar to secure the spacer bar.

7. Repeat Step 5 and Step 6 for the other spacer bar.

8. Tighten all the screws.

Removing the Adjustable Center-Mounting Brackets for QFX3008-I Interconnect Device Four-Post Rack or Cabinet Mounting

Before you begin, ensure that you have a number 2 Phillips (+) screwdriver.

To remove the adjustable center-mounting brackets:

1. Loosen the three screws at the top and bottom of each bracket.

2. Remove the center-mounting brackets.

> **TIP:** Save the center-mounting brackets and screws in case you need to move the device to a two-post rack at a later time.

RELATED DOCUMENTATION

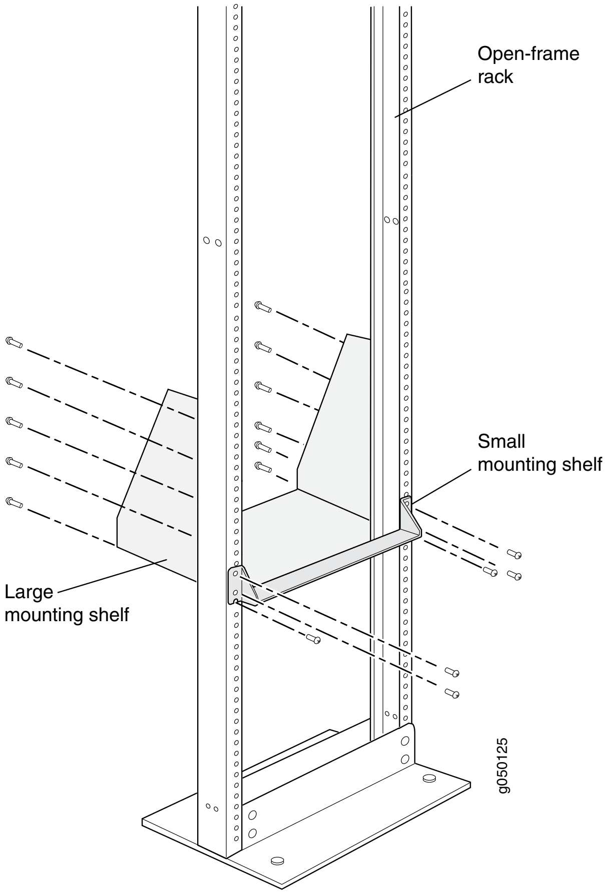
Site Preparation Checklist for a QFX3008-I Interconnect Device

Installing QFX3008-I Interconnect Device Mounting Hardware on Two-Post Racks

Before you install the QFX3008-I Interconnect device in a two-post rack, you must first install mounting hardware on the rack (see Figure 26 on page 179). If spacer bars were included in your shipment, they are not needed for this mounting option; however, you can leave them attached to the front-mounting brackets.

> **NOTE:** In a rack, the device uses 21 U. You can mount two QFX3008-I Interconnect devices on a 42 U rack provided that the racks meet the strength requirements to support the combined weight of the devices. If you are mounting two QFX3008-I Interconnect devices on a rack, mount the first device on the bottom of the rack.

Figure 26: Installing the Mounting Hardware for a Two-Post Rack



For a two-post rack, Table 62 on page 179 specifies the holes in which you insert mounting screws (an **X** indicates a mounting hole location), and cage nuts if needed. The hole distances are relative to one of the standard “U” divisions on the rack. For reference, the bottom of all mounting shelves is at 0.04 in. (0.02 U) above a U division.

Table 62: Two-Post Rack Mounting Hole Locations

Hole	Distance Above “U” Division		Large Shelf	Small Shelf
30	17.26 in. (43.8 cm)	9.86 U	**X**	
27	15.51 in. (39.4 cm)	8.86 U	**X**	
24	13.76 in. (34.9 cm)	7.86 U	**X**	
21	12.01 in. (30.5 cm)	6.86 U	**X**	
18	10.26 in. (26.0 cm)	5.86 U	**X**	

Table 62: Two-Post Rack Mounting Hole Locations *(continued)*

Hole	Distance Above "U" Division		Large Shelf	Small Shelf
15	8.51 in. (21.6 cm)	4.86 U	**X**	
12	6.76 in. (17.1 cm)	3.86 U	**X**	
9	5.01 in. (12.7 cm)	2.86 U	**X**	
6	3.26 in. (8.3 cm)	1.86 U	**X**	
3	1.51 in. (3.8 cm)	0.86 U	**X**	**X**
2	0.88 in. (2.2 cm)	0.50 U	**X**	**X**
1	0.25 in. (0.6 cm)	0.14 U		**X**

Installing Cage Nuts for QFX3008-I Interconnect Device Two-Post Rack Mounting

For racks without threaded holes, you must install cage nuts on the rack rails in the locations specified in Table 62 on page 179 (an **X** indicates a mounting hole location). The hole distances are relative to one of the standard "U" divisions on the rack rails. The bottom of all mounting shelves is at 0.04 in. (0.02 U) above a U division.

Before you begin, ensure that you have 28 cage nuts appropriate for your rack.

To install the cage nuts in the proper locations:

1. On the front rack rail, install cage nuts in the holes specified in Table 62 on page 179 for the small shelf.

2. On the front rack rail, install cage nuts for the center-mounting brackets. The center-mounting brackets have holes for rack-mounting screws, spaced at 3.5 in. (8.89 cm).

3. On the rear rack rail, install cage nuts in the holes specified in Table 62 on page 179 for the large shelf.

Installing the Small Mounting Shelf for QFX3008-I Interconnect Device Two-Post Rack Mounting

To mount the chassis on a two-post rack, you must first install the mounting shelves on the rack.

Before you begin, ensure that you have the following parts and tools available to install the small mounting shelf:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws
- Six mounting screws appropriate for your rack to attach the small mounting shelf to the rack

1. On the front of each rack rail, partially insert a mounting screw into the lowest hole specified in Table 62 on page 179 for the small shelf.

2. Install the small shelf on the rack. Rest the bottom slot of each ear on a mounting screw. The small shelf installs on the front of the rails, extending away from the rack. The bottom of the small shelf should align with the bottom of the large shelf

3. Partially insert screws into the open holes in the ears of the small shelf. Tighten all the screws.

Installing the Large Mounting Shelf for QFX3008-I Interconnect Device Two-Post Rack Mounting

To mount the chassis on a two-post rack, you must first install the mounting shelves on the rack.

Before you begin, ensure that you have the following parts and tools available to install the large mounting shelf:

- A Phillips (+) screwdriver, number 2 or 3, depending on the size of your rack mounting screws
- 22 mounting screws appropriate for your rack to attach the large mounting shelf to the rack

To install the large mounting shelf and spacer bars:

1. On the rear of each rack rail, partially insert a mounting screw into the lowest hole specified in Table 62 on page 179 for the large shelf.

2. Install the large shelf on the rack. Rest the bottom slot of each ear on a mounting screw.

3. Partially insert screws into the open holes in the ears of the large shelf. Tighten all the screws.

RELATED DOCUMENTATION

Understanding Interconnect Devices | 27

QFX3008-I Interconnect Device Overview

Field-Replaceable Units in a QFX3008-I Interconnect Device

Installing the Cable Management System on a QFX3008-I Interconnect Device

Mounting a QFX3008-I Interconnect Device on a Rack or Cabinet Using a Mechanical Lift

The QFX3008-I Interconnect device ships installed with front-mounting brackets and center-mounting brackets on the chassis for mounting the device on a 19-in. equipment rack or cabinet. (The remainder of this topic uses "rack" to mean "rack or cabinet.") The chassis also comes with mounting shelves and brackets to support it in the rack.

Because of the chassis size and weight, we require using a mechanical lift to install the device.

CAUTION: Before mounting the device in a rack, have a qualified technician verify that the rack is strong enough to support the device's weight and is adequately supported at the installation site.

NOTE: In a rack, the chassis occupies 21 U. You can mount two devices on a 42 U rack provided that the racks meet the strength requirements to support the combined weight of the devices. If you are mounting two devices on a rack, mount the first device on the bottom of the rack.

Before mounting a QFX3008-I Interconnect device in a rack:

1. Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3008-I Interconnect Device*.

2. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure. See*Clearance Requirements for Airflow and Hardware Maintenance for a QFX3008-I Interconnect Device* for detailed information.

3. Read *General Safety Guidelines and Warnings*, with particular attention to *Chassis Lifting Guidelines for a QFX3008-I Interconnect Device*.

4. Unpack the device as described in "Unpacking a QFX3008-I Interconnect Device" on page 166.

5. In a four-post rack, install the mounting hardware at the desired position as described in "Installing QFX3008-I Interconnect Device Mounting Hardware on Four-Post Racks or Cabinets" on page 170. In

a two-post rack, install the mounting hardware at the desired position as described in "Installing QFX3008-I Interconnect Device Mounting Hardware on Two-Post Racks" on page 178.

Before you begin, ensure that you have the following parts and tools available to mount the device in a rack:

- A mechanical lift with a load capacity of at least 750 lb (341 kg). If you do not have a lift rated for 750 lb (341 kg), you must remove all components from the chassis and use a lift rated for at least 250 lb (114 kg). The weight of an empty QFX3008-I Interconnect device and midplane is approximately 205 lb (93 kg).
- Phillips (+) screwdriver, number 2 or number 3, depending on the size of your rack mounting screws, for mounting the device in a rack (not provided)
- Mounting screws appropriate for your rack (not provided)
- Rear support anchors to secure the chassis to the four-post mounting shelf and rear support bracket (provided)

> **NOTE:** Earlier versions of the four-post rack mounting hardware did not require the rear support anchors. If your four-post rack mounting hardware includes spacer bars and two shelves the rear support anchors are not required.

- Four screws, two UNC 1/4-20 (right side) screws and two M6 (left side) screws, to secure the rear support anchors to the chassis (provided)

To mount the QFX3008-I Interconnect device in a rack using a mechanical lift (see Figure 27 on page 184 and Figure 28 on page 185):

1. Load the device onto the lift, making sure it rests securely on the lift platform.

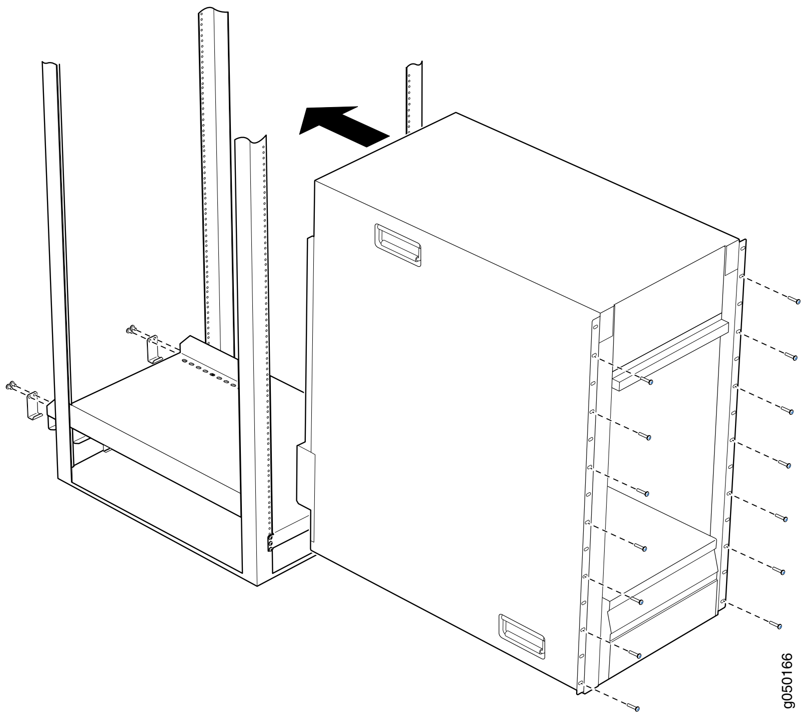
2. Using the lift, position the device in front of the rack, centering it in front of the mounting shelves installed in the rack.

3. Lift the chassis approximately 0.75 in. (1.9 cm) above the surface of the mounting shelves. Position the chassis in the rack as close as possible to resting on the support that the mounting shelves provide.

4. In a four-post rack, carefully slide the device onto the mounting shelves until the front-mounting brackets ("ears") attached to the chassis contact the rack rails. The handles on the side of the chassis can be used to help position the Interconnect device in the rack.

   In a two-post rack, carefully slide the device onto the mounting shelves until the center-mounting brackets ("ears") attached to the chassis contact the rack rails. The handles on the side of the chassis can be used to help position the QFX3008-I Interconnect device in the rack.

Figure 27: Installing a QFX3008-I Interconnect Device in a Four-Post Rack



5. Move the lift away from the rack.

6. Ensure the mounting brackets are flush with the front of the rack.

7. Install a mounting screw into each of the open front-mounting holes aligned with the rack, starting from the bottom.

8. Visually inspect the alignment of the device. If the device is installed properly in the rack, all the mounting screws on one side of the rack are aligned with the mounting screws on the opposite side, and the device is level.

9. After ensuring that the device is aligned properly, tighten the screws.

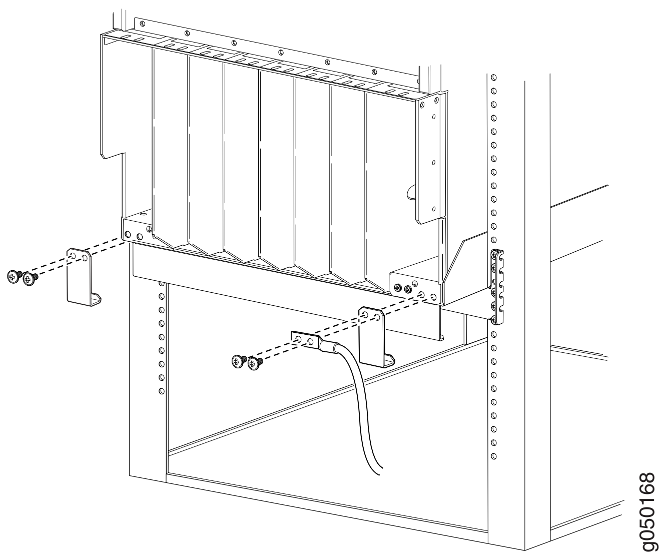
10. In a four-post rack, hook the rear support anchors around the bottom rear flange of the mounting shelf so that its holes line up with the grounding lug screw holes at the bottom left and right corner of the chassis rear.

NOTE: Earlier versions of the four-post rack mounting hardware did not require the rear support anchors. If your four-post rack mounting hardware includes spacer bars and two shelves the rear support anchors are not required.

11. Secure the rear support anchors with the provided UNC 1/4-20 (right side) screws and M6 (left side) screws.

TIP: Because the rear support anchors are attached to the chassis grounding points, it is best to connect the chassis to earth ground while performing this step. See "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186 for more information.

Figure 28: Attaching Rear Support Anchors to the QFX3008-I Chassis in a Four-Post Rack



RELATED DOCUMENTATION

Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays | 188

Powering On a QFX3008-I Interconnect Device | 205

Rack Requirements for a QFX3008-I Interconnect Device

Cabinet Requirements for a QFX3008-I Interconnect Device

Connecting Earth Ground to a QFX3008-I Interconnect Device

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, we recommend that the QFX3008-I Interconnect device be adequately grounded before it is connected to power.

Two pairs of threaded inserts (PEM nuts) are provided on the QFX3008-I Interconnect device for connecting the device to earth ground. The first pair is sized for M6 screws and is located below the wiring tray on the bottom left corner at the rear of the chassis. The second pair is sized for UNC ¼-20 screws and is located below the second wiring tray on the bottom right corner at the rear of the chassis. The grounding points are spaced 0.625 in. (15.86 mm) apart. The grounding lug required is a Panduit LCD2-14A-Q or equivalent.

The accessory box shipped with the device includes a cable lug and two UNC ¼-20 screws with integrated washers. For power cord and grounding cable specifications, see "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays" on page 131, "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 133, "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 134, and *Grounding Cable and Lug Specifications for a QFX3008-I Interconnect Device*.

Before you begin to connect the QFX3008-I Interconnect device to earth ground:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that a licensed electrician has attached the grounding lug to an appropriate grounding cable (see *Grounding Cable and Lug Specifications for a QFX3008-I Interconnect Device*).

> **CAUTION:** Using a grounding cable with an incorrectly attached lug can damage the device.

Ensure you have the following tools and parts available to connect a QFX3008-I Interconnect device to earth ground:

- Electrostatic discharge (ESD) grounding strap
- Grounding cable (not provided) with attached lug
- Screws and split washers to secure the grounding lug to the protective earthing terminal (two UNC ¼-20 screws with integrated washers are provided)
- Phillips (+) torque screwdriver, number 2

> **CAUTION:** You must use an appropriate torque-controlled tool to tighten the screws on the grounding lug. Applying excessive torque damages the grounding lug or chassis. Ground lugs should be installed with SAE Grade 5 screws or better at no more than 72 in-lb (8 Nm).

To connect a QFX3008-I Interconnect device to earth ground (see Figure 29 on page 188):

1. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the approved ESD site grounding point.

2. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the device is installed.

3. Detach the ESD grounding strap from the site ESD grounding point.

4. Attach an electrostatic discharge (ESD) grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

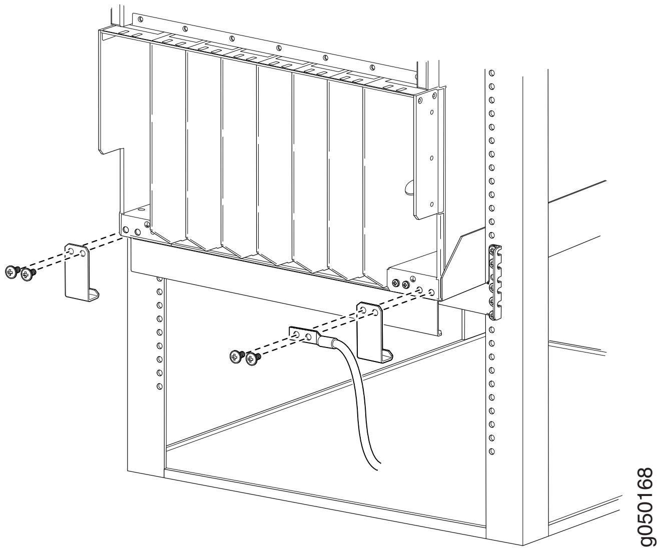
5. In a four-post rack, place the grounding lug attached to the grounding cable over one of the rear support anchors, as shown in Figure 29 on page 188.

   In a two-post rack, place the grounding cable lug over the grounding points on the bottom rear of the chassis below the wiring trays.

   The left pair is sized for M6 screws, and the right pair is sized for UNC ¼-20 screws.

6. Using the torque screwdriver, secure the grounding lug to the protective earthing terminal.

Figure 29: Connecting a Grounding Cable to a QFX3008-I Interconnect Device



RELATED DOCUMENTATION

Site Preparation Checklist for a QFX3008-I Interconnect Device

Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays

A QFX3008-I Interconnect device is configured with six AC power supplies and two wiring trays.

CAUTION: Mixing different types of wiring trays in the same chassis is not a supported configuration.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the QFX3008-I Interconnect device must be adequately grounded before it is connected to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the QFX3008-I Interconnect device to connect to earth ground. For instructions on connecting a QFX3008-I Interconnect device to ground using a separate grounding conductor, see "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186.

A QFX3008-I Interconnect device receives additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays" on page 131.

NOTE: Each wiring tray AC appliance inlet must be connected to a dedicated AC power source outlet.

Before you begin to connect power to the device:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Install power supplies in the device. See *Installing an AC Power Supply in a QFX3008-I Interconnect Device*.
- Install single-phase wiring trays in the device. See *Installing a Wiring Tray in a QFX3008-I Interconnect Device*.

Ensure that you have the following parts and tools available to connect power to the device:

- Electrostatic discharge (ESD) grounding strap
- Power cords appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Single-Phase Wiring Trays" on page 131.

WARNING: Ensure that the power cords do not block access to device components or drape where people can trip on them.

To connect AC power to a QFX3008-I Interconnect device with single-phase wiring trays (see Figure 30 on page 190:

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

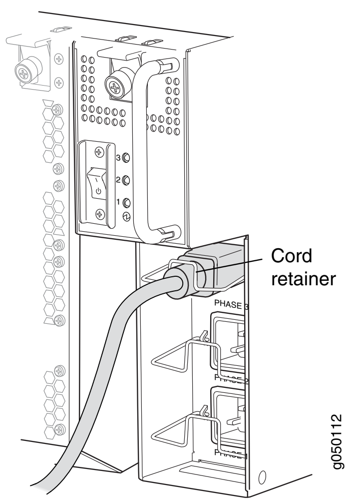
2. Ensure that the wiring tray is fully inserted and latched securely in the chassis. See *Installing a Wiring Tray in a QFX3008-I Interconnect Device*.

3. Set the switch, which is near the top of the wiring tray faceplate, to the OFF (O) position.

4. Locate the power cord or cords shipped with the device; the cords have plugs appropriate for your geographical location.

5. Insert the coupler end of the power cord into the AC appliance inlet on the wiring tray faceplate. See Figure 30 on page 190.

Figure 30: Connecting an AC Power Cord to a Single-Phase Wiring Tray



6. If the AC power source outlet has a power device, set it to the OFF (0) position.

7. Insert the power cord plug into an AC power source outlet.

8. Repeat Step 5 through Step 7 for each AC appliance inlet on the wiring tray faceplate.

9. If the AC power source outlet has a power device, set it to the ON (|) position.

10. Verify that each LED on the wiring tray faceplate is lit solid green. Verify that each LED on the power supply faceplate is lit solid green.

RELATED DOCUMENTATION

Powering On a QFX3008-I Interconnect Device | 205
Wiring Tray in a QFX3008-I Interconnect Device
Wiring Tray LEDs on a QFX3008-I Interconnect Device

Preparing Delta and Wye Three-Phase Power Cords

A QFX3008-I Interconnect device can be configured with two three-phase wiring trays. Delta and wye wiring configurations are available. A licensed electrician must prepare the power cords that you provide for installation in the wiring tray. Several parts included with the wiring trays enable the power cords to be dressed in different positions. If you need the power cable to be routed up to the top of a rack, you must use the included 90° connector to enable the power cord to be routed upward (see Figure 31 on page 191). The 90° connector provides more flexibility to position the power cord outside the width of the chassis. Alternatively, if the power cords will be routed down to the bottom of the rack, or space limitations prevent you from extending the width of the chassis footprint, you can use the flat connector to install the power cord (see Figure 32 on page 192). Figure 33 on page 192 and Figure 34 on page 193 show the power cords installed on the wiring trays in the two different positions. Figure 35 on page 193 shows the wiring tray being installed in the chassis, using the flat connector.

Figure 31: Assembling a Power Cord Using a 90° Connector

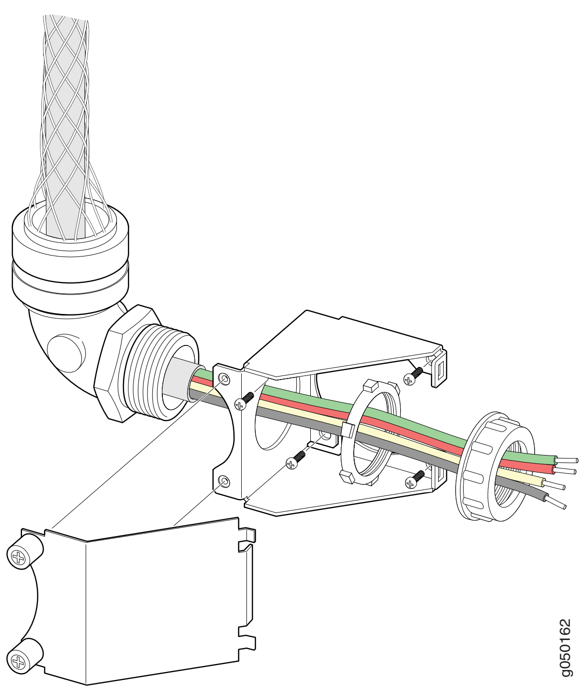


Figure 32: Assembling a Power Cord Using a Flat Connector

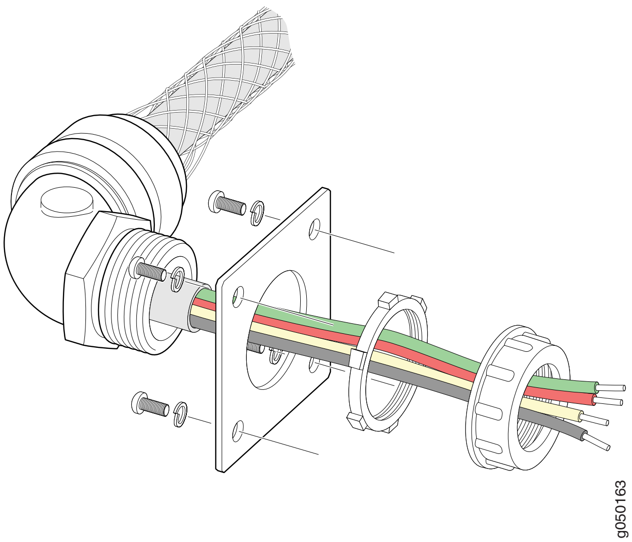


Figure 33: Wye Wiring Tray with a 90° Connector Installed

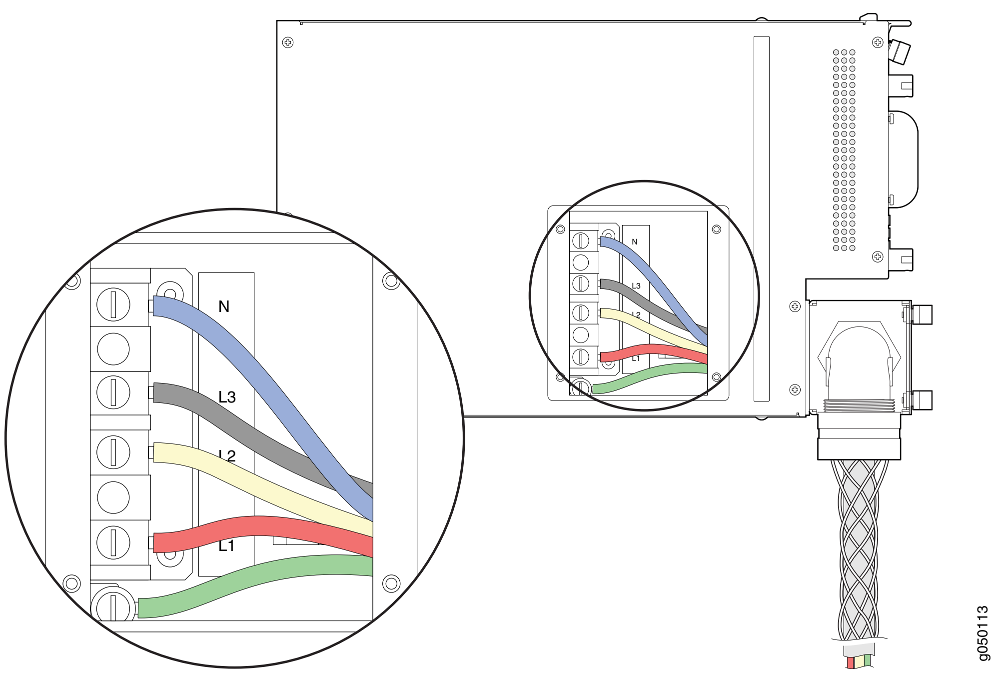


Figure 34: Delta Wiring Tray with a Flat Connector Installed

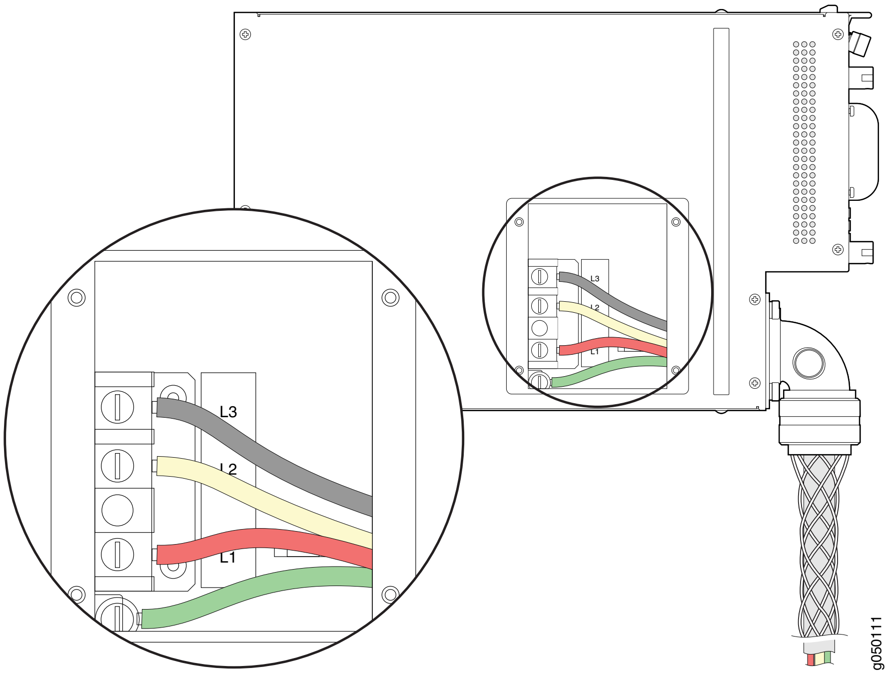
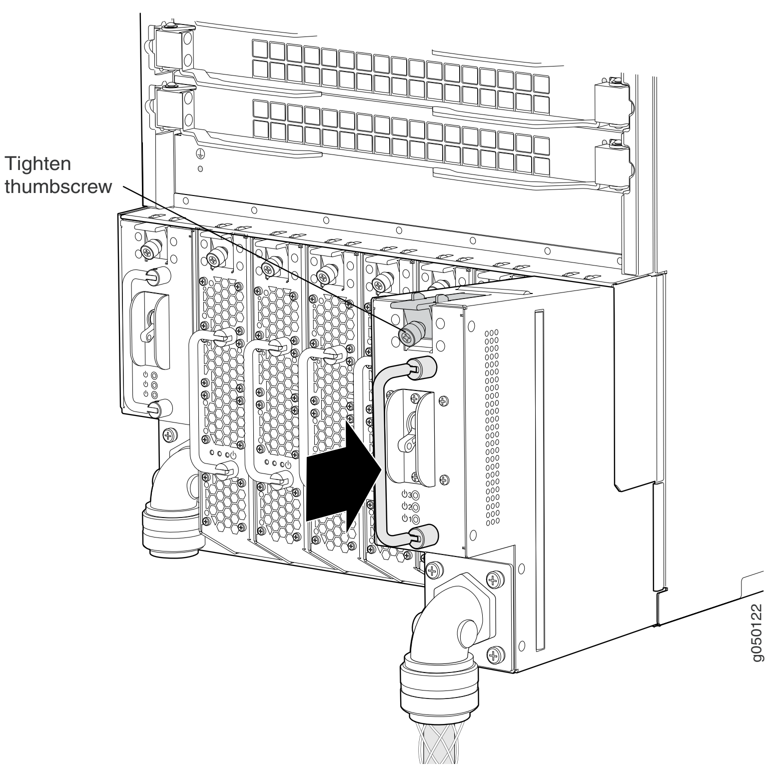


Figure 35: Installing a Three-Phase Wiring Tray with a Power Cord Installed



CAUTION: Mixing different types of wiring trays in the same chassis is not a supported configuration.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, a QFX3008-I Interconnect device must be adequately grounded before it is connected to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the QFX3008-I Interconnect device to connect to earth ground. For instructions on connecting a QFX3008-I Interconnect device to ground using a separate grounding conductor, see "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186.

A QFX3008-I Interconnect device receives additional grounding when you plug the wiring tray in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 133 or "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 134.

NOTE: Each wiring tray must be connected to a dedicated AC power source outlet.

Before you begin to prepare the wiring trays for installation:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.

Ensure that you have the following parts and tools available to prepare the wiring trays for installation:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 2
- Power cords appropriate for your wiring trays and geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 133 or "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 134.

WARNING: Ensure that the power cords do not block access to device components or drape where people can trip on them.

To prepare three-phase power cords for installation:

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

2. Ensure that the power cords are not connected to power outlets. Switch off the customer site circuit breakers. Ensure that the voltage across the AC power source is 0 V and that there is no chance that the voltage might become active during installation.

3. Remove a wiring tray from the chassis. See *Removing a Wiring Tray from a QFX3008-I Interconnect Device*.

4. Flip the breaker on the wiring tray faceplate to the OFF (O) position.

5. Using a number 2 Phillips (+) screwdriver, loosen and remove the screws and washers that hold the square flat connector to the wiring tray. Keep the screws and washers.

6. Depending on how you want to dress the power cords, decide whether to use the 90° connector to attach the power cord to the wiring tray or the square flat connector that you removed in Step 5.

7. Insert the power cord in the wire strain relief by compressing the wire strain relief to enlarge the opening. Pull enough cord through the strain relief to allow easy wiring connections to the terminal block.

8. Remove first the plastic, then the metal retaining nuts from the wire strain relief, and place either the 90° connector or flat connector over the threaded portion of the wire strain relief as shown in Figure 31 on page 191 or Figure 32 on page 192.

9. Screw first the metal, then the plastic retaining nuts on the threaded portion of the wire strain relief to complete the assembly.

10. Route the wiring through the hole in the wiring tray, and using a number 2 Phillips (+) screwdriver, attach the connector to the wiring tray using the screws and washers you removed in Step 5.

TIP: If you are ready to make the wiring connections to the terminal block, see "Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 196 or "Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 200.

11. Repeat Step 3 through Step 10 for the other wiring tray.

RELATED DOCUMENTATION

Powering On a QFX3008-I Interconnect Device | 205

Wiring Tray in a QFX3008-I Interconnect Device

Wiring Tray LEDs on a QFX3008-I Interconnect Device

Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays

A QFX3008-I Interconnect device is configured with six AC power supplies and two wiring trays.

CAUTION: Mixing different types of wiring trays in the same chassis is not a supported configuration.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the QFX3008-I Interconnect device must be adequately grounded before it is connected to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the QFX3008-I Interconnect device to connect to earth ground. For instructions on connecting a QFX3008-I Interconnect device to ground using a separate grounding conductor, see "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186.

A QFX3008-I Interconnect device receives additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays" on page 133.

NOTE: Each wiring tray must be connected to a dedicated AC power source outlet.

Before you begin to connect power to the device:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that a licensed electrician has prepared the power cords. See "Preparing Delta and Wye Three-Phase Power Cords" on page 191.

Ensure that you have the following parts and tools available to connect power to the device:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Slotted (–) screwdriver, 1/4 inch, with a torque range between 23 in-lb (2.6 Nm) and 25 in-lb (2.8 Nm)

CAUTION: You must use an appropriate torque-controlled tool to tighten the screws on the terminal block. Applying excessive torque damages the terminal block and the wiring tray. The absolute maximum torque that may be applied to this screw is 50 in-lb (5.6 Nm).

WARNING: Ensure that the power cords do not block access to device components or drape where people can trip on them.

To connect AC power to three-phase delta wiring trays:

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

2. Ensure that the power cords are not connected to power outlets. Switch off the customer site circuit breakers. Ensure that the voltage across the AC power source is 0 V and that there is no chance that the voltage might become active during installation.

3. If the wiring tray is installed in the chassis, remove it. See *Removing a Wiring Tray from a QFX3008-I Interconnect Device*. The power cord must be attached to the wiring tray as described in "Preparing Delta and Wye Three-Phase Power Cords" on page 191.

4. Ensure that the power switch on the wiring tray faceplate is in the OFF (O) position.

5. Using a number 1 Phillips (+) screwdriver, loosen the four screws on the metal AC wiring compartment on the side of the wiring tray (see Figure 36 on page 199).

6. Open the metal door of the wiring tray compartment.

7. Connect the wires to the AC terminal block on the three-phase delta wiring tray (Figure 36 on page 199). Use a 1/4-in. slotted screwdriver to loosen the input terminal or grounding point screw, insert each wire into the grounding point or input terminal, and tighten the screw to between 23 in-lb (2.6 Nm) and 25 in-lb (2.8 Nm).

   CAUTION: You must use an appropriate torque-controlled tool to tighten the screws on the terminal block. Applying excessive torque damages the terminal block and the wiring tray. The absolute maximum torque that may be applied to this screw is 50 in-lb (5.6 Nm).

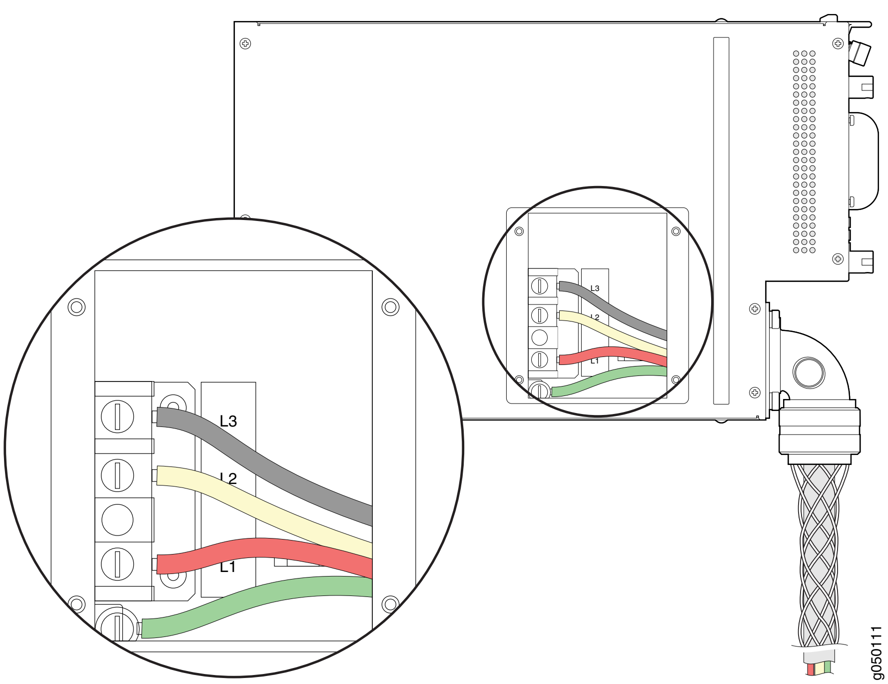
   a. Insert the wire labeled **GND** into the grounding point labeled **GND**.

   b. Insert the wire labeled **L1** into the **L1** input terminal.

   c. Insert the wire labeled **L2** into the **L2** input terminal.

   d. Insert the wire labeled **L3** into the **L3** input terminal.

Figure 36: Connecting Power to a Three-Phase Delta AC Power Supply



NOTE: The color of each AC power wire might vary.

8. Verify that the power cable connections are correct.

9. Replace the cover on the wiring compartment, and using a number 1 Phillips (+) screwdriver, tighten the four screws.

10. Repeat Step 3 through Step 9 for the other wiring tray.

RELATED DOCUMENTATION

Powering On a QFX3008-I Interconnect Device | 205

Wiring Tray in a QFX3008-I Interconnect Device

Wiring Tray LEDs on a QFX3008-I Interconnect Device

Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays

A QFX3008-I Interconnect device is configured with six AC power supplies and two wiring trays.

CAUTION: Mixing different types of wiring trays in the same chassis is not a supported configuration.

CAUTION: To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, the QFX3008-I Interconnect device must be adequately grounded before it is connected to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the QFX3008-I Interconnect device to connect to earth ground. For instructions on connecting a QFX3008-I Interconnect device to ground using a separate grounding conductor, see "Connecting Earth Ground to a QFX3008-I Interconnect Device" on page 186.

A QFX3008-I Interconnect device receives additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays" on page 134.

NOTE: Each wiring tray must be connected to a dedicated AC power source outlet.

Before you begin to connect power to the device:

- Ensure that you understand how to prevent ESD damage. See *Prevention of Electrostatic Discharge Damage*.
- Ensure that a licensed electrician has prepared the power cords. See "Preparing Delta and Wye Three-Phase Power Cords" on page 191.

Ensure that you have the following parts and tools available to connect power to the device:

- Electrostatic discharge (ESD) grounding strap
- Phillips (+) screwdriver, number 1
- Slotted (–) screwdriver, 1/4 inch, with a torque range between 23 in-lb (2.6 Nm) and 25 in-lb (2.8 Nm)

CAUTION: You must use an appropriate torque-controlled tool to tighten the screws on the terminal block. Applying excessive torque damages the terminal block and the wiring tray. The absolute maximum torque that may be applied to this screw is 50 in-lb (5.6 Nm).

WARNING: Ensure that the power cords do not block access to device components or drape where people can trip on them.

To connect AC power to three-phase wye wiring trays:

1. Attach the ESD grounding strap to your bare wrist, and connect the strap to the ESD point on the chassis.

2. Ensure that the power cords are not connected to power outlets. Switch off the customer site circuit breakers. Ensure that the voltage across the AC power source is 0 V and that there is no chance that the voltage might become active during installation.

3. If the wiring tray is installed in the chassis, remove it. See *Removing a Wiring Tray from a QFX3008-I Interconnect Device*. The power cord must be attached to the wiring tray as described in "Preparing Delta and Wye Three-Phase Power Cords" on page 191.

4. Ensure that the power switch on the wiring tray faceplate is in the OFF (O) position.

5. Using a number 1 Phillips (+) screwdriver, loosen the four screws on the metal AC wiring compartment on the side of the wiring tray (see Figure 37 on page 203).

6. Open the metal door of the wiring tray compartment.

7. Connect the wires to the AC terminal block on the three-phase wye wiring tray (Figure 37 on page 203). Use a 1/4-in. slotted screwdriver to loosen the input terminal or grounding point screw, insert each wire into the grounding point or input terminal, and tighten the screw to between 23 in-lb (2.6 Nm) and 25 in-lb (2.8 Nm).

> **CAUTION:** You must use an appropriate torque-controlled tool to tighten the screws on the terminal block. Applying excessive torque damages the terminal block and the wiring tray. The absolute maximum torque that may be applied to this screw is 50 in-lb (5.6 Nm).

a. Insert the wire labeled **GND** into the grounding point labeled **GND**.

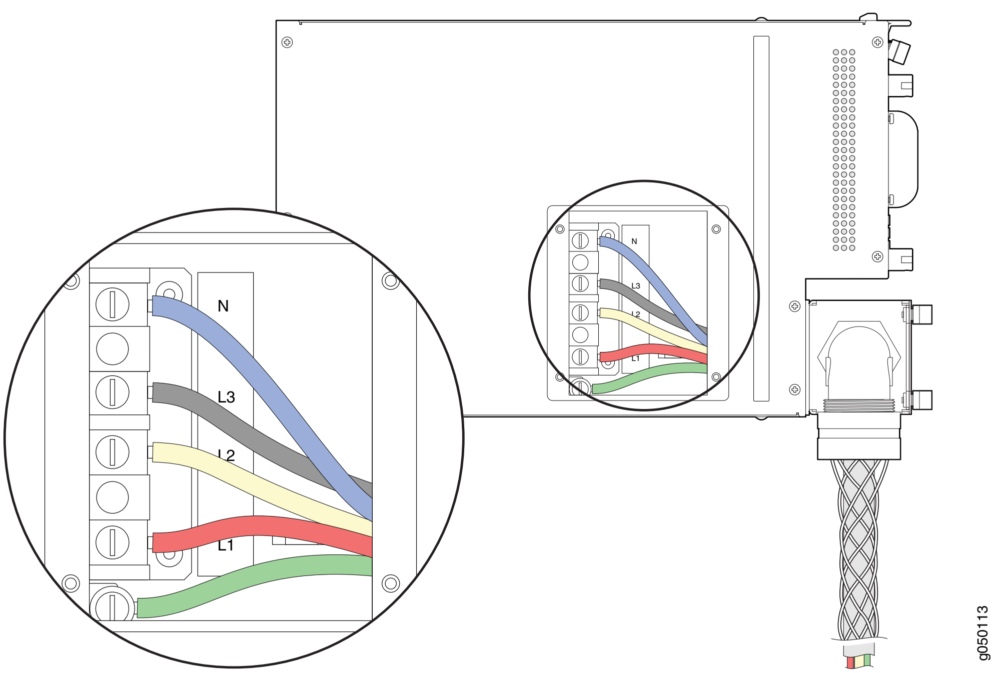
b. Insert the wire labeled **L1** into the **L1** input terminal.

c. Insert the wire labeled **L2** into the **L2** input terminal.

d. Insert the wire labeled **L3** into the **L3** input terminal.

e. Insert the wire labeled **N** into the **N** input terminal

Figure 37: Connecting Power to the Three-Phase Wye Wiring Tray



> **NOTE:** The color of each AC power wire might vary.

8. Verify that the power cable connections are correct.

9. Replace the cover on the wiring compartment, and using a number 1 Phillips (+) screwdriver, tighten the four screws.

10. Repeat Step 3 through Step 9 for the other wiring tray.

RELATED DOCUMENTATION

Powering On a QFX3008-I Interconnect Device | 205

Wiring Tray in a QFX3008-I Interconnect Device

Wiring Tray LEDs on a QFX3008-I Interconnect Device

Connecting a QFX Series Device to a Management Console

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

> **NOTE:** If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the QFX Series, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the QFX Series to a management console (see Figure 22 on page 162 and Figure 23 on page 162):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).

2. Connect the other end of the Ethernet cable into the console server (see Figure 22 on page 162) or management console (see Figure 23 on page 162).

Figure 38: Connecting the QFX Series to a Management Console Through a Console Server

Figure 39: Connecting the QFX Series Directly to a Management Console

RELATED DOCUMENTATION

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

Powering On a QFX3008-I Interconnect Device

Before you power on the QFX3008-I Interconnect device, ensure that:

- You understand how to protect the device from electrostatic damage. See *Prevention of Electrostatic Discharge Damage*.
- You have connected the QFX3008-I Interconnect device to the QFabric system control plane and management network. See "QFX3000-G QFabric System Installation Overview" on page 105.

Ensure that you have the following parts and tools available to power on the device:

- An electrostatic discharge (ESD) grounding strap.

To power on the device:

1. Attach the ESD grounding strap to your bare wrist and connect the strap to the ESD point on the chassis.

2. Ensure that the power supplies are fully inserted in the chassis.

3. Ensure that the source power cords are installed correctly for each wiring tray, and the wiring trays are fully inserted in the chassis.

4. Switch on the site circuit breakers.

5. Set a wiring tray's switch to the ON (|) position. Observe the power supply and wiring tray faceplate LEDs. If the wiring trays are installed correctly and functioning normally, the LEDs light green and remain constantly lit.

6. Repeat Step 5 for the second wiring tray installed in the device.

RELATED DOCUMENTATION

Installing an AC Power Supply in a QFX3008-I Interconnect Device
Connecting AC Power to a QFX3008-I Interconnect Device with Single-Phase Wiring Trays | **188**
Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Delta Wiring Trays | **196**
Connecting AC Power to a QFX3008-I Interconnect Device with Three-Phase Wye Wiring Trays | **200**
Powering Off a QFX3008-I Interconnect Device

CHAPTER 10

Installing a QFX5100 Node Device

IN THIS CHAPTER

Installing and Connecting a QFX5100 Device

You can mount a QFX5100 device:

- Flush with the front of a 19-in. four-post rack. Use the standard mounting brackets provided with the switch for this configuration.
- Recessed 2 in. (5 cm) from the front of a 19-in. four-post rack. Use the extension bracket provided in the standard mounting kit for this configuration. Recessed mounting is primarily used in enclosed cabinets.

To install and connect a QFX5100 device:

1. Follow the instructions in "Unpacking a QFX5100 Device" on page 208.

2. Determine how the device is to be mounted.

   Flush or recessed mounted in a rack or cabinet, see "Mounting a QFX5100 Device in a Rack or Cabinet" on page 210.

3. Follow the instructions in:

   a. Connecting Earth Ground to a QFX5100 Device on page 215

b. "Connecting AC Power to a QFX5100 Device" on page 216 or Connecting DC Power to a QFX5100 Device on page 219

c. *Registering Products—Mandatory for Validating SLAs*

4. Depending on how you plan to use the QFX5100 device, do one of the following:

   - If you are using the QFX5100 device as a standalone switch, follow the instructions in *Configuring a QFX5100 Device*.
   - If you are using the QFX5100 device as a Node device in a QFX3000-G QFabric system, see "QFX3000-G QFabric System Installation Overview" on page 105 for information about the steps to install and configure your QFX3000-G QFabric system.
   - If you are using the QFX5100 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.
   - If you are using a QFX5100-24Q as an Interconnect device in a QFX3000-M QFabric system, see *Connecting a QFX5100 Node Device to a QFX5100-24Q Interconnect Device*.
   - If you are using the QFX5100 device in a Virtual Chassis Fabric, see *Connecting a QFX5100 Device in a Virtual Chassis Fabric*.

RELATED DOCUMENTATION

Rack Requirements for a QFX5100 Device

Cabinet Requirements for a QFX5100 Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX5100 Device

Unpacking a QFX5100 Device

The QFX5100 switch chassis is a rigid sheet-metal structure that houses the hardware components. A QFX5100 device is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

CAUTION: QFX5100 devices are maximally protected inside the shipping carton. Do not unpack the switch until you are ready to begin installation.

To unpack a QFX5100 device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Remove the accessory box and verify the contents against the inventory included in the box. Table 63 on page 209 lists the inventory of components supplied with a QFX5100 device.

5. Pull out the packing material holding the switch in place.

6. Verify the chassis components received:

   - Two power supplies
   - Fan modules
     - Five fan modules for 1 U devices
     - Three fan modules for 2 U devices

   > **NOTE:** Product SKU QFX5100-24Q: If you ordered the optional high-speed uplink modules, they are packaged as components and must be installed in the switch

7. Save the shipping carton and packing materials in case you need to move or ship the switch later.

Table 63: Inventory of Components Supplied with a QFX5100 Device

Component	Quantity
Chassis with five fan modules and two power supplies. The QFX5100-96S has three fan modules.	1
Rear mounting blades	2
Front mounting brackets	2
Extension brackets	2
RJ-45 cable and RJ-45 to DB-9 adapter	1
Power cords (AC systems only)	2

RELATED DOCUMENTATION

Mounting a QFX5100 Device in a Rack or Cabinet

IN THIS SECTION

You can mount all QFX5100 switches on a four post 19-in. rack or cabinet using the mounting kit provided with the device.

For four post rack or cabinet installations, the mounting kit contains two front mounting rails with two matching rear mounting blades. This configuration allows either end of the switch to be mounted flush with the rack and still be adjustable for racks with different depths.

(The remainder of this topic uses “rack” to mean “rack or cabinet.”) The front and rear rack rails must be spaced between 28 in. (71.1 cm) and 36 in. (91.4 cm) front to back.

Before You Begin Rack Installation

Before you begin mounting a QFX5100 switch in the rack or cabinet:

1. Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.

2. Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX5100 Device*.

3. Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.

4. Read “General Site Guidelines” on page 115, with particular attention to *Chassis Lifting Guidelines for a QFX5100 Device*.

5. Remove the switch from the shipping carton (see "Unpacking a QFX5100 Device" on page 208).

6. Ensure that you have the following parts and tools available to mount the switch in a rack:
   - ESD grounding strap (not provided).
   - Blades, rails, or brackets (provided).
     - For four-post installations:
       - One pair of rear mounting blades. These mounting blades support the rear of the chassis and must be installed (provided).
       - One pair of front mounting rails. The mounting blades slide into the mounting rails to support the switch (provided).
       - Screws to secure the mounting rails to the chassis (provided).
         - Twelve screws for 1 U chassis
         - Twenty-four screws for QFX5100-96S
       - Eight screws to secure the chassis and rear installation blades to the rack (not provided).
   - Appropriate screwdriver for the mounting screws (not provided).
   - Two power cords with plugs appropriate to your geographical location (provided).
   - RJ-45 cable and RJ-45 to DB-9 serial port adapter (provided).
   - Management host, such as a PC laptop, with a serial port (not provided).

Optional equipment: Grounding cable kit with bracket, lug, and three nuts with integrated washers.

WARNING: The 1 U versions of QFX5100 switches must be supported at all four corners. Mounting the chassis using only the front brackets will damage the chassis and can result in serious bodily injury.

CAUTION: All QFX5100 switches require two people for installation, one person to lift the switch into place and another person to attach the switch to the rack. If you are installing the QFX5100 switch above 60 in. (152.4 cm) from the floor, you can remove the power supplies and fan modules to minimize the weight before attempting to install the switch.

CAUTION: If you are mounting multiple switches on a rack, mount the switch in the lowest position of the rack first. Proceed to mount the rest of the switches from the bottom to the top of the rack to minimize the risk of the rack toppling.

Four-Post Procedure

To mount the switch on four posts in a rack using the provided mounting kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Decide whether the Field Replaceable Unit (FRU) end of the switch or the port end is to be placed at the front of the rack. Position the switch in such a manner that the **AIR IN** labels on components are next to the cold aisle and **AIR OUT** labels on components are next to the hot aisle.

3. Align the holes in the mounting rail with the holes on the side of the chassis. See Figure 40 on page 212 through Figure 42 on page 213 for examples the proper alignment of 1 U and 2 U chassis systems.

Figure 40: Attaching Mounting Rails to the QFX5100-24Q

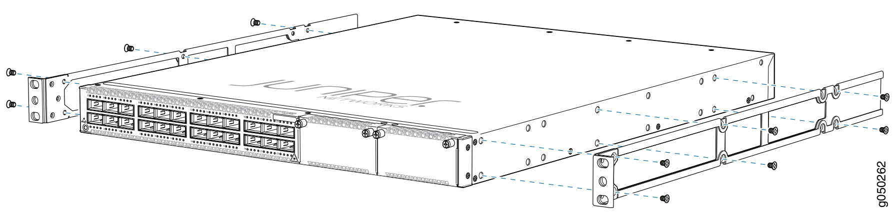


Figure 41: Attaching Mounting Rails to the QFX5100-48S

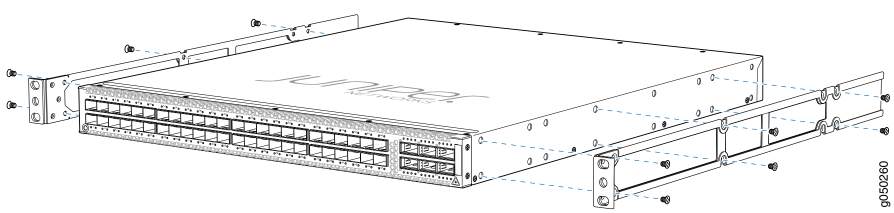
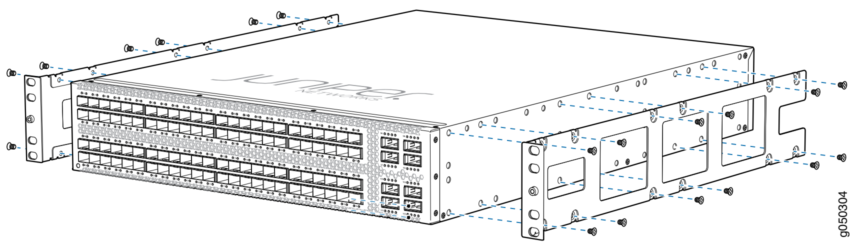


Figure 42: Attaching Mounting Rails to the QFX5100-96S



4. Attach the mounting rail to the switch using the mounting screws (and cage nuts and washers if your rack requires them). Tighten the screws.

5. Repeats steps 4 and 5 on the opposite side of the switch.

6. Have one person grasp both sides of the switch, lift it, and position it in the rack so that the front bracket is aligned with the rack holes.

7. Have a second person secure the front of the switch to the rack using four mounting screws (and cage nuts and washers if your rack requires them.) Tighten the screws. See Figure 43 on page 213 and Figure 44 on page 214 for examples of connecting the mounting rails and blades.

Figure 43: Attach 1 U Switch to Rack

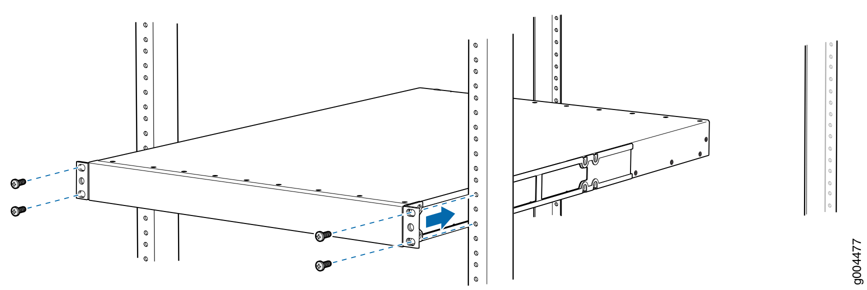
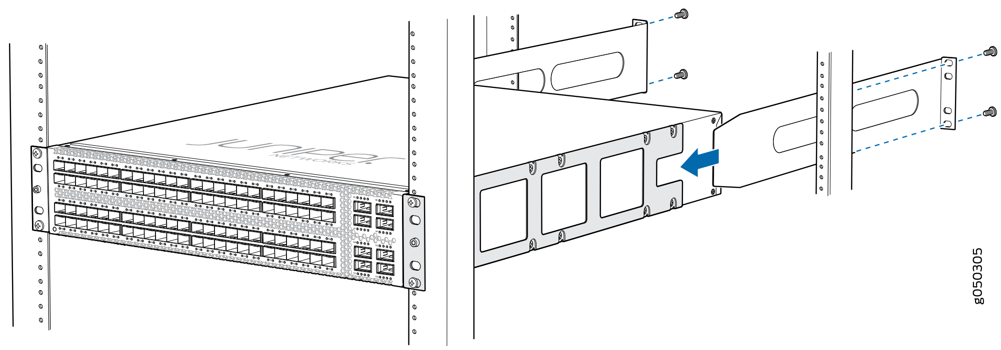
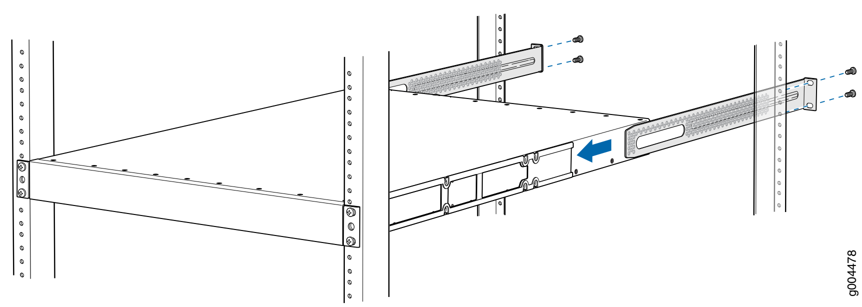


Figure 44: Slide Mounting Rail onto the QFX5100-96S Rear Mounting Blade



8. Continue to support the switch while sliding the rear mounting-blades into the channel of the side mounting-rails and securing the blades to the rack. Use the four mounting screws (and cage nuts and washers if your rack requires them) to attach each blade to the rack. (Use eight front-mounting screws for the QFX5100-96S.) Tighten the screws. See Figure 45 on page 214.

Figure 45: Slide Mounting Blade into 1 U Mounting Rail



9. Ensure that the switch chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings
Connecting AC Power to a QFX5100 Device | 216
Connecting Earth Ground to a QFX5100 Device | 215

Connecting Earth Ground to a QFX5100 Device

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX5100 device to earth ground before you connect it to power.

For installations that require a separate grounding conductor to the chassis, you must attach a protective earthing terminal bracket on the QFX5100 device left front mounting bracket to connect to the earth ground (see Figure 46 on page 216).

Before you connect earth ground to the protective earthing terminal of a QFX5100 device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

CAUTION: Using a grounding cable with an incorrectly attached lug can damage the switch.

NOTE: Mount your switch in the rack or cabinet before attaching the grounding lug to the switch. See "Mounting a QFX5100 Device in a Rack or Cabinet" on page 210.

Ensure that you have the following parts and tools available:

- Protective earthing terminal bracket—This bracket attaches to the QFX5100 switch chassis through the left front mounting bracket, providing a protective earthing terminal for the switch.
- Grounding cable for your QFX5100 device—The grounding cable must be 14 AWG (2 mm^2), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent.
- Two SAE 10-32 washers and screws—To attach the grounding lug to the protective earthing terminal.
- Screwdriver to attach the screws.

An AC-powered QFX5100 switch chassis gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX Series Device" on page 138.

To connect earth ground to a QFX5100 device:

1. Attach one end of the grounding cable to an appropriate earth ground site, such as the mounting rack.

2. Position the grounding lug over the protective earthing terminal on the side of the chassis, which is visible through the mounting bracket.

3. Secure the grounding lug to the protective earthing terminal with the washers and screws. See Figure 46 on page 216 and Figure 47 on page 216.

Figure 46: Connecting a Grounding Cable to a 1 U QFX5100 Device

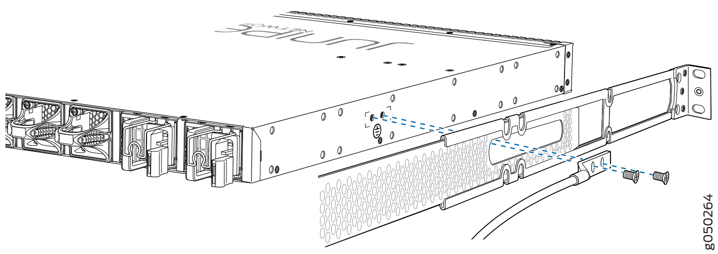
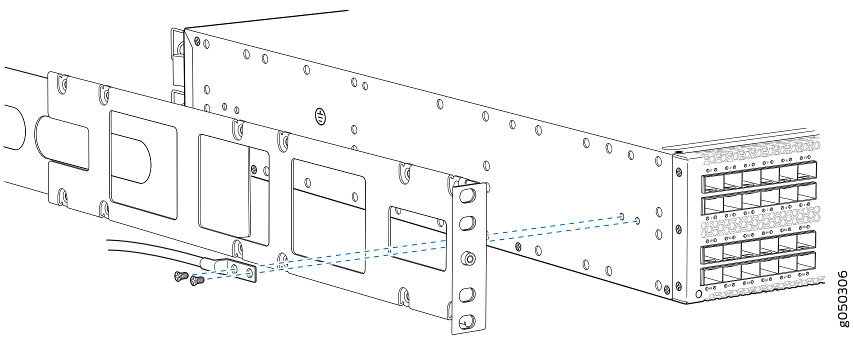


Figure 47: Connecting a Grounding Cable to the 2 U QFX5100-96S Device



4. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

Connecting AC Power to a QFX5100 Device | 216

Connecting DC Power to a QFX5100 Device | 219

Connecting AC Power to a QFX5100 Device

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running.

You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the switch.

Before you begin connecting AC power to the switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the switch chassis to earth ground.

> **CAUTION:** Before you connect power to the switch, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the switch chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX5100 Device" on page 215. The switch gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see *AC Power Supply for a QFX5100 Device*).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5100 device, see *Installing a Power Supply in a QFX5100 Device*.

> **NOTE:** Each power supply must be connected to a dedicated power source outlet.

To connect AC power to a QFX5100 device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.

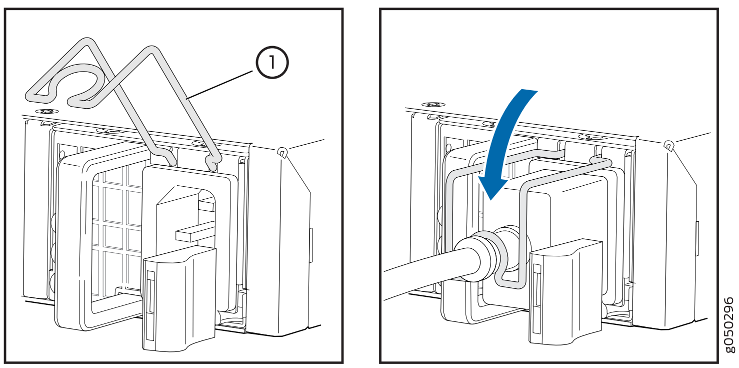
3. Locate the power cord or cords shipped with the switch; the cords have plugs appropriate for your geographical location. See “AC Power Cord Specifications for a QFX Series Device” on page 138.

> **WARNING:** Ensure that the power cord does not block access to device components or drape where people can trip on it.

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.

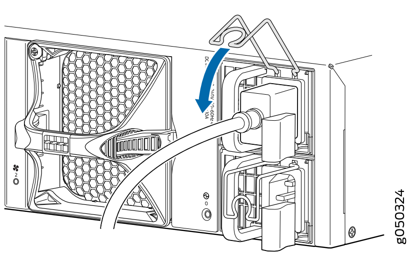
5. Push the power cord retainer onto the power cord (see Figure 48 on page 218 and Figure 49 on page 218).

Figure 48: Connecting an AC Power Cord to an AC Power Supply in a 1 U QFX5100 Device



1–Power cord retainer

Figure 49: Connecting an AC Power Cord to an AC Power Supply in a 2 U QFX5100 Device



6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

> **NOTE:** The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see *Removing a Power Supply from a QFX5100 Device*). Do not remove the power supply until you have a replacement power supply ready: the power supplies or a blank cover panel must be installed in the switch to ensure proper airflow.

   > **CAUTION:** Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

   > **CAUTION:** A system reboot with Routing Engine FPGA version 7.1 might not successfully boot the Junos OS software. In case of a system reboot failure, you need to power cycle the switch. To check the current FPGA version, issue the **show chassis firmware** command.

RELATED DOCUMENTATION

AC Power Supply for a QFX5100 Device

AC Power Supply LEDs on a QFX5100 Device

Connecting DC Power to a QFX5100 Device

The QFX5100 is shipped from the factory with two power supplies. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies in the two slots next to the fan modules without powering off the switch or disrupting the switching function.

> **WARNING:** DC-powered QFX5100 devices are intended for installation only in a restricted access location.

NOTE: The battery returns of the DC power supply must be connected as an isolated DC return (DC-I).

Before you begin connecting DC power to the switch:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the switch chassis to earth ground.

CAUTION: Before you connect power to the switch, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the switch (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the switch chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX5100 Device" on page 215.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX5100 device, see *Installing a Power Supply in a QFX5100 Device*.

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)
- Phillips (+) screwdriver, number 2 (not provided)
- Multimeter (not provided)

To connect DC power to a QFX5100 device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the –48V and RTN DC cables to chassis ground:

   - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.

- The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) DC power input terminal.

  CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the DC power input terminals on each power supply.

3. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

   NOTE: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

4. Ensure that the power supplies are fully inserted in the chassis.

5. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 50 on page 223).

6. Remove the screws on the terminals using the screwdriver. Save the screws.

   WARNING: Ensure that the power cables do not block access to device components or drape where people can trip on them.

7. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 50 on page 223 and Figure 51 on page 224).

   The QFX5100 is designed to operate with a DC power supply that has a single, non-redundant, feed input. For source redundancy, two DC power supplies must be installed in QFX5100; connect source (A) to one power supply and connect source (B) to the second power supply. This configuration provides the commonly deployed A/B feed redundancy for the system.

   The terminal block of the power supply has four terminals labeled V+, V+, V–, and V– for connecting DC power source cables labeled positive (+) and negative (–). The V+ terminals are shunted internally together, as are the V- terminals.

CAUTION: The connection between each power source and power supply must include a circuit breaker.

Do not connect two sources to a single power supply because doing so can potentially cause circulating current in feed wires whenever there is any difference in the voltage of the two sources.

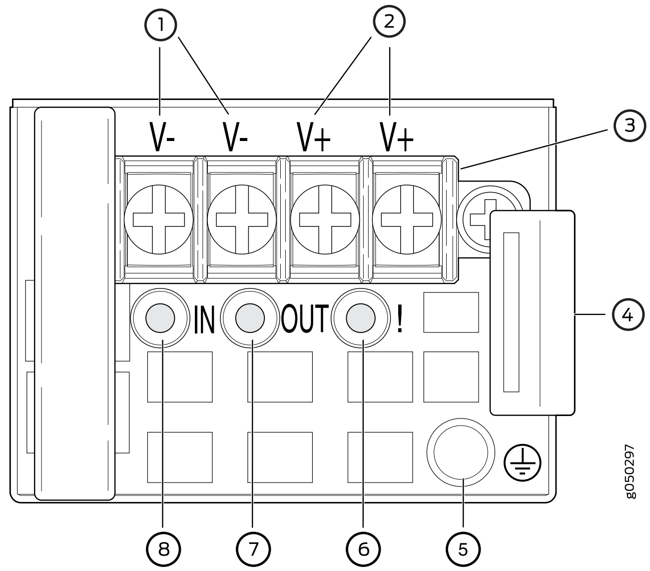
NOTE: For QFX5100-96S installations using battery backup, a single 15 A circuit breaker is recommended.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (–) DC power source cable to the V– terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

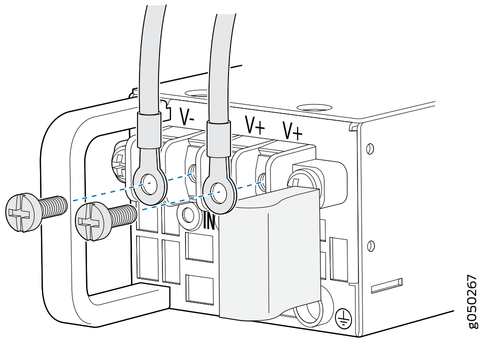
Figure 50: DC Power Supply Faceplate for a QFX5100 Device



1–Shunt negative input terminals (-48V)	5–ESD grounding point
2–Shunt positive input terminals (+RTN)	6–Fault LED
3–Terminal block	7–Output LED
4–Ejector lever	8–Input LED

CAUTION: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 51: Securing Ring Lugs to the Terminals on the QFX5100 DC Power Supply



8. Replace the terminal block cover.

9. Close the input circuit breaker.

> **NOTE:** The switch powers on as soon as power is provided to the power supply. There is no power switch on the device.

10. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

> **CAUTION:** A system reboot with Routing Engine FPGA version 7.1 might not successfully boot the Junos OS software. In case of a system reboot failure, you need to power cycle the switch. To check the current FPGA version, issue the **show chassis firmware** command.

RELATED DOCUMENTATION

DC Power Supply in a QFX5100 Device

DC Power Supply LEDs on a QFX5100 Device

Connecting a QFX Series Device to a Management Console

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

> **NOTE:** If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the QFX Series, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the QFX Series to a management console (see Figure 22 on page 162 and Figure 23 on page 162):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 22 on page 162) or management console (see Figure 23 on page 162).

Figure 52: Connecting the QFX Series to a Management Console Through a Console Server

Figure 53: Connecting the QFX Series Directly to a Management Console

RELATED DOCUMENTATION

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

CHAPTER 11

Installing a QFX3600 Node Device

IN THIS CHAPTER

Installing and Connecting a QFX3600 or QFX3600-I Device

To install and connect a QFX3600 or QFX3600-I device:

1. Follow the instructions in "Unpacking a QFX3600 or QFX3600-I Device" on page 227.
2. Mount the device by following the instructions appropriate for your site:
   - Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet on page 229
   - Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet on page 231
3. Follow the instructions in "Connecting Earth Ground to QFX3600 or QFX3600-I Devices" on page 236.
4. Follow the instructions for connecting power as appropriate for your site:
   - Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device on page 237
   - Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device on page 240
5. Depending on how you will be using the QFX3600 or QFX3600-I device, take one of the following actions:

- If you are using the QFX3600 device as a standalone switch, follow the instructions in *Configuring a QFX3600 Device as a Standalone Switch*.
- If you are using the QFX3600 device as a Node device in a QFX3000-G QFabric system, see "QFX3000-G QFabric System Installation Overview" on page 105 for information about the steps to install and configure your QFX3000-G QFabric system.
- If you are using the QFX3600 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.
- If you are using the QFX3600-I device as an Interconnect device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

RELATED DOCUMENTATION

Rack Requirements for a QFX3600 or QFX3600-I Device

Cabinet Requirements for a QFX3600 or QFX3600-I Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3600 or QFX3600-I Device

Unpacking a QFX3600 or QFX3600-I Device

The QFX3600 or QFX3600-I device chassis is a rigid sheet-metal structure that houses the hardware components. QFX3600 and QFX3600-I devices are shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> **CAUTION:** QFX3600 and QFX3600-I devices are maximally protected inside the shipping carton. Do not unpack the device until you are ready to begin installation.

To unpack a QFX3600 or QFX3600-I device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Remove the accessory box and verify the contents against the inventory included in the box. Table 64 on page 228 lists the inventory of components supplied with a QFX3600 or QFX3600-I device.

5. Pull out the packing material holding the device in place.

6. Verify the chassis components received:
   - Three fan trays
   - Two power supplies

7. Save the shipping carton and packing materials in case you need to move or ship the device later.

Table 64: Accessory Kit Part Contents

Parts	Quantity
Chassis grounding lug	1
M5 screws to attach the chassis grounding lug to the protective earth terminal on the chassis	2
Electrostatic discharge (ESD) grounding strap **NOTE:** Use only clip-style ESD grounding straps with the chassis grounding lug.	1
SFP/SFP+ port dust covers	2
QSFP+ port dust covers	16
RJ-45 cable and RJ-45 to DB-9 adapter for console port connection	1
Mounting brackets for front-mounting in a four-post rack or cabinet	2
M4 flat-head screws to attach the brackets for front-mounting in a rack or cabinet	6
Rear installation blades for front-mounting in a four-post rack or cabinet	2
Mounting brackets for front-mounting in a two-post rack or cabinet	2
Mounting brackets for mid-mounting in a two-post rack or cabinet	2
M4 pan-head screws to attach the brackets for front-mounting or mid-mounting in a rack or cabinet	6

RELATED DOCUMENTATION

Installing and Connecting a QFX3600 or QFX3600-I Device | 226

Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet

You can mid-mount a QFX3600 or QFX3600-I device on two posts of a 19-in. rack or cabinet by using the mounting brackets provided with the device. (The remainder of this topic uses “rack” to mean “rack or cabinet.”)

You can also mount the device on four posts of a four-post rack by using the mounting brackets provided with the device. See “Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet” on page 231.

The holes in the mounting brackets are placed at 1 U (1.75 in., or 4.45 cm.) apart so that the device can be mounted in any rack that provides holes spaced at that distance.

Before mounting a QFX3600 or QFX3600-I device on two posts in a rack:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3600 or QFX3600-I Device*.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read *General Safety Guidelines and Warnings*, with particular attention to *Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device*.
- Remove the device from the shipping carton (see “Unpacking a QFX3600 or QFX3600-I Device” on page 227).

Ensure that you have the following parts and tools available:

- ESD grounding strap (provided)
- One pair of mounting brackets depending on how you want to mount the device (provided)
  - Use the front/rear mounting brackets (part number 540-038579) to front-mount or rear-mount the device.
  - Use the mid-mounting brackets (part number 540-038665) to mid-mount the device.
- 6 Phillips 4x6-mm pan-head mounting screws (provided)
- Four screws to secure the chassis to the rack (not provided)
- Appropriate screwdriver for the mounting screws (not provided)

NOTE: One person must be available to lift the device while another secures the device to the rack.

CAUTION: If you are mounting multiple device on a rack, mount a device in the bottom of the rack first and proceed to mount the rest of the devices from bottom to top.

To mount the device on two posts in a rack:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Place the device on a flat, stable surface.

3. Align the mid-mounting brackets (part number 540-038665) with the holes on the side panels of the device chassis, such that the mounting ears are in the center of the side panels. See Figure 54 on page 231.

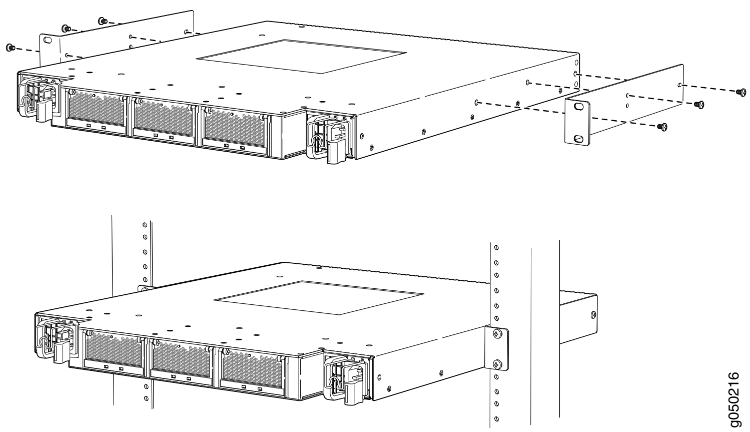
4. Insert mounting screws into the aligned holes. Tighten the screws.

5. Have one person grasp both sides of the device, lift the device, and position it in the rack, aligning the mounting ear holes with the threaded holes in the rack or cabinet rail. Align the bottom mounting ear hole in both the mounting brackets with a hole in each rack rail, making sure the chassis is level. See Figure 54 on page 231.

6. Have a second person secure the device to the rack by using the appropriate screws. Tighten the screws.

7. Ensure that the device chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side.

Figure 54: Mounting the Device on Two Posts in a Rack



RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting Earth Ground to QFX3600 or QFX3600-I Devices | 236

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device | 237

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device | 240

Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet

You can front-mount or rear-mount a QFX3600 or QFX3600-I device on four posts in a 19-in. rack or cabinet by using the mounting brackets and installation blades provided with the device. (The remainder of this topic uses “rack” to mean “rack or cabinet.”) The front and rear rack rails must be spaced between 19.3 in. (49 cm) and 36 in. (91.4 cm) front to back.

You can also mount the device on two posts of a 19-in. rack or cabinet by using the mounting brackets provided with the device. See “Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet” on page 229.

The holes in the mounting brackets and installation blades are placed at 1 U (1.75 in., or 4.45 cm.) apart so that the device can be mounted in any rack that provides holes spaced at that distance.

Before you begin mounting a QFX3600 or QFX3600-I device on the rack or cabinet:

- Ensure you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3600 or QFX3600-I Device*.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read "General Site Guidelines" on page 115, with particular attention to *Chassis Lifting Guidelines for a QFX3600 or QFX3600-I Device*.
- Remove the device from the shipping carton (see "Unpacking a QFX3600 or QFX3600-I Device" on page 227).

Ensure that you have the following parts and tools available to mount the device on four posts in a rack:

- ESD grounding strap (provided).
- One pair of mounting brackets (part number 540-038596) (provided).
- One pair of rear installation blades (part number 540-038598). These installation blades support the rear of the chassis, and must be installed (provided).
- 6 Phillips 4x5-mm flat-head mounting screws (provided).
- Eight screws to secure the chassis and rear installation blades to the rack (not provided).
- Appropriate screwdriver for the mounting screws (not provided).

WARNING: QFX3600 and QFX3600-I devices must be supported at all four corners. Mounting the chassis using only the front brackets damages the chassis and can result in serious bodily injury.

CAUTION: If you are installing the QFX3600 or QFX3600-I device above 60 in. (152.4 cm) from the floor, you must remove the power supplies and fan trays before attempting to install the device, or ask someone to assist you during the installation.

CAUTION: If you are mounting multiple devices on a rack, mount the device in the lowest position of the rack first, and proceed to mount the rest of the devices from bottom to top.

To mount the device on four posts in a rack:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Decide where to position the device in the rack.

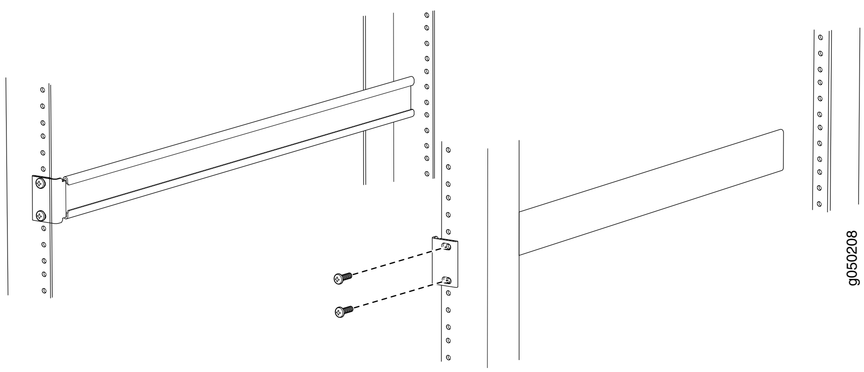
3. Install the rear installation blades. See Figure 55 on page 233.

   a. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the left rear of the rack at the point where you want to mount the device. Tighten the screws.

   b. Position the second rear installation blade at the desired position in the right rear of the rack, so that it is on the same rack level as the left rear installation blade. If the right and left rear installation blades are not on the same level, the chassis will rest at an angle in the rack instead of resting flat and level.

   c. With two mounting screws—and cage nuts and washers if your rack requires them—attach the second rear installation blade to the right rear of the rack at the point where you want to mount the device. Tighten the screws.

Figure 55: Attaching the Installation Blades to the Rear of the Rack



4. Prepare the device for mounting.

   a. Place the device on a flat, stable surface.

   b. Align the mounting brackets along the front or rear of the side panels of the device chassis depending on how you want to mount the device. For example, if you want to front-mount the device, align the brackets along the front of the side panel such that the mounting ears are in the front of the device chassis. See Figure 56 on page 234.

   c. Align the holes in the mounting brackets with holes on the side panels of the device chassis.

   d. Insert mounting screws into the aligned holes. Tighten the screws.

5. Mount the device.

a. Grasp both sides of the device, lift it, and position it in the rack so that the rear of the chassis slides onto the installation blade. See Figure 56 on page 234.

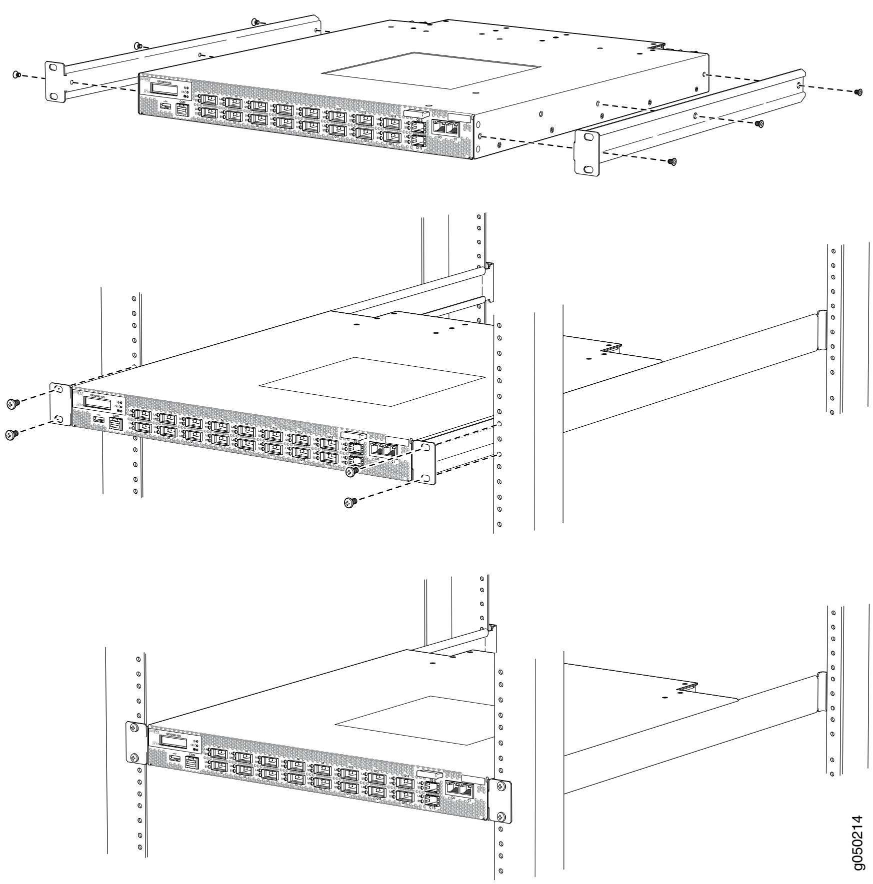
> **TIP:** If someone is assisting you, have one person stand at the rear of the rack where the installation blade is installed, to help guide the device onto the installation blade.

b. Align the holes in the front brackets on the chassis with the holes in the rack. Ensure that the chassis is level.

c. With four mounting screws—and cage nuts and washers if your rack requires them—secure the front of the device to the rack. Tighten the screws.

d. Ensure that the device chassis is level by verifying that all screws on one side of the rack are aligned with the screws on the other side.

Figure 56: Mounting the Device on Four Posts



RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting Earth Ground to QFX3600 or QFX3600-I Devices | **236**

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device | **237**

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device | **240**

Configuring a QFX3600 Device as a Standalone Switch

Connecting Earth Ground to QFX3600 or QFX3600-I Devices

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX3600 and QFX3600-I devices to earth ground before you connect it to power.

For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the left rear of the chassis to connect to the earth ground (see Figure 57 on page 237).

Before you connect earth ground to the protective earthing terminal of a QFX3600 or QFX3600-I device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

CAUTION: Using a grounding cable with an incorrectly attached lug can damage the switch.

NOTE: Mount your device in the rack or cabinet before attaching the grounding lug to the switch. See "Mounting a QFX3600 or QFX3600-I Device on Two Posts in a Rack or Cabinet" on page 229 and "Mounting a QFX3600 or QFX3600-I Device on Four Posts in a Rack or Cabinet" on page 231.

Ensure that you have the following parts and tools available:

- Grounding cable for your QFX3600 or QFX3600-I device—The grounding cable must be 14 AWG (2 mm^2), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent. This grounding lug is provided in the accessory kit.
- Two M5 screws with integrated washers—The screws are used to secure the grounding lug to the protective earthing terminal. The screws are provided in the accessory kit.
- Phillips (+) screwdriver, number 2.

An AC-powered QFX3600 or QFX3600-I device chassis gains additional grounding when you plug the power supply in the switch into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX Series Device" on page 138.

To connect earth ground to a QFX3600 or QFX3600-I device:

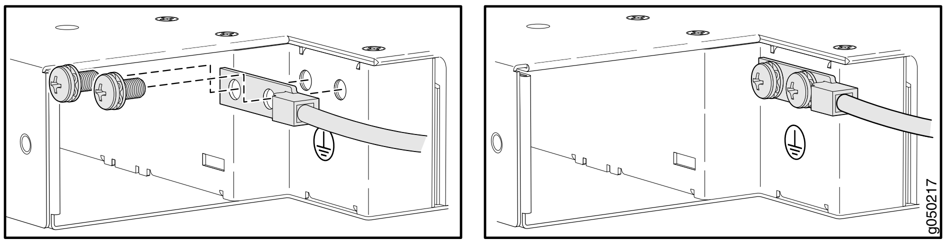
1. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the device is mounted.

2. Place the grounding lug attached to the grounding cable over the protective earthing terminal.

3. Secure the grounding lug to the protective earthing terminal with screws.

4. Dress the grounding cable and ensure that it does not touch or block access to other switch components and that it does not drape where people could trip over it.

Figure 57: Connecting a Grounding Cable to a QFX3600 or QFX3600-I Device



RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device | **237**

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device | **240**

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the device.

Before you begin connecting AC power to the device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the device chassis to earth ground.

CAUTION: Before you connect power to the device, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the device (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the device chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX3500 Device" on page 255 or "Connecting Earth Ground to QFX3600 or QFX3600-I Devices" on page 236. The device gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see "AC Power Cord Specifications for a QFX Series Device" on page 138).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see *Installing a Power Supply in a QFX3500 Device*. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see *Installing a Power Supply in a QFX3600 or QFX3600-I Device*.

NOTE: Each power supply must be connected to a dedicated power source outlet.

To connect AC power to a QFX3500, QFX3600, or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.

3. Locate the power cord or cords shipped with the device; the cords have plugs appropriate for your geographical location. See "AC Power Cord Specifications for a QFX Series Device" on page 138.

   WARNING: Ensure that the power cord does not block access to device components or drape where people can trip on it.

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.

5. Push the power cord retainer onto the power cord (see Figure 58 on page 239 or Figure 59 on page 239).

Figure 58: Connecting an AC Power Cord to an AC Power Supply in a QFX3500 Device

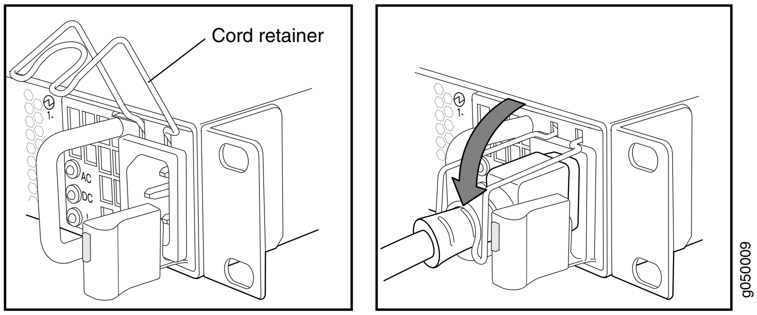
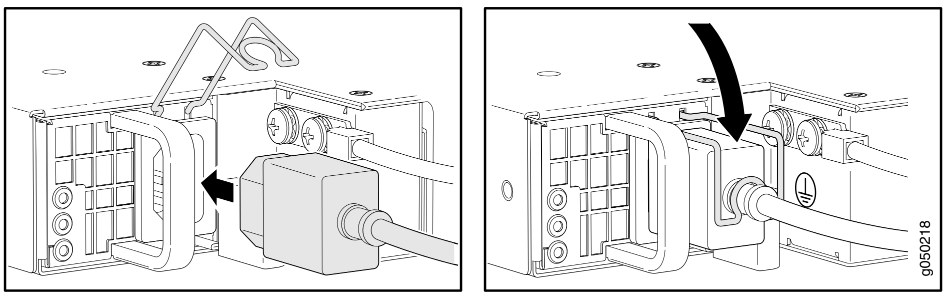


Figure 59: Connecting an AC Power Cord to an AC Power Supply in a QFX3600 or QFX3600-I Device



6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

> **NOTE:** The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see *Removing a Power Supply from a QFX3500 Device* or *Removing a Power Supply from a QFX3600 or QFX3600-I Device*). Do not remove the power supply until you have a replacement power supply ready: the power supplies or a blank cover panel must be installed in the device to ensure proper airflow.

CAUTION: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

WARNING: DC-powered QFX3500, QFX3600 and QFX3600-I devices are intended for installation only in a restricted access location.

NOTE: The battery returns of the DC power supply should be connected as an isolated DC return (DC-I).

Before you begin connecting DC power to the device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the device chassis to earth ground.

CAUTION: Before you connect power to the device, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the device (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the device chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX3500 Device" on page 255 or "Connecting Earth Ground to QFX3600 or QFX3600-I Devices" on page 236.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see *Installing a Power Supply in a QFX3500 Device*. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see *Installing a Power Supply in a QFX3600 or QFX3600-I Device*

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)
- Phillips (+) screwdriver, number 2 (not provided)
- Multimeter (not provided)

To connect DC power to a QFX3500, QFX3600 or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the –48V and RTN DC cables to chassis ground:

   - The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.
   - The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) DC power input terminal.

CAUTION: You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the DC power input terminals on each power supply.

3. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

   NOTE: The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

4. Ensure that the power supplies are fully inserted in the chassis.

5. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 60 on page 244).

6. Remove the screws on the terminals using the screwdriver. Save the screws.

   WARNING: Ensure that the power cables do not block access to device components or drape where people can trip on them.

7. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 61 on page 245 and Figure 60 on page 244).

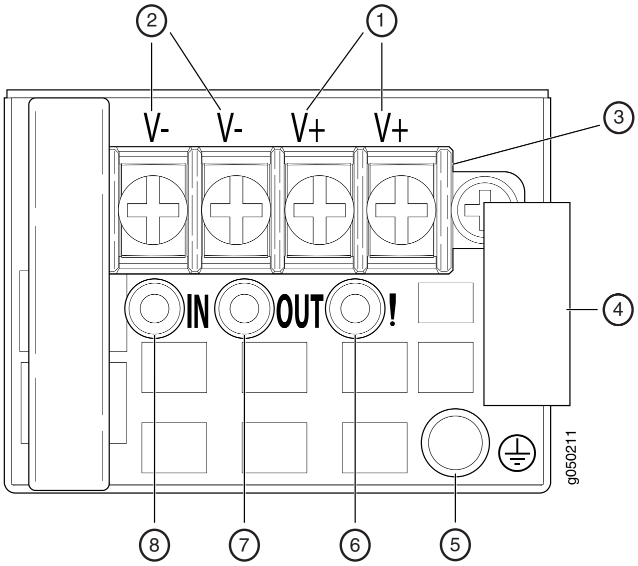
CAUTION: The DC power supply has four terminals labeled V+, V+, V–, and V– for connecting DC power source cables labeled positive (+) and negative (–). The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources. For example, connect –48 V from DC source feed A to the input terminals of one power supply and connect –48 V from feed B to the input terminals of the second power supply on the other side of the chassis. This configuration provides the commonly deployed A/B feed redundancy for the system.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (–) DC power source cable to the V– terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

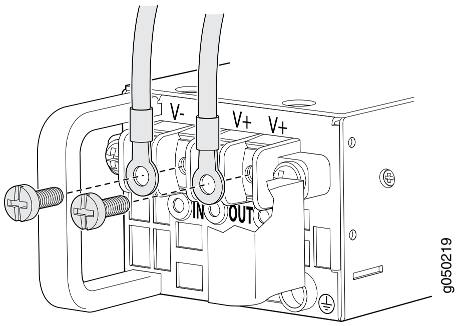
Figure 60: DC Power Supply Faceplate for a QFX3500, QFX3600 or QFX3600-I Device



1—Shunt positive input terminals	5—ESD grounding point
2—Shunt negative input terminals	6—Fault LED
3—Terminal block	7—Output LED
4—Ejector lever	8—Input LED

> **CAUTION:** The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 61: Securing Ring Lugs to the Terminals on the QFX3500, QFX3600 or QFX3600-I DC Power Supply



8. Replace the terminal block cover.

9. Close the input circuit breaker.

> **NOTE:** The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

10. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting a QFX Series Device to a Management Console

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the QFX Series, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the QFX Series to a management console (see Figure 22 on page 162 and Figure 23 on page 162):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).
2. Connect the other end of the Ethernet cable into the console server (see Figure 22 on page 162) or management console (see Figure 23 on page 162).

Figure 62: Connecting the QFX Series to a Management Console Through a Console Server

Figure 63: Connecting the QFX Series Directly to a Management Console

RELATED DOCUMENTATION

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

CHAPTER 12

Installing a QFX3500 Node Device

IN THIS CHAPTER

Installing and Connecting a QFX3500 Device

To install and connect a QFX3500 device:

1. Follow the instructions in “Unpacking a QFX3500 Device” on page 248.

2. Mount the device by following the instructions in “Mounting a QFX3500 Device in a Rack or Cabinet” on page 249.

3. Follow the instructions in “Connecting Earth Ground to a QFX3500 Device” on page 255.

4. Follow the instructions in “Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device” on page 237.

5. Depending on how you will be using the QFX3500 device, do one of the following:

   - If you are using the QFX3500 device as a standalone switch, follow the instructions in *Configuring a QFX3500 Device as a Standalone Switch*.

   - If you are using the QFX3500 device as a Node device in a QFX3000-G QFabric system, see “QFX3000-G QFabric System Installation Overview” on page 105 for information about the steps to install and configure your QFX3000-G QFabric system.

- If you are using the QFX3500 device as a Node device in a QFX3000-M QFabric system, see *QFX3000-M QFabric System Installation Overview* for information about the steps to install and configure your QFX3000-M QFabric system.

RELATED DOCUMENTATION

Rack Requirements for a QFX3500 Device

Cabinet Requirements for a QFX3500 Device

Clearance Requirements for Airflow and Hardware Maintenance for a QFX3500 Device

Unpacking a QFX3500 Device

The QFX3500 device chassis is a rigid sheet-metal structure that houses the hardware components. A QFX3500 device is shipped in a cardboard carton, secured with foam packing material. The carton also contains an accessory box and quick start instructions.

> **CAUTION:** QFX3500 devices are maximally protected inside the shipping carton. Do not unpack the device until you are ready to begin installation.

To unpack a QFX3500 device:

1. Move the shipping carton to a staging area as close to the installation site as possible, but where you have enough room to remove the system components.

2. Position the carton so that the arrows are pointing up.

3. Open the top flaps on the shipping carton.

4. Remove the accessory box and verify the contents against the inventory included in the box. Table 65 on page 249 lists the inventory of components supplied with a QFX3500 device.

5. Pull out the packing material holding the device in place.

6. Verify the chassis components received:

   - Management board

   - Two fan trays

- One or two power supplies, depending on your order. If only one power supply is installed, a blank panel should be installed on the second power supply slot.

7. Save the shipping carton and packing materials in case you need to move or ship the device later.

Table 65: Inventory of Components Supplied with a QFX3500 Device

Component	Quantity
Chassis with management board, two fan trays, and one or two power supplies	1
Rear installation blades	2
RJ-45 cable and RJ-45 to DB-9 adapter	1
SFP/SFP+ port dust covers	48
QSFP+ port dust covers	4
Electrostatic discharge (ESD) grounding strap	1

RELATED DOCUMENTATION

Mounting a QFX3500 Device in a Rack or Cabinet | 249
Installing and Connecting a QFX3500 Device | 247

Mounting a QFX3500 Device in a Rack or Cabinet

IN THIS SECTION

You can mount a QFX3500 device on four posts in a 19-in. rack or cabinet by using the mounting kits provided with the device. Choose one of the following two mounting kits provided for the different QFX3500 chassis configurations.

- If your installation kit has two rails and your QFX3500 has mounting holes integrated as part of the chassis, use "Two Mounting Rails Procedure" on page 251. This configuration aligns the management end of the device flush with the rack. The adjustable rails allow for installation into racks having different depths.
- If your installation kit has four rails and the QFX3500 does not have mounting holes as part of the chassis faceplate, use "Four Mounting Rails Procedure" on page 253. This configuration allows either end of the device to be mounted flush with the rack and still be adjustable for racks with different depths.

(The remainder of this topic uses "rack" to mean "rack or cabinet.") The front and rear rack rails must be spaced between 28 in. (71.1 cm) and 36 in. (91.4 cm) front to back.

Before You Begin Rack Installation

Before you begin mounting a QFX3500 device in the rack or cabinet:

- If replacing an existing QFX3500, remove previous rack-mount hardware. The mounting bracket and mounting blade in this procedure is not compatible with other Juniper mounting kits.
- Ensure that you understand how to prevent electrostatic discharge (ESD) damage. See *Prevention of Electrostatic Discharge Damage*.
- Verify that the site meets the requirements described in *Site Preparation Checklist for a QFX3500 Device*.
- Place the rack in its permanent location, allowing adequate clearance for airflow and maintenance, and secure it to the building structure.
- Read "General Site Guidelines" on page 115, with particular attention to *Chassis Lifting Guidelines for a QFX3500 Device*.
- Remove the device from the shipping carton (see "Unpacking a QFX3500 Device" on page 248).

Ensure that you have the following parts and tools available to mount the device on four posts in a rack:

- ESD grounding strap (provided).
- One pair of rear installation blades. These installation blades support the rear of the chassis and must be installed (provided).
- Eight screws to secure the chassis and rear installation blades to the rack (not provided).
- Appropriate screwdriver for the mounting screws (not provided).

WARNING: The QFX3500 device must be supported at all four corners. Mounting the chassis using only the front brackets will damage the chassis and can result in serious bodily injury.

CAUTION: If you are installing the QFX3500 device above 60 in. (152.4 cm) from the floor, you must remove the power supplies, fan trays, and management board before attempting to install the device, or ask someone to assist you during the installation.

CAUTION: If you are mounting multiple devices on a rack, mount the device in the lowest position of the rack first and proceed to mount the rest of the devices from bottom to top.

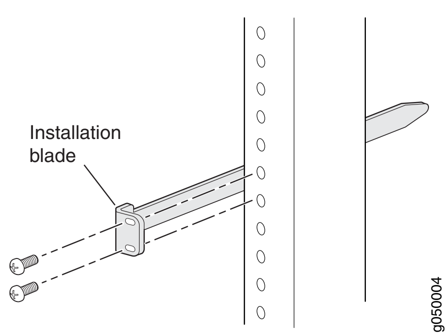
Two Mounting Rails Procedure

To mount the device on four posts in a rack using a two-rail kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the rear of the rack at the point where you want to mount the device. Tighten the screws. The blade helps support the rear of the chassis. You install the second rear installation blade after securing both front mounting brackets. See Figure 64 on page 251.

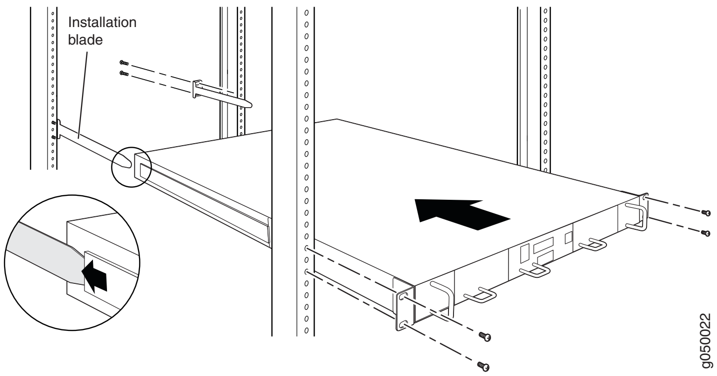
Figure 64: Installing an Installation Blade in a Rack



3. Grasp both sides of the device, lift it, and position it in the rack so that the blade receptacle at the rear of the chassis catches and slides onto the installation blade. See Figure 65 on page 252.

> **TIP:** If someone is assisting you, have one person stand at the rear of the rack where the installation blade is installed, to help guide the device onto the installation blade.

Figure 65: Mounting the QFX3500 Device on Four Posts in a Rack Using a Two-Rail Kit



4. Align the holes in the front brackets on the chassis with the holes in the rack. Ensure that the chassis is level.

5. With four mounting screws—and cage nuts and washers if your rack requires them—secure the front of the device to the rack. Insert the first screw on the opposite corner from the rear installation blade you installed. Tighten the screws.

6. Ensure that the device chassis is level by verifying that all the screws on the front of the rack are aligned with the screws at the back of the rack.

7. With two mounting screws—and cage nuts and washers if your rack requires them—slide the second rear mounting blade into the blade receptacle on the chassis, and secure it to the rear of the rack by tightening the screws. You might need to loosen and adjust the first mounting blade to install the second blade.

Four Mounting Rails Procedure

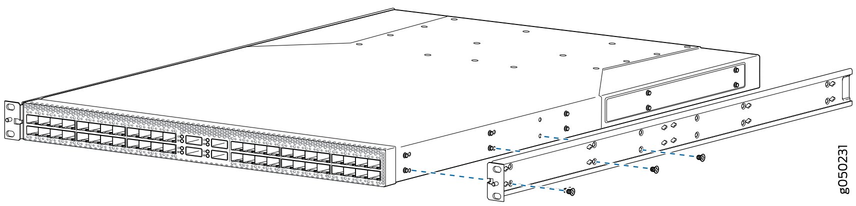
To mount the device on four posts in a rack using a four -rail kit:

1. Attach the ESD grounding strap to your bare wrist and to a site ESD point.

2. Decide whether the management end of the device or the ports are to be placed at the front of the rack.

3. Align the holes in the mounting rail with the button fasteners on the side of the device and slide the holes over the fasteners to click into place. See Figure 40 on page 212 to see the proper alignment.

Figure 66: Attaching a Mounting Rail to the QFX3500



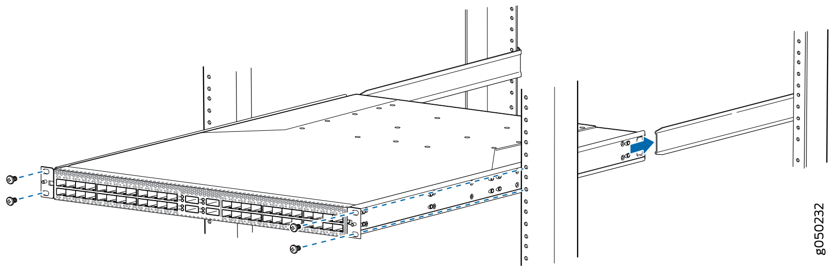
4. With three mounting screws—and cage nuts and washers if your rack requires them—attach the mounting rail to the device. Tighten the screws.

5. Repeats steps 3 and 4 on the opposite side of the device. One end of the device now has front facing mounting holes, the other end none.

6. With two mounting screws—and cage nuts and washers if your rack requires them—attach one of the rear installation blades to the rear of the rack at the point where you want to mount the device. Tighten the screws. The blade helps support the rear of the chassis. You install the second rear installation blade after securing both front mounting brackets. See Figure 64 on page 251 for detail on installing the rear blade.

7. Grasp both sides of the device, lift it, and position it in the rack so that the blade receptacle at the rear of the chassis catches and slides onto the installation blade. See Figure 43 on page 213.

Figure 67: Slide Mounting Rail onto the Rear Mounting Blade



8. Align the holes in the mounting brackets with the holes in the rack. Ensure that the chassis is level.

9. With four front mounting screws–and cage nuts and washers if your rack requires them–attach the mounting bracket to the rack. Insert the first screw on the opposite corner from the mounting blade. Tighten the screws.

10. Ensure that the switch chassis is level by verifying that the screws on the front of the rack are aligned with the screws at the back of the rack.

11. With two mounting screws—and cage nuts and washers if your rack requires them—slide the second rear mounting blade into the blade receptacle on the mounting blade, and secure it to the rear of the rack by tightening the screws. You might need to loosen and adjust the other mounting blade to install the second blade.

RELATED DOCUMENTATION

Rack-Mounting and Cabinet-Mounting Warnings

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device | **237**

Configuring a QFX3500 Device as a Standalone Switch

Connecting Earth Ground to a QFX3500 Device

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the QFX3500 device to earth ground before you connect it to power.

For installations that require a separate grounding conductor to the chassis, you must attach a protective earthing terminal bracket on the QFX3500 device left front mounting bracket to connect to the earth ground (see Figure 68 on page 256).

Before you connect earth ground to the protective earthing terminal of a QFX3500 device, ensure that a licensed electrician has attached an appropriate grounding lug to the grounding cable.

CAUTION: Using a grounding cable with an incorrectly attached lug can damage the device.

NOTE: Mount your device in the rack or cabinet before attaching the grounding lug to the device. See "Mounting a QFX3500 Device in a Rack or Cabinet" on page 249.

Ensure that you have the following parts and tools available:

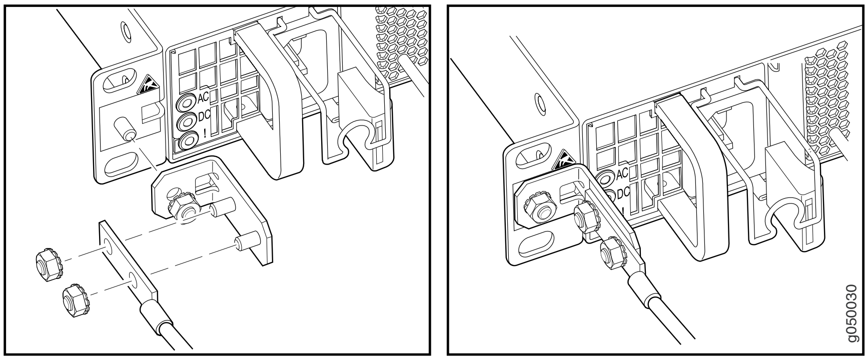
- Protective earthing terminal bracket—This L-shaped bracket attaches to a post on the QFX3500 device left front mounting bracket, providing a protective earthing terminal for the device. This bracket is provided in the accessory kit.
- Grounding cable for your QFX3500 device—The grounding cable must be 14 AWG (2 mm^2), minimum 90° C wire, or as permitted by the local code.
- Grounding lug for your grounding cable—The grounding lug required is a Panduit LCD10-10A-L or equivalent. This grounding lug is provided in the accessory kit.
- Three M4 hex nuts with integrated washers—One nut and washer are required to secure the grounding lug bracket to the left front mounting bracket, and two nuts and washers are used to secure the grounding lug to the grounding lug bracket protective earthing terminal. Four nuts are provided in the accessory kit.
- 7-mm wrench or socket with driver to attach all three nuts.

An AC-powered QFX3500 device chassis gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using an AC power cord appropriate for your geographical location. See "AC Power Cord Specifications for a QFX Series Device" on page 138.

To connect earth ground to a QFX3500 device:

1. Secure the provided protective earthing terminal bracket to the threaded post on the QFX3500 device left front mounting bracket with the nut provided. The posts on the protective earthing terminal bracket should point to the left. See Figure 68 on page 256.

Figure 68: Connecting a Grounding Cable to a QFX3500 Device



2. Connect one end of the grounding cable to a proper earth ground, such as the rack in which the device is mounted.

3. Place the grounding lug attached to the grounding cable over the protective earthing terminal on the protective earthing terminal bracket.

4. Secure the grounding lug to the protective earthing terminal with two nuts.

5. Dress the grounding cable and ensure that it does not touch or block access to other device components and that it does not drape where people could trip over it.

RELATED DOCUMENTATION

General Safety Guidelines and Warnings

Grounded Equipment Warning

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device | **237**

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device | **240**

Connecting AC Power to a QFX3500, QFX3600, or QFX3600-I Device

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

Ensure that you have a power cord appropriate for your geographical location available to connect AC power to the device.

Before you begin connecting AC power to the device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the device chassis to earth ground.

> **CAUTION:** Before you connect power to the device, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the device (for example, by causing a short circuit).
>
> To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the device chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX3500 Device" on page 255 or "Connecting Earth Ground to QFX3600 or QFX3600-I Devices" on page 236. The device gains additional grounding when you plug the power supply in the device into a grounded AC power outlet by using the AC power cord appropriate for your geographical location (see "AC Power Cord Specifications for a QFX Series Device" on page 138).

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see *Installing a Power Supply in a QFX3500 Device*. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see *Installing a Power Supply in a QFX3600 or QFX3600-I Device*.

> **NOTE:** Each power supply must be connected to a dedicated power source outlet.

To connect AC power to a QFX3500, QFX3600, or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Ensure that the power supplies are fully inserted in the chassis and the latches are secure. If only one power supply is installed, ensure a that blank cover panel is installed over the second power supply slot.

3. Locate the power cord or cords shipped with the device; the cords have plugs appropriate for your geographical location. See "AC Power Cord Specifications for a QFX Series Device" on page 138.

> **WARNING:** Ensure that the power cord does not block access to device components or drape where people can trip on it.

4. Connect each power supply to the power sources. Insert the coupler end of the power cord into the AC power cord inlet on the AC power supply faceplate.

5. Push the power cord retainer onto the power cord (see Figure 58 on page 239 or Figure 59 on page 239).

Figure 69: Connecting an AC Power Cord to an AC Power Supply in a QFX3500 Device

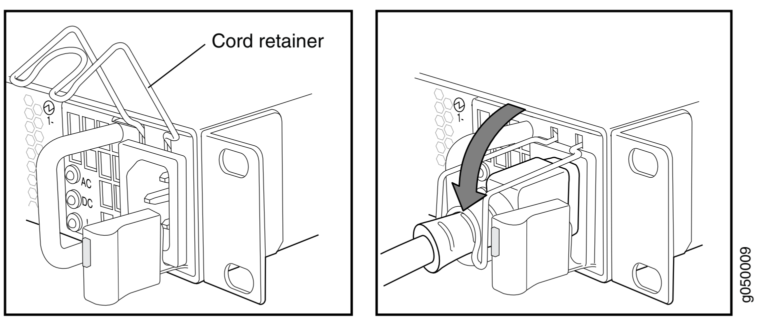
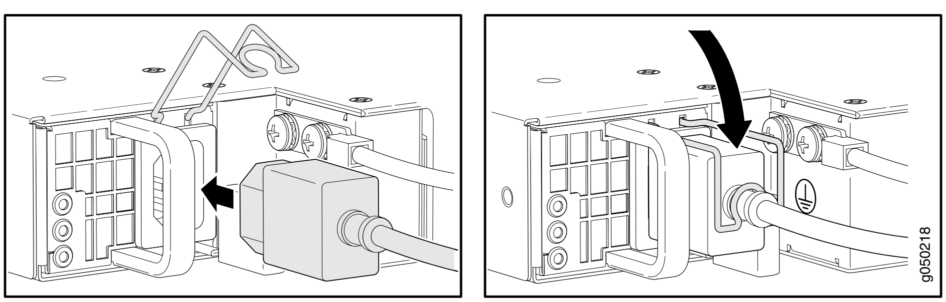


Figure 70: Connecting an AC Power Cord to an AC Power Supply in a QFX3600 or QFX3600-I Device



6. If the AC power source outlet has a power switch, set it to the OFF (O) position.

NOTE: The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

7. Insert the power cord plug into an AC power source outlet.

8. If the AC power source outlet has a power switch, set it to the ON (|) position.

9. Verify that the AC and DC LEDs on each power supply are lit green.

   If the amber fault LED is lit, remove power from the power supply, and replace the power supply (see *Removing a Power Supply from a QFX3500 Device* or *Removing a Power Supply from a QFX3600 or QFX3600-I Device*). Do not remove the power supply until you have a replacement power supply ready: the power supplies or a blank cover panel must be installed in the device to ensure proper airflow.

   CAUTION: Replace a failed power supply with a blank panel or new power supply within 1 minute of removal to prevent chassis overheating.

RELATED DOCUMENTATION

AC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

AC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting DC Power to a QFX3500, QFX3600, or QFX3600-I Device

The QFX3500, QFX3600, and QFX3600-I devices are shipped from the factory with two 650 W power supplies pre-installed. Each power supply is a hot-removable and hot-insertable field-replaceable unit (FRU) when the second power supply is installed and running. You can install replacement power supplies without powering off the device or disrupting the switching function.

WARNING: DC-powered QFX3500, QFX3600 and QFX3600-I devices are intended for installation only in a restricted access location.

NOTE: The battery returns of the DC power supply should be connected as an isolated DC return (DC-I).

Before you begin connecting DC power to the device:

- Ensure that you have taken the necessary precautions to prevent electrostatic discharge (ESD) damage (see *Prevention of Electrostatic Discharge Damage*).
- Ensure that you have connected the device chassis to earth ground.

CAUTION: Before you connect power to the device, a licensed electrician must attach a cable lug to the grounding and power cables that you supply. A cable with an incorrectly attached lug can damage the device (for example, by causing a short circuit).

To meet safety and electromagnetic interference (EMI) requirements and to ensure proper operation, you must connect the chassis to earth ground before you connect it to power. For installations that require a separate grounding conductor to the chassis, use the protective earthing terminal on the device chassis to connect to the earth ground. For instructions on connecting earth ground, see "Connecting Earth Ground to a QFX3500 Device" on page 255 or "Connecting Earth Ground to QFX3600 or QFX3600-I Devices" on page 236.

- Install the power supply in the chassis. For instructions on installing a power supply in a QFX3500 device, see *Installing a Power Supply in a QFX3500 Device*. For instructions on installing a power supply in a QFX3600 or QFX3600-I device, see *Installing a Power Supply in a QFX3600 or QFX3600-I Device*

Ensure that you have the following parts and tools available:

- DC power source cables (14–16 AWG) with ring lug (Molex 190700069 or equivalent) (not provided)
- Phillips (+) screwdriver, number 2 (not provided)
- Multimeter (not provided)

To connect DC power to a QFX3500, QFX3600 or QFX3600-I device:

1. Attach the grounding strap to your bare wrist and to a site ESD point.

2. Verify that the DC power cables are correctly labeled before making connections to the power supply. In a typical power distribution scheme where the return is connected to chassis ground at the battery plant, you can use a multimeter to verify the resistance of the –48V and RTN DC cables to chassis ground:

- The cable with very low resistance (indicating a closed circuit) to chassis ground is positive (+) and will be installed on the V+ (return) DC power input terminal.
- The cable with very high resistance (indicating an open circuit) to chassis ground is negative (–) and will be installed on the V– (input) DC power input terminal.

> **CAUTION:** You must ensure that power connections maintain the proper polarity. The power source cables might be labeled (+) and (–) to indicate their polarity. There is no standard color coding for DC power cables. The color coding used by the external DC power source at your site determines the color coding for the leads on the power cables that attach to the DC power input terminals on each power supply.

3. Ensure that the input circuit breaker is open so that the voltage across the DC power source cable leads is 0 V and that the cable leads do not become active while you are connecting DC power.

> **NOTE:** The V+ terminals are referred to as +RTN, and V– terminals are referred to as –48 V in *DC Power Wiring Sequence Warning* and *DC Power Electrical Safety Guidelines*.

4. Ensure that the power supplies are fully inserted in the chassis.

5. Remove the terminal block cover. The terminal block cover is a piece of clear plastic that snaps into place over the terminal block (see Figure 60 on page 244).

6. Remove the screws on the terminals using the screwdriver. Save the screws.

> **WARNING:** Ensure that the power cables do not block access to device components or drape where people can trip on them.

7. Connect each power supply to the power sources. Secure power source cables to the power supplies by screwing the ring lugs attached to the cables to the appropriate terminals by using the screw from the terminals (see Figure 61 on page 245 and Figure 60 on page 244).

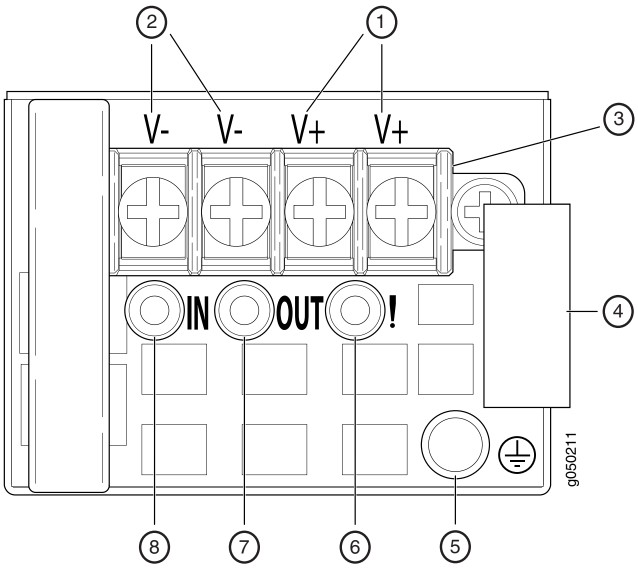
CAUTION: The DC power supply has four terminals labeled V+, V+, V–, and V– for connecting DC power source cables labeled positive (+) and negative (–). The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources. For example, connect –48 V from DC source feed A to the input terminals of one power supply and connect –48 V from feed B to the input terminals of the second power supply on the other side of the chassis. This configuration provides the commonly deployed A/B feed redundancy for the system.

a. Secure the ring lug of the positive (+) DC power source cable to the V+ terminal on the DC power supply.

b. Secure the ring lug of the negative (–) DC power source cable to the V– terminal on the DC power supply.

c. Tighten the screws on the power supply terminals until snug using the screwdriver. Do not overtighten—apply between 5 in-lb (0.56 Nm) and 6 in-lb (0.68 Nm) of torque to the screws.

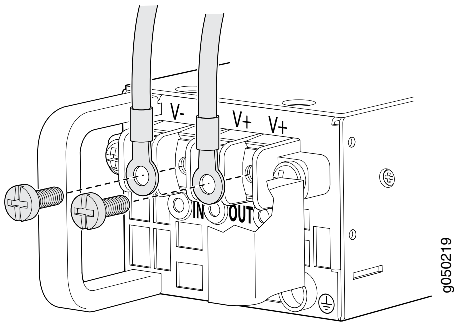
Figure 71: DC Power Supply Faceplate for a QFX3500, QFX3600 or QFX3600-I Device



1–Shunt positive input terminals	5–ESD grounding point
2–Shunt negative input terminals	6–Fault LED
3–Terminal block	7–Output LED
4–Ejector lever	8–Input LED

CAUTION: The V+ terminals are shunted internally together, as are the V- terminals. The same polarity terminal can be wired together from the same source to provide an additional current path in a higher power chassis. Do not connect the terminals to different sources.

Figure 72: Securing Ring Lugs to the Terminals on the QFX3500, QFX3600 or QFX3600-I DC Power Supply



8. Replace the terminal block cover.

9. Close the input circuit breaker.

> **NOTE:** The device powers on as soon as power is provided to the power supply. There is no power switch on the device.

10. Verify that the **IN** and **OUT** LEDs on the power supply are lit green and are on steadily.

RELATED DOCUMENTATION

DC Power Supply for a QFX3500, QFX3600, or QFX3600-I Device

DC Power Supply LEDs on a QFX3500, QFX3600, or QFX3600-I Device

Connecting a QFX Series Device to a Management Console

The QFX Series has a console port with an RJ-45 connector. Use the console port to connect the device to a management console or to a console server.

Ensure that you have an RJ-45 to DB-9 rollover cable available. An RJ-45 cable with an RJ-45 to DB-9 adapter is provided with the device.

NOTE: If your laptop or PC does not have a DB-9 male connector pin and you want to connect your laptop or PC directly to the QFX Series, use a combination of the RJ-45 cable and RJ-45 to DB-9 adapter supplied with the device and a USB to DB-9 male adapter. You must provide the USB to DB-9 male adapter.

To connect the QFX Series to a management console (see Figure 22 on page 162 and Figure 23 on page 162):

1. Connect one end of the Ethernet cable to the console port (labeled **CON**).

2. Connect the other end of the Ethernet cable into the console server (see Figure 22 on page 162) or management console (see Figure 23 on page 162).

Figure 73: Connecting the QFX Series to a Management Console Through a Console Server

Figure 74: Connecting the QFX Series Directly to a Management Console

RELATED DOCUMENTATION

Console Port Connector Pinout Information

Configuring Junos OS to Set Console and Auxiliary Port Properties

CHAPTER 13

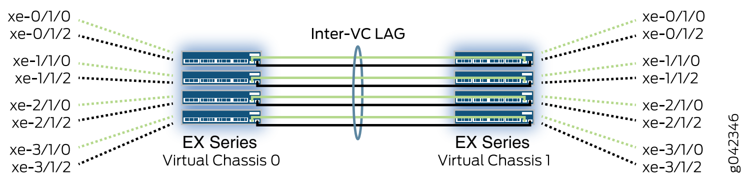
Cabling a Copper-Based Control Plane for the QFX3000-G QFabric System

IN THIS CHAPTER

Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis. If you are creating a copper-based control plane network, you use four EX4200-48T or four EX4300-48P Ethernet switches in each Virtual Chassis. For redundancy and communication, you must connect the two Virtual Chassis using the 10-Gigabit Ethernet uplink module ports configured as a link aggregation group (LAG) (see Figure 75 on page 267).

Figure 75: QFX3000-G QFabric System Copper-Based Control Plane—Inter-Virtual Chassis LAG Connections



Before you begin to interconnect two Virtual Chassis for QFX3000-G QFabric system control plane redundancy:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). See "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165 "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your EX4200 or EX4300 switches. See *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of four members each.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Ensure that you have installed a 10-Gigabit Ethernet SFP+ transceivers in ports **0** and **2** on each Virtual Chassis member uplink module (see *Installing a Transceiver*). EX4200 uplink modules only support SFP+ transceivers installed in ports **0** and **2**. EX4300 uplink modules support SFP+ transceivers installed in all uplink module ports. For a list of supported transceivers, see *Pluggable Transceivers Supported on EX4200 Switches* and *Pluggable Transceivers Supported on EX4300 Switches*.

  Instead of using optical transceivers, you can use 10-Gigabit Ethernet SFP+ direct-attach (DAC) cables. For a list of supported DAC cables, see *SFP+ Direct Attach Copper Cables for EX Series Switches*. The procedure below assumes you are using optical transceivers, but the port mappings in Table 66 on page 268 also apply to DAC cables.
- Ensure that you have appropriate fiber-optic cables (see *Pluggable Transceivers Supported on EX4200 Switches* or *Pluggable Transceivers Supported on EX4300 Switches*).
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).
- Use Table 66 on page 268 to determine the copper-based control plane Virtual Chassis-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric

system. It also permits the use of a standard Virtual Chassis configuration (see “Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane” on page 333.

Table 66: Virtual Chassis-to-Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Connect **xe-0/1/0** on EX0 to **xe-0/1/0** on EX1	Connect **xe-1/1/0** on EX0 to **xe-1/1/0** on EX1	Connect **xe-2/1/0** on EX0 to **xe-2/1/0** on EX1	Connect **xe-3/1/0** on EX0 to **xe-3/1/0** on EX1
Connect **xe-0/1/2** on EX0 to **xe-0/1/2** on EX1	Connect **xe-1/1/2** on EX0 to **xe-1/1/2** on EX1	Connect **xe-2/1/2** on EX0 to **xe-2/1/2** on EX1	Connect **xe-3/1/2** on EX0 to **xe-3/1/2** on EX1

To interconnect two Virtual Chassis for QFabric system control plane redundancy (see Figure 75 on page 267 and Table 66 on page 268):

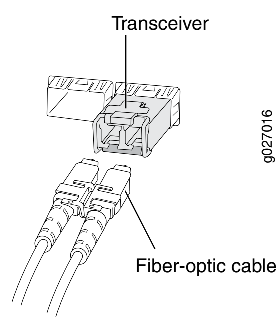
> **WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the SFP+ optical transceiver in port **0** on member **0** of the first Virtual Chassis. Save the cap.

3. Insert the cable connector into the optical transceiver (see Figure 76 on page 268).

Figure 76: Connecting a Fiber-Optic Cable to an Optical Transceiver Installed in an EX Series Switch



4. If the connector at the other end of the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

5. Remove the rubber safety cap from the SFP+ optical transceiver in port **0** on member **0** of the *second* Virtual Chassis. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Repeat Step 1 through Step 6 for each uplink module port, following the port assignments in Table 66 on page 268.

8. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

   CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

   Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | **153**

Connecting QFX3100 Director Devices in a Director Group

A QFabric system requires two QFX3100 Director devices interconnected as a QFX3100 Director *group* (see Figure 77 on page 270 through Figure 79 on page 271).

Figure 77: QFX3100 Director Group Control Plane Connections for QFX3000-G QFabric System Using Copper-Based Control Plane

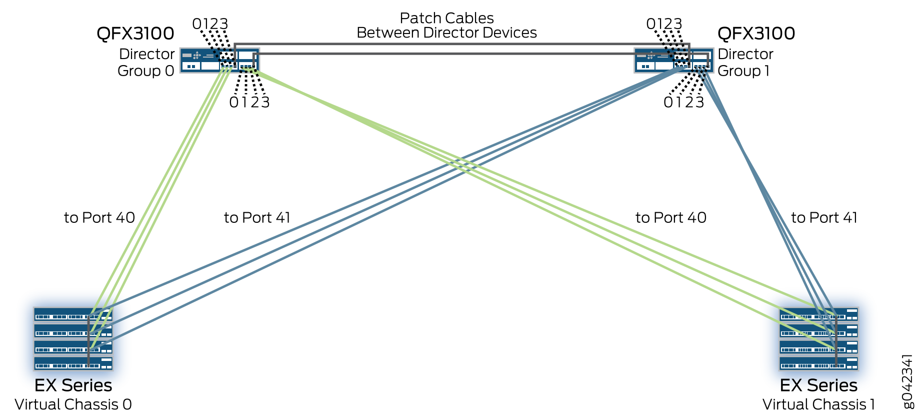


Figure 78: QFX3100 Director Group Control Plane Connections for QFX3000-G QFabric System Using Fiber-Based Control Plane

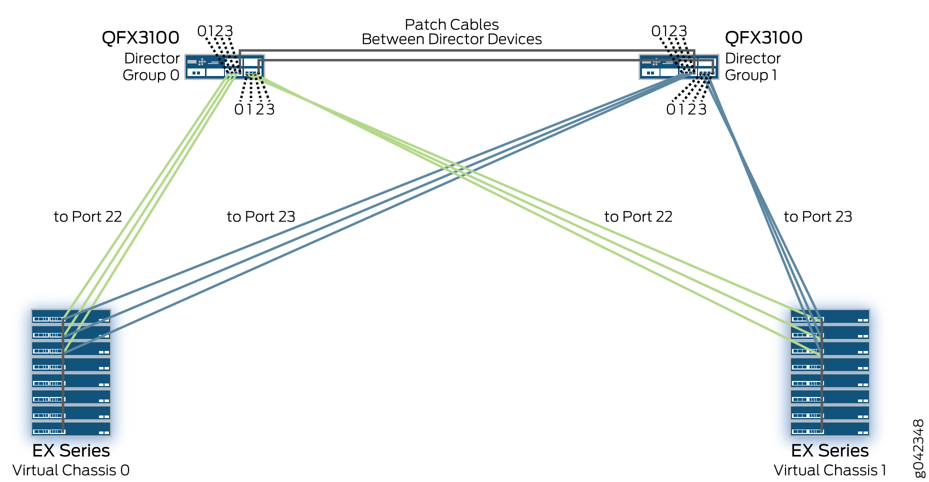
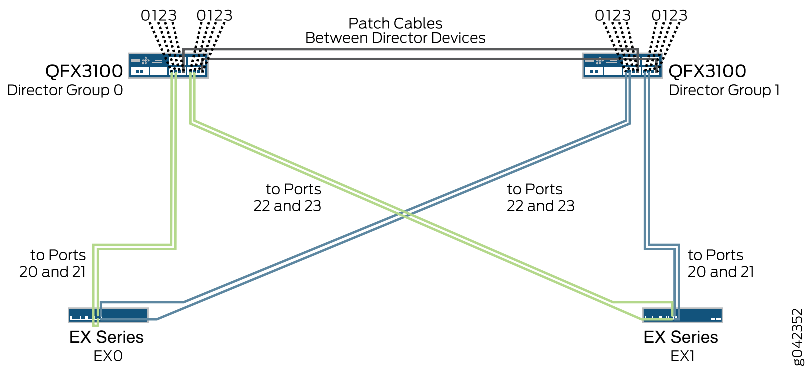


Figure 79: QFX3100 Director Group Control Plane Connections for QFX3000-M QFabric System



The second QFX3100 Director device provides redundancy for the control plane and management network.

Before you begin to connect QFX3100 Director devices in a Director group:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see “Installing and Connecting a QFX3100 Director Device” on page 153, “Installing and Connecting a QFX3008-I Interconnect Device” on page 165, “Installing and Connecting a QFX3600 or QFX3600-I Device” on page 226, and “Installing and Connecting a QFX3500 Device” on page 247.

> **NOTE:** For a copper-based QFX3000-M QFabric system control plane network, use QFX3100 Director devices with RJ-45 network modules installed. For a fiber-based control plane network, use QFX3100 Director devices with SFP network modules installed.

- Ensure that you have appropriate transceivers and cables available. For cable specifications, see “Cable Specifications for Copper-Based Control Plane Connections for the QFabric System” on page 124 and “Determining Transceiver Support for QFabric Systems” on page 123.

> **CAUTION:** The redundant patch cables interconnecting the Director devices are critical links required for the operation of the Director group. The two inter-Director device links must remain connected when the Director devices are online. Although a single inter-Director device can lose a link and regain its connection, the loss of both inter-Director device links causes one of the Director devices to become isolated from the Director group. In Figure 77 on page 270 through Figure 79 on page 271, these redundant patch cables are shown in red and connect port **3** to port **3**.

To connect QFX3100 Director devices in a Director group (see Figure 77 on page 270):

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. Connect the port labeled **3** on the first network module on one of the Director devices to the corresponding port (labeled **3**) on the first network module on the second Director device.

2. Connect the port labeled **3** on the *second* network module on one of the Director devices to the corresponding port (labeled **3**) on the *second* network module on the second Director device.

RELATED DOCUMENTATION

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | **272**

Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-G QFabric System Control Plane Network | **294**

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-M QFabric System Control Plane Network

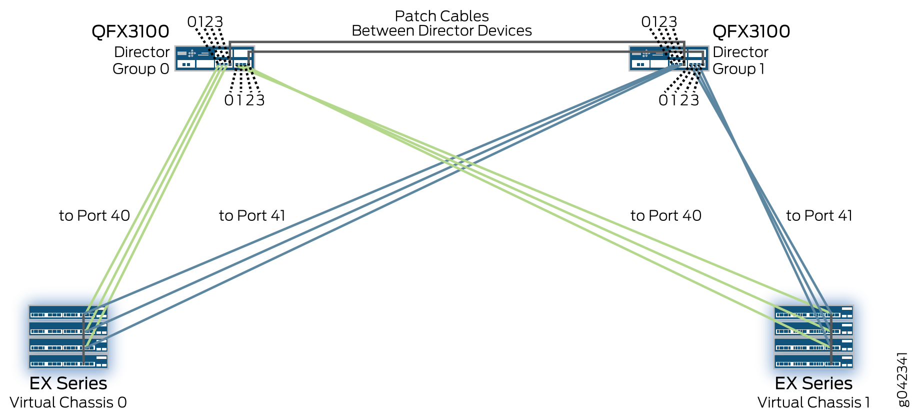
Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Troubleshooting QFX3100 Director Device Isolation

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of four EX4200 or four EX4300 switches. If you are creating a copper-based control plane network, you use four EX4200-48T or four EX4300-48T Ethernet switches in each Virtual Chassis. QFX3100 Director devices have two RJ-45 or SFP network modules. Use the RJ-45 network module ports to connect the QFX3100 Director group to each Virtual Chassis (see Figure 80 on page 273).

Figure 80: QFX3100 Director Group to Virtual Chassis Connections for QFX3000-G QFabric System



Use the following QFX3100 Director devices and EX Series switches for a copper-based QFX3000-G QFabric system control plane network:

- QFX3100 Director devices with RJ-45 network modules installed. Each RJ-45 network module provides four RJ-45 ports labeled **0** through **3**.
- Virtual Chassis EX4200-48T or EX4300-48T switches with an SFP+ uplink module installed.

Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333).

Before you begin to connect a QFX3100 Director device to the copper-based QFX3000-G control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). See "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). See *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis switches of four members each.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. See "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Connect the two QFX3100 Director devices to create a Director group. See "Connecting QFX3100 Director Devices in a Director Group" on page 269.
- Ensure that you have enough RJ-45 patch cables available, and ensure that the cables meet the specifications described in "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124.

To connect a QFX3100 Director device to the QFX3000-G QFabric control plane network (see Figure 80 on page 273):

1. Connect both network modules on the first Director device (labeled **DG0** in Figure 80 on page 273) to the two Virtual Chassis (labeled **VC0** and **VC1** in Figure 80 on page 273). You connect the first three ports (labeled **0** through **2**) on the first network module to the first Virtual Chassis (**VC0**. You connect the first three ports on the second network module (also labeled **0** through **2**) to the second Virtual Chassis (**VC0VC1**). The ports used are the same on each Virtual Chassis.

   Table 67: QFX3100 Director Device-to-Virtual Chassis Control Plane Port Assignments for DG0

Network Module Port 0	Network Module Port 1	Network Module Port 2	Network Module Port 3
Virtual Chassis port **ge-0/0/40**	Virtual Chassis port **ge-1/0/40**	Virtual Chassis port **ge-2/0/40**	Connect this port to the identical port on the other Director device. See "Connecting QFX3100 Director Devices in a Director Group" on page 269 .

2. Connect both network modules on the *second* Director device (labeled **DG1** in Figure 80 on page 273) to the two Virtual Chassis (labeled **VC0** and **VC1** in Figure 80 on page 273). You connect the first three ports on the first network module to the first Virtual Chassis (**VC0**). You connect the first three ports on the second network module to the second Virtual Chassis (**VC1**). The ports used are the same on each Virtual Chassis.

   Table 68: Second QFX3100 Director Device-to-Virtual Chassis Control Plane Port Assignments for DG1

Network Module Port 0	Network Module Port 1	Network Module Port 2	Network Module Port 3
Virtual Chassis port **ge-0/0/41**	Virtual Chassis port **ge-1/0/41**	Virtual Chassis port **ge-2/0/41**	Connect this port to the identical port on the other Director device. See "Connecting QFX3100 Director Devices in a Director Group" on page 269 .

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | 153

Connecting a QFX3100 Director Device to a Network for Out-of-Band Management

Use the management port on your QFX3100 Director device to connect each Director device in your Director group to your out-of-band management network.

> **NOTE:** You cannot use the management port to perform the initial configuration of the QFX3100 Director device. You must configure the management port before you can successfully connect to the QFX3100 Director device using this port. See "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

Ensure that you have an RJ-45 patch cable available.

To connect a QFX3100 Director device to a network for out-of-band management:

1. Connect one end of the Ethernet cable to the management port (labeled **MGMT** on the Director device front panel).

2. Connect the other end of the Ethernet cable to your management device or management network.

3. Repeat these steps for the second Director device.

RELATED DOCUMENTATION

Management Port Connector Pinouts for the QFX Series

Cable Specifications for Console and Management Connections for the QFX Series

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | 272

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-M QFabric System Control Plane Network

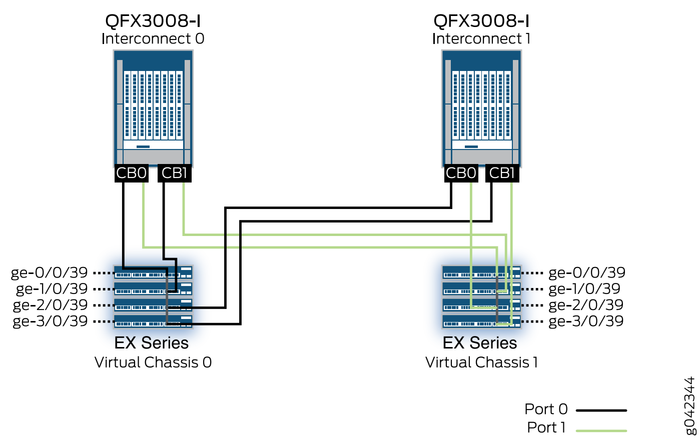
Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX Series Device to a Management Console | 161

Connecting a QFX3008-I Interconnect Device to a Copper-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFabric system devices in your network to two Virtual Chassis composed of four EX4200 switches or four EX4300 each. QFX3008-I Interconnect Devices have four small form factor pluggable plus (SFP+) management ports on each Control Board. Use the SFP+ management ports to connect the QFX3008-I Interconnect Devices to each Virtual Chassis (see Figure 81 on page 276.

Figure 81: QFX3008-I Interconnect Device Control Plane Connections



Specific ports have been reserved on the Virtual Chassis to connect to the Interconnect devices, Node devices, and QFX3100 Director devices in your QFabric system. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also enables the use of a standard Virtual Chassis configuration (see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333).

Before you begin to connect a QFX3008-I Interconnect Device to the copper-based QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware. For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis switches of four members each.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.

- See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. For more information, see "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.

- Ensure that 1000BASE-T SFP transceivers are installed in port **0** and port **1** on both Control Boards for each QFX3008-I Interconnect device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.

- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX4200 or EX4300 switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.

- Ensure that you have four RJ-45 patch cables available for each Interconnect device. For cable specifications, see "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124.

- Use Table 69 on page 277 to determine the QFX3008-I Interconnect device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system.

NOTE: The two Control Boards in each Interconnect device are labeled **CB0** and **CB1** in Figure 81 on page 276 and Table 69 on page 277. Interconnect devices IC2 and IC3 are not shown in Figure 81 on page 276 and describe the port mappings for the optional third and fourth Interconnect devices

Table 69: Interconnect Device Port Mappings

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC0	• **CB0, port 0** to **ge-0/0/39** • **CB1, port 0** to **ge-1/0/39**	• **CB0, port 1** to **ge-0/0/39** • **CB1, port 1** to **ge-1/0/39**
IC1	• **CB0, port 0** to **ge-2/0/39** • **CB1, port 0** to **ge-3/0/39**	• **CB0, port 1** to **ge-2/0/39** • **CB1, port 1** to **ge-3/0/39**
IC2	• **CB0, port 0** to **ge-0/0/38** • **CB1, port 0** to **ge-1/0/38**	• **CB0, port 1** to **ge-0/0/38** • **CB1, port 1** to **ge-1/0/38**
IC3	• **CB0, port 0** to **ge-2/0/38** • **CB1, port 0** to **ge-3/0/38**	• **CB0, port 1** to **ge-2/0/38** • **CB1, port 1** to **ge-3/0/38**

To connect each QFX3008-I Interconnect Device to the QFX3000-G QFabric system control plane network (see Figure 81 on page 276:

1. Connect the first Interconnect device.

    a. Connect one end of the first RJ-45 patch cable to the first SFP management port (labeled **0**) on the first Control Board (labeled **CB 0**).

    b. Connect the other end of that cable to port **ge-0/0/39** on the first Virtual Chassis.

    c. Connect one end of the second RJ-45 patch cable to the second SFP management port (labeled **1**) on the first Control Board (labeled **CB 0**).

    d. Connect the other end of that cable to port **ge-0/0/39** on the *second* Virtual Chassis.

    e. Connect one end of the third RJ-45 patch cable to the first SFP management port (labeled **0**) on the second Control Board (labeled **CB 1**).

    f. Connect the other end of that cable to port **ge-1/0/39** on the first Virtual Chassis.

    g. Connect one end of the fourth RJ-45 patch cable to the second SFP management port (labeled **1**) on the second Control Board (labeled **CB 1**).

    h. Connect the other end of that cable to port **ge-1/0/39** on the *second* Virtual Chassis.

2. Connect the second Interconnect device.

    a. Connect one end of the first RJ-45 patch cable to the first SFP management port (labeled **0**) on the first Control Board (labeled **CB 0**).

    b. Connect the other end of that cable to port **ge-2/0/39** on the first Virtual Chassis.

    c. Connect one end of the second RJ-45 patch cable to the second SFP management port (labeled **1**) on the first Control Board (labeled **CB 0**).

    d. Connect the other end of that cable to port **ge-2/0/39** on the *second* Virtual Chassis.

    e. Connect one end of the third RJ-45 patch cable to the first SFP management port (labeled **0**) on the second Control Board (labeled **CB 1**).

    f. Connect the other end of that cable to port **ge-3/0/39** on the first Virtual Chassis.

g. Connect one end of the fourth RJ-45 patch cable to the second SFP management port (labeled**1**) on the second Control Board (labeled **CB 1**).

h. Connect the other end of that cable to port **ge-3/0/39** on the *second* Virtual Chassis.

3. (Optional) Connect the third Interconnect device.

a. Connect one end of the first RJ-45 patch cable to the first SFP management port (labeled **0**) on the first Control Board (labeled **CB 0**).

b. Connect the other end of that cable to port **ge-0/0/38** on the first Virtual Chassis.

c. Connect one end of the second RJ-45 patch cable to the second SFP management port (labeled **1**) on the first Control Board (labeled **CB 0**).

d. Connect the other end of that cable to port **ge-0/0/38** on the *second* Virtual Chassis.

e. Connect one end of the third RJ-45 patch cable to the first SFP management port (labeled **0**) on the second Control Board (labeled **CB 1**).

f. Connect the other end of that cable to port **ge-1/0/38** on the first Virtual Chassis.

g. Connect one end of the fourth RJ-45 patch cable to the second SFP management port (labeled **1**) on the second Control Board (labeled **CB 1**).

h. Connect the other end of that cable to port **ge-1/0/38** on the *second* Virtual Chassis.

4. (Optional) Connect the fourth Interconnect device.

a. Connect one end of the first RJ-45 patch cable to the first SFP management port (labeled **0**) on the first Control Board (labeled **CB 0**).

b. Connect the other end of that cable to port **ge-2/0/38** on the first Virtual Chassis.

c. Connect one end of the second RJ-45 patch cable to the second SFP management port (labeled **1**) on the first Control Board (labeled **CB 0**).

d. Connect the other end of that cable to port **ge-2/0/38** on the *second* Virtual Chassis.

e. Connect one end of the third RJ-45 patch cable to the first SFP management port (labeled **0**) on the second Control Board (labeled **CB 1**).

f. Connect the other end of that cable to port **ge-3/0/38** on the first Virtual Chassis.

g. Connect one end of the fourth RJ-45 patch cable to the second SFP management port (labeled **1**) on the second Control Board (labeled **CB 1**).

h. Connect the other end of that cable to port **ge-3/0/38** on the *second* Virtual Chassis.

RELATED DOCUMENTATION

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | **283**

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | **318**

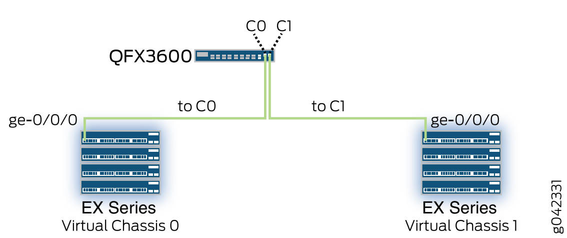
Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | **272**

Connecting QFX3100 Director Devices in a Director Group | **269**

Connecting a QFX3600 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX series devices in your network to two Virtual Chassis composed of four EX4200 or four EX4300 switches each. QFX3600 Node devices have two management ports with RJ-45 connectors. Use the management ports to connect the QFX3600 Node device to each Virtual Chassis (see Figure 82 on page 280).

Figure 82: QFX3600 Node Device Control Plane Connections



Before you begin to cable the QFX3000-G QFabric system control plane and management network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch*or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of four members each.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. For more information, see "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Ensure that you have two RJ-45 patch cables available. For cable specifications, see "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124.
- Use Table 70 on page 281 to determine the QFX3600 Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device port you connect (Node 0) will be connected to port **ge-0/0/0** on Virtual Chassis member **0**.

Table 70: QFX3600 Node Device-to-Virtual Chassis Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: **ge-0/0/0**	Node 32: **ge-1/0/0**	Node 64: **ge-2/0/0**	Node 96: **ge-3/0/0**
Node 1: **ge-0/0/1**	Node 33: **ge-1/0/1**	Node 65: **ge-2/0/1**	Node 97: **ge-3/0/1**
...	...	...	...
Node 30: **ge-0/0/30**	Node 62: **ge-1/0/30**	Node 94: **ge-2/0/30**	Node 126: **ge-3/0/30**

Table 70: QFX3600 Node Device-to-Virtual Chassis Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3
Node 31: **ge-0/0/31**	Node 63: **ge-1/0/31**	Node 95: **ge-2/0/31**	Node 127: **ge-3/0/31**

To connect a QFX3600 Node device to the QFX3000-G QFabric system control plane network (see Figure 82 on page 280):

1. Connect one end of the first RJ-45 patch cable to the first management port (labeled **0**) on the Node device front panel.

2. Connect the other end of that cable to the appropriate member and port on the Virtual Chassis. See Table 70 on page 281.

3. Connect one end of the second RJ-45 patch cable to the second management port (labeled **C1**) on the Node device front panel.

4. Connect the other end of that cable to the appropriate member and port on the *second* Virtual Chassis. This should be the same member number and port number that you connected to in Step 2. For example, if you connected the first cable to **ge-0/0/0** on Member **0** on the first Virtual Chassis, you connect the second cable to **ge-0/0/0** on Member **0** on the second Virtual Chassis.

5. Repeat this procedure for each Node device.

RELATED DOCUMENTATION

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | **272**

Connecting QFX3100 Director Devices in a Director Group | **269**

Connecting a QFX3008-I Interconnect Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | **276**

Connecting a QFX3600 Node Device to a QFX3008-I Interconnect Device | **316**

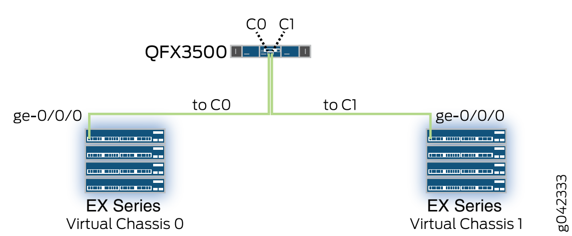
Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | **283**

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | **318**

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX series devices in your network to two Virtual Chassis composed of EX4200 or EX4300 switches. If you are creating a copper-based control plane network, you use four EX Series Ethernet switches in each Virtual Chassis. QFX3500 Node devices have an RJ-45 or SFP management board. Use the RJ-45 management ports (labeled **C0** and **C1**) to connect the QFX3500 Node device to each Virtual Chassis (see Figure 83 on page 283).

Figure 83: QFX3500 Node Device Control Plane Connections



Use the following QFX3500 Node devices and EX4200 or EX4300 switches for a copper-based QFX3000-M QFabric system control plane network:

- QFX3500 Node devices with an RJ-45 management board installed. The RJ-45 management board provides two RJ-45 1-Gbps management ports labeled **C0** and **C1**.
- Virtual Chassis EX4200-48T or EX4300-48T switch members with an SFP+ uplink module installed.

Before you begin to connect a QFX3500 Node device to the QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of four members each.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. For more information, see "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Ensure that you have two RJ-45 patch cables available. For cable specifications, see "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124.
- Use Table 71 on page 284 to determine the QFX3500 Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device port (Node 0) is connected to port **ge-0/0/0** on each Virtual Chassis.

Table 71: QFX3500 Node Device-to-Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: **ge-0/0/0**	Node 32: **ge-1/0/0**	Node 64: **ge-2/0/0**	Node 96: **ge-3/0/0**
Node 1: **ge-0/0/1**	Node 33: **ge-1/0/1**	Node 65: **ge-2/0/1**	Node 97: **ge-3/0/1**
...	...	...	...
Node 30: **ge-0/0/30**	Node 62: **ge-1/0/30**	Node 94: **ge-2/0/30**	Node 126: **ge-3/0/30**
Node 31: **ge-0/0/31**	Node 63: **ge-1/0/31**	Node 95: **ge-2/0/31**	Node 127: **ge-3/0/31**

To connect a QFX3500 Node device to the QFX3000-G QFabric system control plane network (see Figure 83 on page 283):

1. Connect one end of the first RJ-45 patch cable to the first management port (labeled **C0**) on the Node device management board.

2. Connect the other end of that cable to the appropriate member and port on the Virtual Chassis. See Table 71 on page 284.

3. Connect one end of the second RJ-45 patch cable to the second management port (labeled **C1**) on the Node device management board.

4. Connect the other end of that cable to the appropriate member and port on the *second* Virtual Chassis. This should be the same member number and port number that you connected to in Step 2. For example, if you connected the first cable to **ge-0/0/0** on the first Virtual Chassis, you connect the second cable to **ge-0/0/0** on the second Virtual Chassis.

5. Repeat this procedure for each Node device.

RELATED DOCUMENTATION

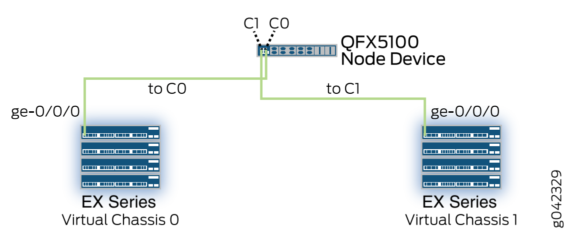
Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | **318**

Connecting a QFX3600 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | **280**

Connecting a QFX5100 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX series devices in your network to two Virtual Chassis composed of four EX4200 or four EX4300 switches. If you are creating a copper-based control plane network, you use the four EX Series Ethernet switches in each Virtual Chassis. QFX5100-48S Node devices have an RJ-45 **C0** located under the **CON** port, and an SFP cage **C1** that can be used as a copper management port. Use the RJ-45 management port (labeled **C0** and the SFP management port **C1**) to connect the QFX5100 Node device to each Virtual Chassis. See Figure 84 on page 285 for a cabling example.

Figure 84: QFX5100 Node Device Control Plane Connections



Use the following QFX5100 Node devices and EX4200 switches for a copper-based QFX3000-M QFabric system control plane network:

- QFX5100 Node devices with:
  - em0–RJ-45 (1000BASE-T) management Ethernet port (**C0**)

- em1–SFP management Ethernet port (**C1**) cage (socket for 1 GbE copper SFP)

- Virtual Chassis of EX4200-48T or EX4300-48T switches with SFP+ uplink modules installed.

Before you begin to connect a QFX5100 Node device to the QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see “Installing and Connecting a QFX3100 Director Device” on page 153, “Installing and Connecting a QFX3008-I Interconnect Device” on page 165, “Installing and Connecting a QFX3600 or QFX3600-I Device” on page 226, “Installing and Connecting a QFX3500 Device” on page 247, and “Installing and Connecting a QFX5100 Device” on page 207.

- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch*or *Installing and Connecting an EX4300 Switch*.

- Create two Virtual Chassis of four members each.

  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.

  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. For more information, see “Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy” on page 266.

- Ensure that you have two RJ-45 patch cables available. For cable specifications, see “Cable Specifications for Copper-Based Control Plane Connections for the QFabric System” on page 124.

- Use Table 72 on page 286 to determine the QFX5100-48S Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see “Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane” on page 333).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device port (Node 0) is connected to port ge-0/0/0 on each Virtual Chassis.

Table 72: QFX5100-48S Node Device-to-Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: ge-0/0/0	Node 32: ge-1/0/0	Node 64: ge-2/0/0	Node 96: ge-3/0/0

Table 72: QFX5100-48S Node Device-to-Virtual Chassis Copper-Based Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3
Node 1: ge-0/0/1	Node 33: ge-1/0/1	Node 65: ge-2/0/1	Node 97: ge-3/0/1
...	...	...	...
Node 30: ge-0/0/30	Node 62: ge-1/0/30	Node 94: ge-2/0/30	Node 126: ge-3/0/30
Node 31: ge-0/0/31	Node 63: ge-1/0/31	Node 95: ge-2/0/31	Node 127: ge-3/0/31

To connect a QFX5100 Node device to the QFX3000-G QFabric system control plane network):

1. Connect one end of the first RJ-45 patch cable to the management port (labeled **C0**) on the Node device management board.

2. Connect the other end of that cable to the appropriate member and port on the Virtual Chassis. See Table 72 on page 286.

3. Connect one end of the second RJ-45 patch cable to the second management port (labeled **C1**) on the Node device management board.

4. Connect the other end of that cable to the appropriate member and port on the *second* Virtual Chassis. This should be the same member number and port number that you connected to in Step 2. For example, if you connected the first cable to ge-0/0/0 on the first Virtual Chassis, you connect the second cable to ge-0/0/0 on the second Virtual Chassis.

5. Repeat this procedure for each Node device.

RELATED DOCUMENTATION

Connecting a QFX5100 Node Device to a QFX3008-I Interconnect Device | **320**

Connecting a QFX3600 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | **280**

CHAPTER 14

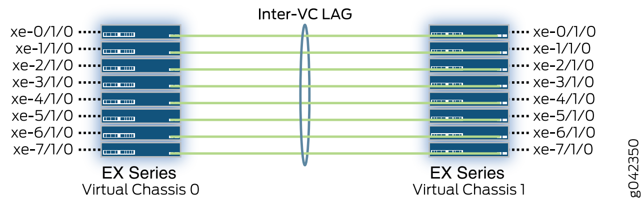
Cabling a Fiber-Based Control Plane for the QFX3000-G QFabric System

IN THIS CHAPTER

Interconnecting Two Virtual Chassis for Fiber-Based QFX3000-G QFabric System Control Plane Redundancy

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis. If you are creating a fiber-based control plane network, you use eight EX4200-24F or four EX4300-48P Ethernet switches in each Virtual Chassis. For redundancy and communication, you must connect the two Virtual Chassis using the 10-Gigabit Ethernet uplink module ports configured as a link aggregation group (LAG) (see Figure 85 on page 289).

Figure 85: QFX3000-G QFabric System Fiber-Based Control Plane—Inter-Virtual Chassis LAG Connections



Before you begin to interconnect two Virtual Chassis for QFX3000-G QFabric system control plane redundancy:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). See "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165 "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Ensure that you have installed a 10-Gigabit Ethernet SFP+ transceivers in port **0** on each Virtual Chassis member uplink module (see *Installing a Transceiver*). EX4200 uplink modules only support SFP+ transceivers installed in ports **0** and **2**. For a list of supported transceivers, see *Pluggable Transceivers Supported on EX4200 Switches* and *Pluggable Transceivers Supported on EX4300 Switches*.

  Instead of using optical transceivers, you can use 10-Gigabit Ethernet SFP+ direct-attach (DAC) cables. For a list of supported DAC cables, see *SFP+ Direct Attach Copper Cables for EX Series Switches*. The procedure below assumes you are using optical transceivers, but the port mappings in Table 73 on page 290 and Table 74 on page 290 also apply to DAC cables.
- Ensure that you have appropriate fiber-optic cables (see *Pluggable Transceivers Supported on EX4200 Switches* or *Pluggable Transceivers Supported on EX4300 Switches*).
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings*).
- Use Table 73 on page 290 and Table 74 on page 290 to determine the fiber-based control plane Virtual Chassis-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System" on page 387.

Table 73: Virtual Chassis-to-Virtual Chassis Fiber-Based Control Plane Port Assignments for EX 4200

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7
xe-0/1/0 on EX0 to **xe-0/1/0** on EX1	**xe-1/1/0** on EX0 to **xe-1/1/0** on EX1	**xe-2/1/0** on EX0 to **xe-2/1/0** on EX1	**xe-3/1/0** on EX0 to **xe-3/1/0** on EX1	**xe-4/1/0** on EX0 to **xe-4/1/0** on EX1	**xe-5/1/0** on EX0 to **xe-5/1/0** on EX1	**xe-6/1/0** on EX0 to **xe-6/1/0** on EX1	**xe-7/1/0** on EX0 to **xe-7/1/0** on EX1

Table 74: Virtual Chassis-to-Virtual Chassis Fiber-Based Control Plane Port Assignments for EX4300

Member 0	Member 1	Member 2	Member 3
xe-0/1/0 on EX0 to **xe-0/1/0** on EX1	**xe-1/1/0** on EX0 to **xe-1/1/0** on EX1	**xe-2/1/0** on EX0 to **xe-2/1/0** on EX1	**xe-3/1/0** on EX0 to **xe-3/1/0** on EX1

To interconnect two Virtual Chassis for QFabric system control plane redundancy (see Figure 85 on page 289):

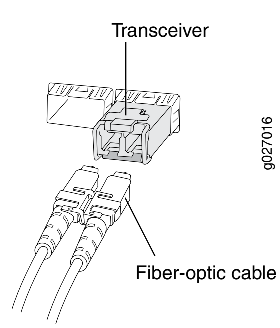
WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the SFP+ optical transceiver in port **0** on member **0** of the first Virtual Chassis. Save the cap.

3. Insert the cable connector into the optical transceiver (see Figure 76 on page 268).

Figure 86: Connecting a Fiber-Optic Cable to an Optical Transceiver Installed in an EX Series Switch



4. If the connector at the other end of the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

5. Remove the rubber safety cap from the SFP+ optical transceiver in port **0** on member **0** of the *second* Virtual Chassis. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Repeat Step 1 through Step 6 for each uplink module port, following the port assignments in Table 73 on page 290 and Table 74 on page 290.

8. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

   CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.

   Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | 153

Connecting QFX3100 Director Devices in a Director Group

A QFabric system requires two QFX3100 Director devices interconnected as a QFX3100 Director *group* (see Figure 77 on page 270 through Figure 79 on page 271).

Figure 87: QFX3100 Director Group Control Plane Connections for QFX3000-G QFabric System Using Copper-Based Control Plane

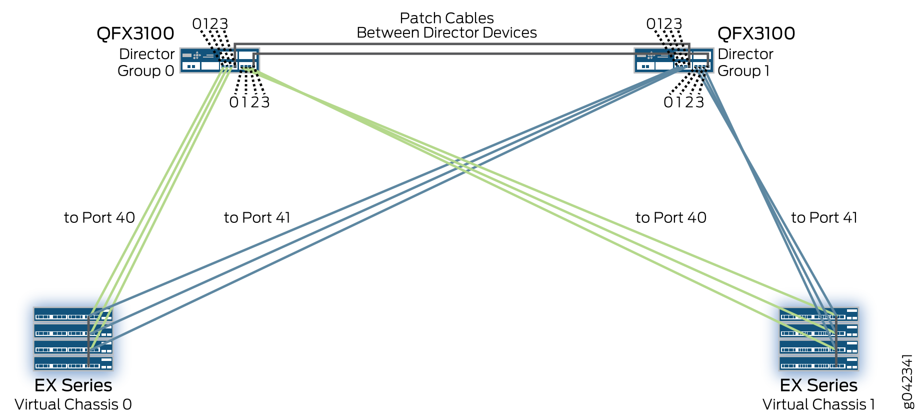


Figure 88: QFX3100 Director Group Control Plane Connections for QFX3000-G QFabric System Using Fiber-Based Control Plane

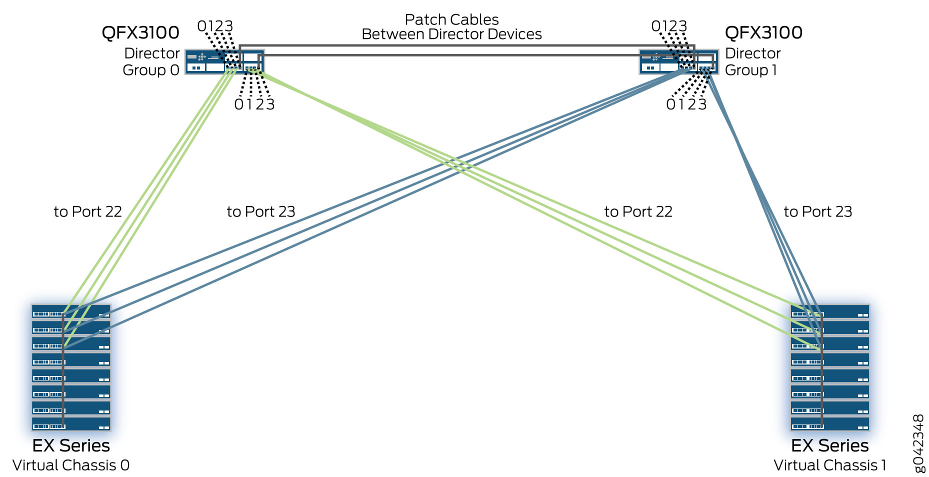
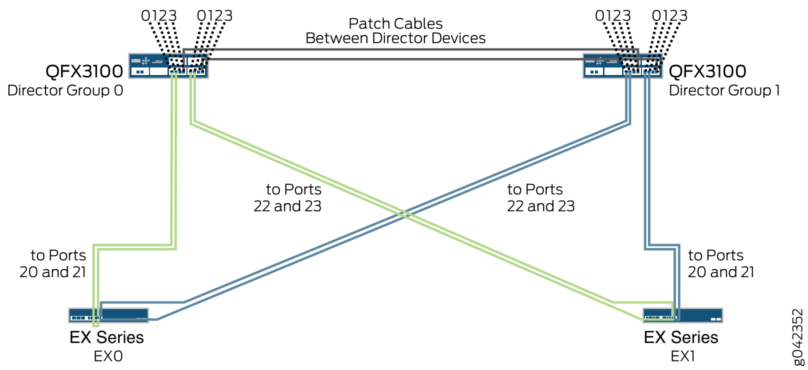


Figure 89: QFX3100 Director Group Control Plane Connections for QFX3000-M QFabric System



The second QFX3100 Director device provides redundancy for the control plane and management network.

Before you begin to connect QFX3100 Director devices in a Director group:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.

> **NOTE:** For a copper-based QFX3000-M QFabric system control plane network, use QFX3100 Director devices with RJ-45 network modules installed. For a fiber-based control plane network, use QFX3100 Director devices with SFP network modules installed.

- Ensure that you have appropriate transceivers and cables available. For cable specifications, see "Cable Specifications for Copper-Based Control Plane Connections for the QFabric System" on page 124 and "Determining Transceiver Support for QFabric Systems" on page 123.

> **CAUTION:** The redundant patch cables interconnecting the Director devices are critical links required for the operation of the Director group. The two inter-Director device links must remain connected when the Director devices are online. Although a single inter-Director device can lose a link and regain its connection, the loss of both inter-Director device links causes one of the Director devices to become isolated from the Director group. In Figure 77 on page 270 through Figure 79 on page 271, these redundant patch cables are shown in red and connect port **3** to port **3**.

To connect QFX3100 Director devices in a Director group (see Figure 77 on page 270):

> **WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. Connect the port labeled **3** on the first network module on one of the Director devices to the corresponding port (labeled **3**) on the first network module on the second Director device.

2. Connect the port labeled **3** on the *second* network module on one of the Director devices to the corresponding port (labeled **3**) on the *second* network module on the second Director device.

RELATED DOCUMENTATION

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | 272

Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-G QFabric System Control Plane Network | 294

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-M QFabric System Control Plane Network

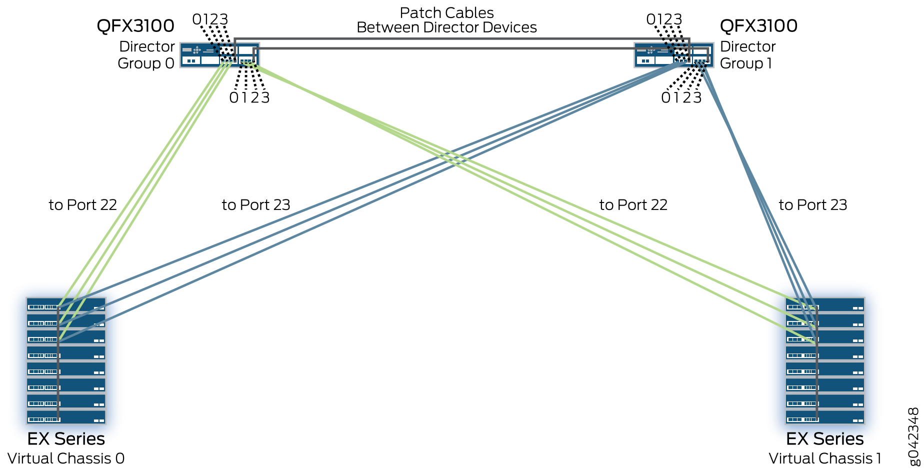
Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Troubleshooting QFX3100 Director Device Isolation

Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of EX4200 or EX4300 switches. If you are creating a fiber-based control plane network, you use eight EX4200-24F four EX4300-48P Ethernet switches in each Virtual Chassis. QFX3100 Director devices have two RJ-45 or SFP network modules network modules. Use the SFP network module ports to connect the QFX3100 Director group to each Virtual Chassis (see Figure 90 on page 295).

Figure 90: QFX3100 Director Group to Virtual Chassis Connections for QFX3000-G QFabric System



Use the following QFX3100 Director devices and EX Series switches for a fiber-based QFX3000-M QFabric system control plane network:

- QFX3100 Director devices with SFP network modules installed. Each SFP network module provides four SFP ports labeled **0** through **3**.
- Virtual Chassis EX4200-24F or EX4300-48P switches members with an SFP+ uplink module installed.

Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see “Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System” on page 387).

Before you begin to connect a QFX3100 Director device to the fiber-based QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). See “Installing and Connecting a QFX3100 Director Device” on page 153, “Installing and Connecting a QFX3008-I Interconnect Device” on page 165, “Installing and Connecting a QFX3600 or QFX3600-I Device” on page 226, and “Installing and Connecting a QFX3500 Device” on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). See *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. See "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Connect the two QFX3100 Director devices to create a Director group. See "Connecting QFX3100 Director Devices in a Director Group" on page 269.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports labeled **0** and **1** on both the network modules on each QFX3100 Director device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports labeled **22** and **23** on member **0**, **1**, and **2** (see *Installing a Transceiver*). For a list of supported transceivers and required cables, see *Pluggable Transceivers Supported on EX4200 Switches* and *Pluggable Transceivers Supported on EX4300 Switches*.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX4200 switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.
- Ensure that you have appropriate fiber-optic cables.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).

To connect a QFX3100 Director device to the fiber-based QFX3000-G QFabric control plane network (see Figure 90 on page 295):

> **WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. Connect both network modules on the first Director device (labeled **DG0** in Figure 90 on page 295) to the two Virtual Chassis (labeled **VC0** and **VC1** in Figure 90 on page 295). You connect the first three ports (labeled **0** through **2**) on the first network module to the first Virtual Chassis (**VC0**). You connect the first two ports on the second network module (also labeled **0** through **2**) to the second Virtual Chassis (**VC1**). The ports used are the same on each Virtual Chassis.

Table 75: QFX3100 Director Device-to-VIrtual Chassis Control Plane Port Assignments for DG0

Network Module Port 0	Network Module Port 1	Network Module Port 2	Network Module Port 3
Virtual Chassis port **ge-0/0/22**	Virtual Chassis port **ge-1/0/22**	Virtual Chassis port **ge-2/0/22**	Connect this port to the identical port on the other Director device. See "Connecting QFX3100 Director Devices in a Director Group" on page 269.

2. Connect both network modules on the *second* Director device (labeled **DG1** in Figure 90 on page 295) to the two Virtual Chassis (labeled **VC0** and **VC1** in Figure 90 on page 295). You connect the first three ports on the first network module to the first Virtual Chassis (**VC0**). You connect the first three ports on the second network module to the second Virtual Chassis (**VC1**). The ports used are the same on each Virtual Chassis.

   Table 76: Second QFX3100 Director Device-to-Virtual Chassis Control Plane Port Assignments for DG1

Network Module Port 0	Network Module Port 1	Network Module Port 2	Network Module Port 3
Virtual Chassis port **ge-0/0/23**	Virtual Chassis port **ge-1/0/23**	Virtual Chassis port **ge-2/0/23**	Connect this port to the identical port on the other Director device. See "Connecting QFX3100 Director Devices in a Director Group" on page 269.

RELATED DOCUMENTATION

Installing and Connecting a QFX3100 Director Device | **153**

Connecting a QFX3100 Director Device to a Network for Out-of-Band Management

Use the management port on your QFX3100 Director device to connect each Director device in your Director group to your out-of-band management network.

NOTE: You cannot use the management port to perform the initial configuration of the QFX3100 Director device. You must configure the management port before you can successfully connect to the QFX3100 Director device using this port. See "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

Ensure that you have an RJ-45 patch cable available.

To connect a QFX3100 Director device to a network for out-of-band management:

1. Connect one end of the Ethernet cable to the management port (labeled **MGMT** on the Director device front panel).

2. Connect the other end of the Ethernet cable to your management device or management network.

3. Repeat these steps for the second Director device.

RELATED DOCUMENTATION

Management Port Connector Pinouts for the QFX Series

Cable Specifications for Console and Management Connections for the QFX Series

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-G QFabric System Control Plane Network | 272

Connecting QFX3100 Director Devices to a Copper-Based QFX3000-M QFabric System Control Plane Network

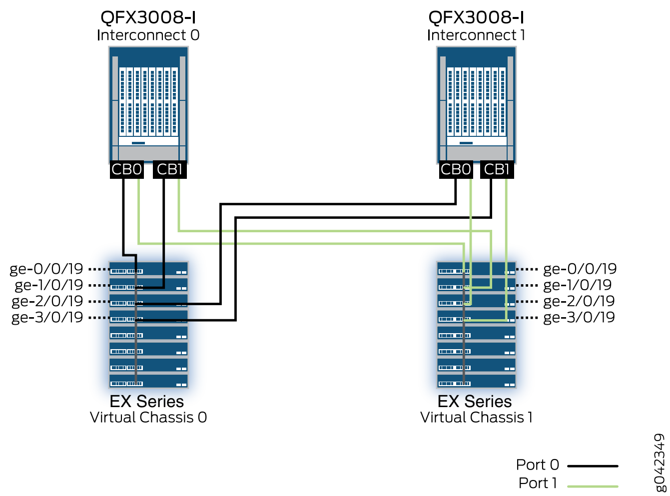
Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX Series Device to a Management Console | 161

Connecting a QFX3008-I Interconnect Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of EX4200 or EX4300 switches. If you are creating a fiber-based control plane network, you use eight EX4200-24F or four EX4300-48P Ethernet switches in each Virtual Chassis. QFX3008-I Interconnect Devices have four small form factor pluggable plus (SFP+) management ports on each Control Board (**CB0** and **CB1**). Use the SFP+ management ports to connect the QFX3008-I Interconnect Devices to each Virtual Chassis (see Figure 91 on page 299).

Figure 91: QFX3000-G QFabric System Fiber-Based Control Plane—Interconnect Device to Virtual Chassis Connections



Specific ports have been reserved on the Virtual Chassis to connect to the Interconnect devices, Node devices, and QFX3100 Director devices in your QFabric system. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also enables the use of a standard Virtual Chassis configuration (see "Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System" on page 387).

Before you begin to connect a QFX3008-I Interconnect Device to the fiber-based QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Install your Virtual Chassis hardware. For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. For more information, see "Interconnecting Two Virtual Chassis for Fiber-Based QFX3000-G QFabric System Control Plane Redundancy" on page 288.

- Ensure that 1-Gigabit Ethernet SFP transceivers are installed in port **0** and port **1** on both Control Boards for each QFX3008-I Interconnect device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX Series switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.
- Ensure that you have appropriate fiber-optic cables.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Use Table 77 on page 300 to determine the QFX3008-I Interconnect device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system.

> **NOTE:** The two Control Boards in each Interconnect device are labeled **CB0** and **CB1** in Figure 91 on page 299 and Table 77 on page 300. Interconnect devices IC2 and IC3 are not shown in Figure 91 on page 299 and describe the port mappings for the optional third and fourth Interconnect devices

Table 77: Interconnect Device Port Mappings

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC0	• **CB0, port 0** to **ge-0/0/19** • **CB1, port 0** to **ge-1/0/19**	• **CB0, port 1** to **ge-0/0/19** • **CB1, port 1** to **ge-1/0/19**
IC1	• **CB0, port 0** to **ge-2/0/19** • **CB1, port 0** to **ge-3/0/19**	• **CB0, port 1** to **ge-2/0/19** • **CB1, port 1** to **ge-3/0/19**
IC2	• **CB0, port 0** to **ge-0/0/18** • **CB1, port 0** to **ge-1/0/18**	• **CB0, port 1** to **ge-0/0/18** • **CB1, port 1** to **ge-1/0/18**
IC3	• **CB0, port 0** to **ge-2/0/18** • **CB1, port 0** to **ge-3/0/18**	• **CB0, port 1** to **ge-2/0/18** • **CB1, port 1** to **ge-3/0/18**

To connect each QFX3600-I Interconnect device to the fiber-based control plane network:

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

NOTE: Before you connect each cable to a device, if the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. If the transceiver is covered with a rubber safety cap, remove the cap. Save the caps for future use.

1. Connect the first QFX3008-I Interconnect device.

   a. Connect one end of the first fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the first Control Board (labeled **CB 0**).

   b. Connect the other end of that cable to port **ge-0/0/19** on the first Virtual Chassis.

   c. Connect one end of the second fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB0**.

   d. Connect the other end of that cable to port **ge-0/0/19** on the *second* Virtual Chassis.

   e. Connect one end of the third fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the *second* Control Board (labeled **CB 1**).

   f. Connect the other end of that cable to port **ge-1/0/19** on the first Virtual Chassis.

   g. Connect one end of the fourth fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB1**.

   h. Connect the other end of that cable to port **ge-1/0/19** on the *second* Virtual Chassis.

2. Connect the second QFX3008-I Interconnect device.

   a. Connect one end of the first fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the first Control Board (labeled **CB 0**).

   b. Connect the other end of that cable to port **ge-2/0/19** on the first Virtual Chassis.

c. Connect one end of the second fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB0**.

d. Connect the other end of that cable to port **ge-2/0/19** on the *second* Virtual Chassis.

e. Connect one end of the third fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the *second* Control Board (labeled **CB 1**).

f. Connect the other end of that cable to port **ge-3/0/19** on the first Virtual Chassis.

g. Connect one end of the fourth fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB1**.

h. Connect the other end of that cable to port **ge-3/0/19** on the *second* Virtual Chassis.

3. (Optional) Connect the third QFX3008-I Interconnect device.

   a. Connect one end of the first fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the first Control Board (labeled **CB 0**).

   b. Connect the other end of that cable to port **ge-0/0/18** on the first Virtual Chassis.

   c. Connect one end of the second fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB0**.

   d. Connect the other end of that cable to port **ge-0/0/18** on the *second* Virtual Chassis.

   e. Connect one end of the third fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the *second* Control Board (labeled **CB 1**).

   f. Connect the other end of that cable to port **ge-1/0/18** on the first Virtual Chassis.

   g. Connect one end of the fourth fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB1**.

   h. Connect the other end of that cable to port **ge-1/0/18** on the *second* Virtual Chassis.

4. Connect the fourth QFX3008-I Interconnect device.

   a. Connect one end of the first fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the first Control Board (labeled **CB 0**).

b. Connect the other end of that cable to port **ge-2/0/18** on the first Virtual Chassis.

c. Connect one end of the second fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB0**.

d. Connect the other end of that cable to port **ge-2/0/18** on the *second* Virtual Chassis.

e. Connect one end of the third fiber optic cable to the SFP optical transceiver in the first management port labeled (labeled **0**) on the *second* Control Board (labeled **CB 1**).

f. Connect the other end of that cable to port **ge-3/0/18** on the first Virtual Chassis.

g. Connect one end of the fourth fiber optic cable to the SFP optical transceiver in the second management port (labeled **1**) on **CB1**.

h. Connect the other end of that cable to port **ge-3/0/18** on the *second* Virtual Chassis.

RELATED DOCUMENTATION

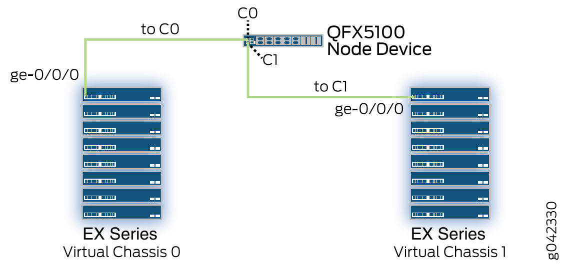
Connecting a QFX3600 Node Device to a QFX3008-I Interconnect Device | **316**

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | **318**

Connecting a QFX5100 Node Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of EX4200 or EX4300 switches. If you are creating a fiber-based control plane network, you use eight EX4200-24F or four EX4300-48P Ethernet switches in each Virtual Chassis. QFX5100 Node devices have an RJ-45 management port and one or two small form-factor pluggable (SFP) cages for copper or fiber SFP modules. For an all-fiber connection, place an 1 Gbps fiber SFP in the **C0** and **C1** management ports to connect the QFX5100 Node device to each Virtual Chassis, (see Figure 92 on page 304.)

Figure 92: QFX5100 Node Device Fiber-Based Control Plane Connections for QFX3000-G QFabric System



Use the following QFX5100 Node devices and EX Series switches for a fiber-based QFX3000-G QFabric system control plane network:

- QFX5100 Node devices with two 1-Gbps SFP modules installed in the management ports labeled **C0** and **C1**.
- Virtual Chassis EX4200-24F or EX4300-48P switch members with an SFP+ uplink module installed.

Before you begin to connect a QFX5100 Node device to the fiber-based QFX3000-M QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, "Installing and Connecting a QFX3500 Device" on page 247 and "Installing and Connecting a QFX5100 Device" on page 207.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch*or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. See "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in both management ports labeled **C0** on each QFX5100 Node device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.

- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX Series switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.
- Ensure that you have appropriate fiber-optic cables.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Use Table 78 on page 305 or Table 79 on page 306to determine the QFX5100 Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System" on page 387).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device (Node 0) is connected to port ge-0/0/0 on each Virtual Chassis.

Table 78: QFX5100 Node Device-to-EX4200 Virtual Chassis Fiber-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7
Node: 0 ge-0/0/0	Node: 16 ge-1/0/0	Node: 32 ge-2/0/0	Node: 48 ge-3/0/0	Node: 64 ge-4/0/0	Node: 80 ge-5/0/0	Node: 96 ge-6/0/0	Node: 112 ge-7/0/0
Node: 1 ge-0/0/1	Node: 17 ge-1/0/1	Node: 33 ge-2/0/1	Node: 49 ge-3/0/1	Node: 65 ge-4/0/1	Node: 81 ge-5/0/1	Node: 97 ge-6/0/1	Node: 113 ge-7/0/1
...	...	...	...	...	...	...	...
Node: 14 ge-0/0/14	Node: 30 ge-1/0/14	Node: 46 ge-2/0/14	Node: 62 ge-3/0/14	Node: 78 ge-4/0/14	Node: 94 ge-5/0/14	Node: 110 ge-6/0/14	Node: 126 ge-7/0/14
Node: 15 ge-0/0/15	Node: 31 ge-1/0/15	Node: 47 ge-2/0/15	Node: 63 ge-3/0/15	Node: 79 ge-4/0/15	Node: 95 ge-5/0/15	Node: 111 ge-6/0/15	Node: 127 ge-7/0/15

Table 79: QFX5100-48S Node Device-to-EX4300 Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: ge-0/0/0	Node 32: ge-1/0/0	Node 64: ge-2/0/0	Node 96: ge-3/0/0
Node 1: ge-0/0/1	Node 33: ge-1/0/1	Node 65: ge-2/0/1	Node 97: ge-3/0/1
...	...	...	...
Node 30: ge-0/0/30	Node 62: ge-1/0/30	Node 94: ge-2/0/30	Node 126: ge-3/0/30
Node 31: ge-0/0/31	Node 63: ge-1/0/31	Node 95: ge-2/0/31	Node 127: ge-3/0/31

To connect a QFX5100 Node device to the fiber-based QFX3000-G QFabric system control plane network:

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the SFP optical transceiver in the first management port (labeled **C0**) on the Node device management panel. Save the cap.

3. Insert the cable connector into the optical transceiver.

4. Connect the other end of that cable to the appropriate port on the first Virtual Chassis. See Table 78 on page 305.

5. Remove the rubber safety cap from the SFP optical transceiver in the second management port (labeled **C1**) on the Node device management panel. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Connect the other end of that cable to the appropriate port on the *second* Virtual Chassis. This should be the same port number that you connected to in Step 4. For example, if you connected the first cable to ge-0/0/0 on the first Virtual Chassis, you connect the second cable to ge-0/0/0 on the second Virtual Chassis.

8. Repeat this procedure for each QFX5100 Node device.

9. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> **CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

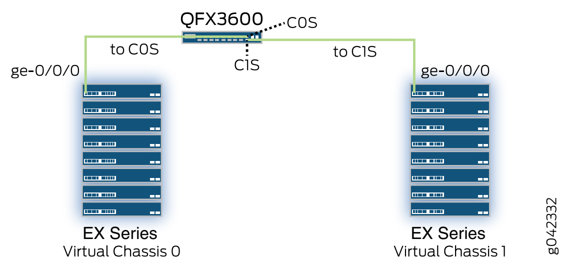
Connecting a QFX5100 Node Device to a QFX3008-I Interconnect Device | **320**

Connecting a QFX3600 Node Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network | **307**

Connecting a QFX3600 Node Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of EX4200 or EX4300 switches. If you are creating a fiber-based control plane network, you use eight EX4200-24F or four EX4300-48P Ethernet switches in each Virtual Chassis. QFX3600 Node devices have RJ-45 and SFP management ports. Use the SFP management ports (labeled **C0S** and **C1S**) to connect the QFX3500 Node device to each Virtual Chassis (see Figure 93 on page 308).

Figure 93: QFX3600 Node Device Fiber-Based Control Plane Connections for QFX3000-M QFabric System



Use the following QFX3600 Node devices and EX Series switches for a fiber-based QFX3000-G QFabric system control plane network:

- QFX3600 Node devices.
- Virtual Chassis EX4200-24F or EX4300-48P switch members with an SFP+ uplink module installed.

Before you begin to connect a QFX3600 Node device to the fiber-based QFX3000-G QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see “Installing and Connecting a QFX3100 Director Device” on page 153, “Installing and Connecting a QFX3008-I Interconnect Device” on page 165, “Installing and Connecting a QFX3600 or QFX3600-I Device” on page 226, and “Installing and Connecting a QFX3500 Device” on page 247.
- Install your Virtual Chassis hardware (EX4200 or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch*or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. See “Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy” on page 266.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in management ports **C0S** and **C1S** on each QFX3600 Node device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX Series switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.

- Ensure that you have appropriate fiber-optic cables.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Use Table 80 on page 309 or Table 81 on page 309 to determine the QFX3600 Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System" on page 387).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device (Node 0) is connected to port **ge-0/0/0** on each Virtual Chassis.

Table 80: QFX3600 Node Device-to-Virtual Chassis Fiber-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7
Node: 0 **ge-0/0/0**	Node: 16 **ge-1/0/0**	Node: 32 **ge-2/0/0**	Node: 48 **ge-3/0/0**	Node: 64 **ge-4/0/0**	Node: 80 **ge-5/0/0**	Node: 96 **ge-6/0/0**	Node: 112 **ge-7/0/0**
Node: 1 **ge-0/0/1**	Node: 17 **ge-1/0/1**	Node: 33 **ge-2/0/1**	Node: 49 **ge-3/0/1**	Node: 65 **ge-4/0/1**	Node: 81 **ge-5/0/1**	Node: 97 **ge-6/0/1**	Node: 113 **ge-7/0/1**
...	...	...	...	...	...	...	...
Node: 14 **ge-0/0/14**	Node: 30 **ge-1/0/14**	Node: 46 **ge-2/0/14**	Node: 62 **ge-3/0/14**	Node: 78 **ge-4/0/14**	Node: 94 **ge-5/0/14**	Node: 110 **ge-6/0/14**	Node: 126 **ge-7/0/14**
Node: 15 **ge-0/0/15**	Node: 31 **ge-1/0/15**	Node: 47 **ge-2/0/15**	Node: 63 **ge-3/0/15**	Node: 79 **ge-4/0/15**	Node: 95 **ge-5/0/15**	Node: 111 **ge-6/0/15**	Node: 127 **ge-7/0/15**

Table 81: QFX3600 Node Device-to-EX4300 Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: ge-0/0/0	Node 32: ge-1/0/0	Node 64: ge-2/0/0	Node 96: ge-3/0/0
Node 1: ge-0/0/1	Node 33: ge-1/0/1	Node 65: ge-2/0/1	Node 97: ge-3/0/1

Table 81: QFX3600 Node Device-to-EX4300 Virtual Chassis Copper-Based Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3
...	...	...	...
Node 30: ge-0/0/30	Node 62: ge-1/0/30	Node 94: ge-2/0/30	Node 126: ge-3/0/30
Node 31: ge-0/0/31	Node 63: ge-1/0/31	Node 95: ge-2/0/31	Node 127: ge-3/0/31

To connect a QFX3600 Node device to the fiber-based QFX3000-G QFabric system control plane network (see Figure 93 on page 308):

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the SFP optical transceiver in the first SFP management port (labeled **C0S**) on the Node device front panel. Save the cap.

3. Insert the cable connector into the optical transceiver.

4. Connect the other end of that cable to the appropriate port on the first Virtual Chassis. See Table 80 on page 309.

5. Remove the rubber safety cap from the SFP optical transceiver in the second SFP management port (labeled **C1S**) on the Node device front panel. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Connect the other end of that cable to the appropriate port on the *second* EX Series switch. This should be the same port number that you connected to in Step 4. For example, if you connected the first cable to **ge-0/0/0** on the first Virtual Chassis, you connect the second cable to **ge-0/0/0** on the second Virtual Chassis.

8. Repeat this procedure for each QFX3600 Node device.

9. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> **CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Connecting a QFX3600-I Interconnect Device to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Connecting a QFX3600 Node Device to a QFX3600-I Interconnect Device

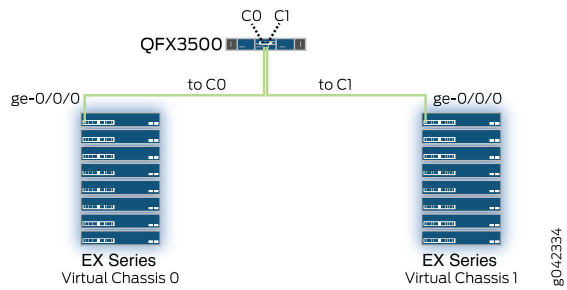
Connecting QFX3100 Director Devices to a Fiber-Based QFX3000-M QFabric System Control Plane Network

Connecting QFX3100 Director Devices in a Director Group | **269**

Connecting a QFX3500 Node Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network

A QFX3000-G QFabric system control plane and management network is formed by connecting the QFX Series devices in your network to two Virtual Chassis composed of EX Series switches. If you are creating a fiber-based control plane network, you use eight EX4200-24F or four EX4300-48P Ethernet switches in each Virtual Chassis. QFX3500 Node devices have an RJ-45 or SFP management board. Use the SFP management ports (labeled **C0** and **C1**) to connect the QFX3500 Node device to each Virtual Chassis (see Figure 94 on page 312).

Figure 94: QFX3500 Node Device Fiber-Based Control Plane Connections for QFX3000-G QFabric System



Use the following QFX3500 Node devices and EX Series switches for a fiber-based QFX3000-G QFabric system control plane network:

- QFX3500 Node devices with an SFP management board installed. The SFP management board provides two small form-factor pluggable (SFP) 1-Gbps management ports labeled **C0** and **C1**.
- Virtual Chassis EX4200-24F or EX4300-48P switch members with an SFP+ uplink module installed.

Before you begin to connect a QFX3500 Node device to the fiber-based QFX3000-M QFabric system control plane network:

- Install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226, and "Installing and Connecting a QFX3500 Device" on page 247.
- Create two Virtual Chassis of eight EX4200-24F switch members or four EX4300-48P switch members.
  - See *Cabling EX4200 or EX4300 Series Switches Virtual Chassis for a QFX3000-G QFabric System Control Plane*.
  - See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Interconnect the two Virtual Chassis switches using the 10-Gigabit Ethernet SFP+ uplink ports. See "Interconnecting Two Virtual Chassis for Copper-Based QFX3000-G QFabric System Control Plane Redundancy" on page 266.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in management ports **C0** and **C1** on each QFX3500 Node device (see *Installing a Transceiver in a QFX Series Device*). For a list of supported transceivers and required cables, see The Hardware Compatibility Tool.
- Ensure that you have installed 1-Gigabit Ethernet SFP transceivers in the ports you are using on each EX Series switch (see *Installing a Transceiver*). For a list of supported transceivers, see The Hardware Compatibility Tool.
- Ensure that you have appropriate fiber-optic cables.

- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Use Table 82 on page 313 and Table 83 on page 313 to determine the QFX3500 Node device-to-Virtual Chassis port mappings. Specific ports have been reserved on the Virtual Chassis to connect to each of the QFX Series device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration (see "Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System" on page 387).

> **NOTE:** The numerical identifiers for each Node device below are not preassigned to the Node devices that are shipped to you. They represent the order in which you connect the Node devices. For example, the first Node device (Node 0) is connected to port **ge-0/0/0** on each Virtual Chassis.

Table 82: QFX3500 Node Device-to-Virtual Chassis Fiber-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7
Node: 0 **ge-0/0/0**	Node: 16 **ge-1/0/0**	Node: 32 **ge-2/0/0**	Node: 48 **ge-3/0/0**	Node: 64 **ge-4/0/0**	Node: 80 **ge-5/0/0**	Node: 96 **ge-6/0/0**	Node: 112 **ge-7/0/0**
Node: 1 **ge-0/0/1**	Node: 17 **ge-1/0/1**	Node: 33 **ge-2/0/1**	Node: 49 **ge-3/0/1**	Node: 65 **ge-4/0/1**	Node: 81 **ge-5/0/1**	Node: 97 **ge-6/0/1**	Node: 113 **ge-7/0/1**
...	...	...	...	...	...	...	...
Node: 14 **ge-0/0/14**	Node: 30 **ge-1/0/14**	Node: 46 **ge-2/0/14**	Node: 62 **ge-3/0/14**	Node: 78 **ge-4/0/14**	Node: 94 **ge-5/0/14**	Node: 110 **ge-6/0/14**	Node: 126 **ge-7/0/14**
Node: 15 **ge-0/0/15**	Node: 31 **ge-1/0/15**	Node: 47 **ge-2/0/15**	Node: 63 **ge-3/0/15**	Node: 79 **ge-4/0/15**	Node: 95 **ge-5/0/15**	Node: 111 **ge-6/0/15**	Node: 127 **ge-7/0/15**

Table 83: QFX3500 Node Device-to-EX4300 Virtual Chassis Copper-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3
Node 0: ge-0/0/0	Node 32: ge-1/0/0	Node 64: ge-2/0/0	Node 96: ge-3/0/0
Node 1: ge-0/0/1	Node 33: ge-1/0/1	Node 65: ge-2/0/1	Node 97: ge-3/0/1
...	...	...	...

Table 83: QFX3500 Node Device-to-EX4300 Virtual Chassis Copper-Based Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3
Node 30: ge-0/0/30	Node 62: ge-1/0/30	Node 94: ge-2/0/30	Node 126: ge-3/0/30
Node 31: ge-0/0/31	Node 63: ge-1/0/31	Node 95: ge-2/0/31	Node 127: ge-3/0/31

To connect a QFX3500 Node device to the fiber-based QFX3000-G QFabric system control plane network (see Figure 94 on page 312):

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the SFP optical transceiver in the first management port (labeled **C0**) on the Node device management board. Save the cap.

3. Insert the cable connector into the optical transceiver.

4. Connect the other end of that cable to the appropriate port on the first Virtual Chassis. See Table 82 on page 313.

5. Remove the rubber safety cap from the SFP optical transceiver in the second management port (labeled **C1**) on the Node device management board. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Connect the other end of that cable to the appropriate port on the *second* Virtual Chassis. This should be the same port number that you connected to in Step 4. For example, if you connected the first cable to **ge-0/0/0** on the first Virtual Chassis, you connect the second cable to **ge-0/0/0** on the second Virtual Chassis.

8. Repeat this procedure for each QFX3500 Node device.

9. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

> ⚠ **CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. An arc smaller than a few inches in diameter can damage the cables and cause problems that are difficult to diagnose.
>
> Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device | **318**

Connecting a QFX3600 Node Device to a Fiber-Based QFX3000-G QFabric System Control Plane Network | **307**

CHAPTER 15

Cabling the Data Plane for the QFX3000-G QFabric System

IN THIS CHAPTER

Connecting a QFX3600 Node Device to a QFX3008-I Interconnect Device

To form the data plane in a QFX3000-G QFabric system, you connect the QSFP+ uplink ports (labeled **Q0** through **Q7**) on the QFX3600 Node device to the QSFP+ ports on the 16-port QSFP+ front cards in a QFX3008-I Interconnect device.

NOTE: By default, four ports (labeled **Q0** through **Q3**) are configured for 40-Gbps uplink connections between your QFX3600 Node device and your Interconnect device. Optionally, you can choose to configure the first eight ports (labeled **Q0** through **Q7**) for the uplink connections (see “Configuring the Port Type on QFX3600 Node Devices” on page 467).

CAUTION: For redundancy, each QFX3600 Node device must be connected to each QFX3008-I Interconnect device. For example, if you have two QFX3008-I Interconnect devices, then at least one uplink port on each QFX3600 Node device must be connected to each QFX3008-I Interconnect device. If you are connecting four uplink ports to two QFX3008-I Interconnect devices, we recommend connecting two uplink ports to each Interconnect device, each to a different front card. If you are connecting eight uplink ports to two QFX3008-I Interconnect devices, we recommend connecting four uplink ports to each Interconnect device, each to a different front card.

Before you begin to cable the QFX3000-G QFabric system data plane:

- Review The Hardware Compatibility Tool for information about the optical interface characteristics.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Ensure you have installed QSFP+ transceivers in each port you are using. See *Installing a Transceiver in a QFX Series Device*.
- Ensure that you have appropriate fiber-optic cables (see The Hardware Compatibility Tool).

To connect a QFX3600 Node device to a QFX3008-I Interconnect device:

> **WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the QSFP+ optical transceiver on the QFX3600 Node device. Save the cap.

3. Insert the cable connector into the optical transceiver.

4. If the connector at the other end of the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

5. Remove the rubber safety cap from the QSFP+ optical transceiver on the 16-port QSFP+ front card on the QFX3008-I Interconnect device. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

   > **CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.
   >
   > Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Connecting a QFX3500 Node Device to a QFX3008-I Interconnect Device

To form the data plane in a QFX3000-G QFabric system, you connect the QSFP+ uplink ports (labeled **Q0** through **Q3**) on the QFX3500 Node device to the QSFP+ ports on the 16-port QSFP+ front cards in a QFX3008-I Interconnect device.

The number of uplink connections from your Node device to your Interconnect devices determines the oversubscription ratio on the Node device.

> **CAUTION:** For redundancy, each QFX3500 Node device must be connected to *each* QFX3008-I Interconnect device. For example, if you have two QFX3008-I Interconnect devices, then at least one uplink port on each QFX3500 Node device must be connected to each QFX3008-I Interconnect device. If you have four QFX3008-I Interconnect devices, then each uplink port should be connected to a different QFX3008-I Interconnect device. If you are connecting all four uplink ports to two QFX3008-I Interconnect devices, we recommend connecting two uplink ports to each Interconnect device, each to a different front card.

Before you begin to cable the QFX3000-G QFabric system data plane:

- Review The Hardware Compatibility Tool for information about the optical interface characteristics.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Ensure you have installed QSFP+ transceivers in each port you are using. See *Installing a Transceiver in a QFX Series Device*.
- Ensure that you have appropriate fiber-optic cables (see The Hardware Compatibility Tool).

To connect a QFX3500 Node device to a QFX3008-I Interconnect device:

> **WARNING:** Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Remove the rubber safety cap from the QSFP+ optical transceiver on the QFX3500 Node device. Save the cap.

3. Insert the cable connector into the optical transceiver.

4. If the connector at the other end of the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

5. Remove the rubber safety cap from the QSFP+ optical transceiver on the 16-port QSFP+ front card on the QFX3008-I Interconnect device. Save the cap.

6. Insert the cable connector into the optical transceiver.

7. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

   > **CAUTION:** Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.
   >
   > Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Determining Transceiver Support for QFabric Systems | 123

Connecting a QFX5100 Node Device to a QFX3008-I Interconnect Device

To form the data plane in a QFX3000-G QFabric system, you connect the QSFP+ uplink ports (labeled **48** through **51**) on the QFX5100 Node device to the QSFP+ ports on the 16-port QSFP+ front cards in a QFX3008-I Interconnect device.

The number of uplink connections from your Node device to your Interconnect devices determines the oversubscription ratio on the Node device (see "Understanding Port Oversubscription on Node Devices" on page 38).

CAUTION: For redundancy, each QFX5100 Node device must be connected to *each* QFX3008-I Interconnect device. For example, if you have two QFX3008-I Interconnect devices, then at least one uplink port on each QFX5100 Node device must be connected to each QFX3008-I Interconnect device. If you have four QFX3008-I Interconnect devices, then each uplink port should be connected to a different QFX3008-I Interconnect device. If you are connecting four uplink ports to two QFX3008-I Interconnect devices, we recommend connecting two uplink ports to each Interconnect device, each to a different front card.

Before you begin to cable the QFX3000-G QFabric system data plane:

- Review The Hardware Compatibility Tool for information about the optical interface characteristics.
- Ensure that you have taken the necessary precautions for safe handling of lasers (see *Laser and LED Safety Guidelines and Warnings for the QFX Series*).
- Ensure you have installed QSFP+ transceivers in each port you are using. See *Installing a Transceiver in a QFX Series Device*.
- Ensure that you have appropriate fiber-optic cables (see The Hardware Compatibility Tool).

To connect a QFX5100 Node device to a QFX3008-I Interconnect device:

WARNING: Do not look directly into a fiber-optic transceiver or into the ends of fiber-optic cables. Fiber-optic transceivers and fiber-optic cables connected to transceivers emit laser light that can damage your eyes.

1. If the fiber-optic cable connector is covered by a rubber safety cap, remove the cap. Save the cap.

2. Insert the cable connector into the optical transceiver.

3. If the connector at the other end of the fiber-optic cable is covered by a rubber safety cap, remove the cap. Save the cap.

4. Remove the rubber safety cap from the QSFP+ optical transceiver on the 16-port QSFP+ front card on the QFX3008-I Interconnect device. Save the cap.

5. Insert the cable connector into the optical transceiver.

6. Secure the cables so that they are not supporting their own weight. Place excess cable out of the way in a neatly coiled loop. Placing fasteners on a loop helps cables maintain their shape.

   CAUTION: Do not bend fiber-optic cables beyond their minimum bend radius. Bending the cables beyond their minimum bend radius can damage the cables and cause problems that are difficult to diagnose.

   Do not let fiber-optic cables hang free from the connector. Do not allow fastened loops of cables to dangle, which stresses the cables at the fastening point.

RELATED DOCUMENTATION

Determining Transceiver Support for QFabric Systems | 123

3

PART

Configuration

CHAPTER 16

Initial Setup

IN THIS CHAPTER

QFabric System Initial and Default Configuration Information

Once you install the hardware for the QFabric system, you can configure the Junos operating system (Junos OS) to begin using the system. This topic discusses which setup activities you need to perform and which activities are handled automatically by the QFabric system.

The fabric manager Routing Engine in the Director group automatically handles some of the initial setup activities, including:

- Assignment of IP addresses and unique identifiers to each QFabric system component by way of the management control plane
- Inclusion of all QFabric system devices within the default partition
- Establishment of interdevice communication and connectivity through the use of a fabric provisioning protocol and a fabric management protocol

The initial configuration tasks you need to perform to bring up the QFabric system and make it operational include:

- Converting any standalone devices, such as QFX3500 and QFX3600 devices, to Node device mode (see "Converting the Device Mode for a QFabric System Component" on page 326)
- Setting up the QFabric system control plane cabling, topology, and configuration

- To set up the control plane cabling, topology, and configuration for the QFX3000-G QFabric system, see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333.
- To set up a copper or fiber-based control plane cabling, topology, and configuration for the QFX3000-M QFabric system, see *Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane*.

- Accessing the Director group through a console connection, turning on the devices, and running through the initial setup script (see "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428), which prompts you to:
  - Set IP addresses for the Director devices in the Director group.
  - Set an IP address for the default partition.
  - Add the software serial number for your QFabric system. (Review the e-mail containing the software serial number that you received from Juniper Networks when you purchased your QFabric system.)
  - Set the starting MAC address and the range of MAC addresses for the QFabric system. (See "Generating the MAC Address Range for a QFabric System" on page 426 for this information.)
  - Set a root password for the Director devices.
  - Set a root password for the QFabric system components, such as Node devices, Interconnect devices, and infrastructure.
- Logging into the default partition by using the IP address you configured when you ran the Director group initial setup script (See "Gaining Access to the QFabric System Through the Default Partition" on page 439)
- Configuring basic system settings for the default partition, such as time, location, and default gateways

> **NOTE:** Unlike other Juniper Networks devices that run Junos OS, a QFabric system does not have a default factory configuration (containing the basic configuration settings for system logging, interfaces, protocols, and so on) that is loaded when you first install and power on the Director devices. Therefore, you must configure all the settings required for your QFabric system through the default partition CLI.

- Configuring aliases for Node devices (see "Configuring Aliases for the QFabric System" on page 452)
- Configuring VLANs and interfaces for the QFabric system devices
- Configuring redundant server Node groups to provide resiliency for server and storage connections (see "Configuring Node Groups for the QFabric System" on page 476)
- Configuring a network Node group to connect the QFabric system to external networks (see "Configuring Node Groups for the QFabric System" on page 476)

- Configuring the port type on QFX3600 Node devices (see "Configuring the Port Type on QFX3600 Node Devices" on page 467)
- Configuring routing protocols to run on the network Node group interfaces and reach external networks

> **NOTE:** When you configure routing protocols on the QFabric system, you must use interfaces from the Node devices assigned to the network Node group. If you try to configure routing protocols on interfaces from the Node devices assigned to server Node groups, the configuration commit operation fails.

- Generating and adding the license keys for the QFabric system (see *Generating the License Keys for a QFabric System* and *Adding New Licenses (CLI Procedure)*)

RELATED DOCUMENTATION

QFX3000-G QFabric System Installation Overview | 105

QFX3000-M QFabric System Installation Overview

Converting the Device Mode for a QFabric System Component | 326

Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane | 333

Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane

Generating the MAC Address Range for a QFabric System | 426

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

Understanding QFabric System Administration Tasks and Utilities | 435

Gaining Access to the QFabric System Through the Default Partition | 439

Configuring Aliases for the QFabric System | 452

Configuring Node Groups for the QFabric System | 476

Configuring the Port Type on QFX3600 Node Devices | 467

Generating the License Keys for a QFabric System

Adding New Licenses (CLI Procedure)

Converting the Device Mode for a QFabric System Component

You can configure some devices to act as a standalone switch or participate in a QFabric system in a particular role. To change the role of your device, you must set the device mode. Table 84 on page 326 shows the device modes available for various devices.

Table 84: Support for device mode options

Device mode	QFX3500	QFX3600	QFX5100
Interconnect device	N/A	Supported	Supported for QFX3000-M
Node device	Supported	Supported	Supported
Standalone	Supported	Supported	N/A

To convert a device to a different mode, issue the **request chassis device-mode** command and specify the desired device mode. You verify the current and future device mode with the **show chassis device-mode** command.

When you convert a device from standalone mode to either Node device or Interconnect device mode, the software prepares the device to be configured automatically by the QFabric system. However, changing the device mode erases all configuration data on the device.

NOTE: The QFX3600 switch requires Jloader Release 1.1.8 before you can convert the switch to Interconnect device mode. For more information, see: Jloader 1.1.8 Release for QFX-Series Platforms.

CAUTION: We recommend that you back up your device configuration to an external location before converting a device to a different device mode.

The following procedures illustrate the conversion options available when you modify a device mode:

- Convert from standalone switch mode to Node device mode
- Convert from Node device mode to Interconnect device mode
- Convert from Interconnect device mode to Node device mode
- Convert from Node device mode or Interconnect device mode to standalone switch mode

Standalone Switch to Node Device

To convert your device from standalone mode to Node device mode, follow these steps:

1. Connect to your standalone device through the console port and log in as the root user.

2. Back up your device configuration to an external location.

   `root@switch#` **save *configuration-name external-path***

3. Upgrade the software on your device to a QFabric system **Node and Interconnect device** software package that matches the QFabric system complete software package used by your QFabric system. If the complete software package for your QFabric system is named **jinstall-qfabric-13.2X52-D10.2.rpm**, you need to install the **jinstall-qfabric-5-13.2X52-D10.2-domestic-signed.tgz** package on your QFX5100 device and the **jinstall-qfx-13.2X52-D10.2-domestic-signed.tgz** package on your QFX3500 or QFX3600 device. Matching the two software packages ensures a smooth and successful addition of the device to the QFabric system inventory.

   `root@switch#` **request system software add *software-package-name* reboot**

   > **NOTE:** After you install the correct software, the QFX5100 device is placed into Node device mode by default and cannot be converted to any other mode in Junos OS Release 13.2X52-D10.

4. Check the current device mode by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

   ```
   Current device-mode : Standalone
   Future device-mode after reboot : Standalone
   ```

5. Issue the **request chassis device-mode** command and select the desired device mode.

   `root@switch>` **request chassis device-mode node-device**

   ```
   Device mode set to 'node-device' mode.
   Please reboot the system to complete the process.
   ```

6. Verify the future device mode by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

```
Current device-mode : Standalone
Future device-mode after reboot : Node-device
```

7. Reboot the device.

   `root@switch>` **request system reboot**

```
Reboot the system ? [yes,no] (no) yes

Shutdown NOW!
[pid 34992]

root@switch>

*** FINAL System shutdown message from root@switch ***
System going down IMMEDIATELY
```

8. Verify that the new device mode has been enabled by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

```
Current device-mode : Node-device
Future device-mode after reboot : Node-device
```

9. To enable a converted device to participate in the QFabric system, locate the applicable network cables for your device and connect the device ports to the control plane and data plane.

10. (Optional) If you change the device back from Node device mode to standalone mode, restore the saved backup configuration from your external location.

    `root@switch#` **load *configuration-name external-path***

Node Device to Interconnect Device

To convert your device from Node device mode to Interconnect device mode, follow these steps:

1. From the default partition CLI prompt, back up your QFabric system configuration to an external location.

   `user@qfabric#` **save *configuration-name external-path***

2. Connect to your device through the console port and log in as the root user.

3. Check the current device mode by issuing the **show chassis device-mode** command.

root@switch> **show chassis device-mode**

```
Current device-mode : Node-device
Future device-mode after reboot : Node-device
```

4. Issue the **request chassis device-mode** command and select the desired device mode.

   root@switch> **request chassis device-mode interconnect-device**

   ```
   Device mode set to 'interconnect-device' mode.
   Please reboot the system to complete the process.
   ```

5. Verify the future device mode by issuing the **show chassis device-mode** command.

   root@switch> **show chassis device-mode**

   ```
   Current device-mode : Node-device
   Future device-mode after reboot : Interconnect-device
   ```

6. Reboot the device.

   root@switch> **request system reboot**

   ```
   Reboot the system ? [yes,no] (no) yes

   Shutdown NOW!
   [pid 34992]

   root@switch>

   *** FINAL System shutdown message from root@switch ***
   System going down IMMEDIATELY
   ```

7. Verify that the new device mode has been enabled by issuing the **show chassis device-mode** command.

   root@switch> **show chassis device-mode**

   ```
   Current device-mode : Interconnect-device
   Future device-mode after reboot : Interconnect-device
   ```

8. To enable a converted device to participate in the QFabric system in its new role, move the device to a different rack (as needed), locate the applicable network cables for your device, connect the device ports to the control plane and data plane per the design for your specific QFabric system, and reconfigure any aliases for the device at the QFabric default partition CLI prompt.

Interconnect Device to Node Device

To convert your device from Interconnect device mode to Node device mode, follow these steps:

1. From the default partition CLI prompt, back up your QFabric system configuration to an external location.

   `user@qfabric#` **save *configuration-name external-path***

2. Connect to your device through the console port and log in as the root user.

3. Check the current device mode by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

   ```
   Current device-mode : Interconnect-device
   Future device-mode after reboot : Interconnect-device
   ```

4. Issue the **request chassis device-mode** command and select the desired device mode.

   `root@switch>` **request chassis device-mode node-device**

   ```
   Device mode set to 'node-device' mode.
   Please reboot the system to complete the process.
   ```

5. Verify the future device mode by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

   ```
   Current device-mode : Interconnect-device
   Future device-mode after reboot : Node-device
   ```

6. Reboot the device.

   `root@switch>` **request system reboot**

   ```
   Reboot the system ? [yes,no] (no) yes

   Shutdown NOW!
   [pid 34992]

   root@switch>

   *** FINAL System shutdown message from root@switch ***
   System going down IMMEDIATELY
   ```

7. Verify that the new device mode has been enabled by issuing the **show chassis device-mode** command.

   `root@switch>` **show chassis device-mode**

   ```
   Current device-mode : Node-device
   Future device-mode after reboot : Node-device
   ```

8. To enable a converted device to participate in the QFabric system in its new role, move the device to a different rack (as needed), locate the applicable network cables for your device, connect the device ports to the control plane and data plane per the design for your specific QFabric system, and reconfigure any aliases for the device at the QFabric default partition CLI prompt.

QFabric Component (Interconnect or Node Device) to Standalone Switch

To convert your QFabric component from either Interconnect device mode or Node device mode to standalone switch mode, follow these steps:

1. From the default partition CLI prompt, back up your QFabric system configuration to an external location.

   `user@qfabric#` **save *configuration-name external-path***

2. Connect to the desired QFabric component through the console port of the device and log in as the root user.

3. Check the current device mode by issuing the **show chassis device-mode** command.

   `root@node1>` **show chassis device-mode**

   ```
   Current device-mode : Node-device
   Future device-mode after reboot : Node-device
   ```

4. Issue the **request chassis device-mode standalone** command to convert the component to standalone switch mode, while the component is still connected to the QFabric system.

   `root@node1>` **request chassis device-mode standalone**

   ```
   Device mode set to 'standalone' mode.
   Please reboot the system to complete the process.
   ```

NOTE: Always convert the device mode to **standalone** before you remove the component from the QFabric system. If you remove the component from the QFabric system before converting the device mode to **standalone**, the switch might not operate properly. For example, the output of the **show chassis hardware** command might display no FPCs or interfaces for the switch.

5. Verify the future device mode by issuing the **show chassis device-mode** command.

   `root@node1>` **show chassis device-mode**

   ```
   Current device-mode : Node-device
   Future device-mode after reboot : Standalone
   ```

6. Reboot the component to complete the conversion process.

   `root@node1>` **request system reboot**

   ```
   Reboot the system ? [yes,no] (no) yes

   Shutdown NOW!
   [pid 34992]

   root@node1>

   *** FINAL System shutdown message from root@node1 ***
   System going down IMMEDIATELY
   ```

7. Disconnect and remove the component from the QFabric system. You may now operate the device as a standalone switch.

RELATED DOCUMENTATION

request chassis device-mode | 659

show chassis device-mode | 712

Software Installation and Upgrade Overview

Connecting a QFX3500 Node Device to a Copper-Based QFX3000-G QFabric System Control Plane Network | 283

Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane

IN THIS SECTION

This example shows you how to connect QFabric system components and configure the Virtual Chassis used by a copper-based QFX3000-G QFabric system control plane network. Proper wiring of Director devices, Interconnect devices, and Node devices to the Virtual Chassis, combined with a standard configuration, enables you to bring up the internal QFabric system management network and prepare your QFabric system for full operation.

Requirements

This example uses the following hardware and software components:

- One QFX3000-G QFabric system containing:
  - Two QFX3100 Director devices
  - Two QFX3008-I Interconnect devices
  - Eight QFX3500 Node devices
- Eight EX4200-48T switches, used to make two redundant Virtual Chassis with four members apiece

> **NOTE:** You can use eight EX4300-48T switches in place of eight EX4200-48T switches.

- Junos OS Release 12.3R6.6 for the EX Series switches used in the Virtual Chassis
- Junos OS Release 13.2X52-D10 for the QFX Series

Before you begin:

- Rack, mount, and install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see “Installing and Connecting a QFX3100 Director Device” on page 153, “Installing and Connecting a QFX3008-I Interconnect Device” on page 165, and “Installing and Connecting a QFX3500 Device” on page 247.
- Rack, mount, and install your Virtual Chassis hardware. For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of four members each. For more information, see *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

Overview

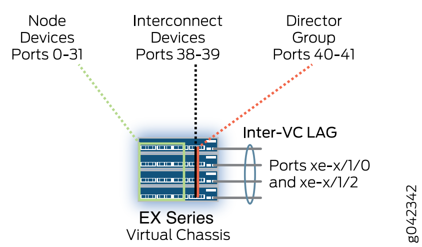
The QFX3000-G QFabric system control plane network connects the Director group, Interconnect devices, and Node devices in a QFabric system across a pair of redundant Virtual Chassis. By separating the management control plane from the data plane, the QFabric system can scale efficiently. The control plane network uses Gigabit Ethernet cabling and connections between components, and a 10-Gigabit Ethernet backbone between the redundant Virtual Chassis.

Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration included as part of this example. The standard configuration can scale from the minimum topology of eight Node devices shown in this example to the maximum of 128 Node devices for a fully implemented QFX3000-G QFabric system.

Topology

Figure 95 on page 335 shows the general port ranges where QFabric system devices must be connected to the Virtual Chassis. For each Virtual Chassis member, connect ports 0 through 31 to Node devices, ports 38 and 39 to Interconnect devices, and ports 40 and 41 to Director devices. Table 85 on page 336 shows the details of the QFabric system device-to-Virtual Chassis port mappings.

Figure 95: QFX3000-G QFabric System Control Plane—Virtual Chassis Port Ranges



CAUTION:

- The control plane network within a QFabric system should be considered a critical component of the system that should not be shared with other network traffic. In order to scale efficiently, the control plane network must be reserved for the QFabric system and its components. As a result, the ports of the QFabric system control plane must never be used for any purpose other than to transport QFabric system control plane traffic, and we neither recommend nor support the connection of other devices to the QFabric system control plane network.
- Do not install Junos Space and AI-Scripts (AIS) on the control plane network Virtual Chassis in a QFX3000-G QFabric system.

NOTE: Not all port numbers are represented in Table 85 on page 336, and ports 32 through 37 and ports 42 through 47 are reserved for future uses.

Table 85 on page 336 shows the specific mappings of QFabric system control plane network ports from the Virtual Chassis to the QFabric system components.

Table 85: QFX3000-G QFabric System Virtual Chassis Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3	Member Port Number	QFabric System Component
Node0 ge-0/0/0	Node32 ge-1/0/0	Node64 ge-2/0/0	Node96 ge-3/0/0	ge-X/0/0	Node devices
Node1 ge-0/0/1	Node33 ge-1/0/1	Node65 ge-2/0/1	Node97 ge-3/0/1	ge-X/0/1	Node devices
Node2 ge-0/0/2	Node34 ge-1/0/2	Node66 ge-2/0/2	Node98 ge-3/0/2	ge-X/0/2	Node devices
Node3 ge-0/0/3	Node35 ge-1/0/3	Node67 ge-2/0/3	Node99 ge-3/0/3	ge-X/0/3	Node devices
Node4 ge-0/0/4	Node36 ge-1/0/4	Node68 ge-2/0/4	Node100 ge-3/0/4	ge-X/0/4	Node devices
Node5 ge-0/0/5	Node37 ge-1/0/5	Node69 ge-2/0/5	Node101 ge-3/0/5	ge-X/0/5	Node devices
Node6 ge-0/0/6	Node38 ge-1/0/6	Node70 ge-2/0/6	Node102 ge-3/0/6	ge-X/0/6	Node devices
Node7 ge-0/0/7	Node39 ge-1/0/7	Node71 ge-2/0/7	Node103 ge-3/0/7	ge-X/0/7	Node devices
Node8 ge-0/0/8	Node40 ge-1/0/8	Node72 ge-2/0/8	Node104 ge-3/0/8	ge-X/0/8	Node devices
Node9 ge-0/0/9	Node41 ge-1/0/9	Node73 ge-2/0/9	Node105 ge-3/0/9	ge-X/0/9	Node devices

Table 85: QFX3000-G QFabric System Virtual Chassis Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3	Member Port Number	QFabric System Component
Node10 ge-0/0/10	Node42 ge-1/0/10	Node74 ge-2/0/10	Node106 ge-3/0/10	ge-X/0/10	Node devices
Node11 ge-0/0/11	Node43 ge-1/0/11	Node75 ge-2/0/11	Node107 ge-3/0/11	ge-X/0/11	Node devices
Node12 ge-0/0/12	Node44 ge-1/0/12	Node76 ge-2/0/12	Node108 ge-3/0/12	ge-X/0/12	Node devices
Node13 ge-0/0/13	Node45 ge-1/0/13	Node77 ge-2/0/13	Node109 ge-3/0/13	ge-X/0/13	Node devices
Node14 ge-0/0/14	Node46 ge-1/0/14	Node78 ge-2/0/14	Node110 ge-3/0/14	ge-X/0/14	Node devices
Node15 ge-0/0/15	Node47 ge-1/0/15	Node79 ge-2/0/15	Node111 ge-3/0/15	ge-X/0/15	Node devices
Node16 ge-0/0/16	Node48 ge-1/0/16	Node80 ge-2/0/16	Node112 ge-3/0/16	ge-X/0/16	Node devices
Node17 ge-0/0/17	Node49 ge-1/0/17	Node81 ge-2/0/17	Node113 ge-3/0/17	ge-X/0/17	Node devices
Node18 ge-0/0/18	Node50 ge-1/0/18	Node82 ge-2/0/18	Node114 ge-3/0/18	ge-X/0/18	Node devices
Node19 ge-0/0/19	Node51 ge-1/0/19	Node83 ge-2/0/19	Node115 ge-3/0/19	ge-X/0/19	Node devices
Node20 ge-0/0/20	Node52 ge-1/0/20	Node84 ge-2/0/20	Node116 ge-3/0/20	ge-X/0/20	Node devices

Table 85: QFX3000-G QFabric System Virtual Chassis Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3	Member Port Number	QFabric System Component
Node21 ge-0/0/21	Node53 ge-1/0/21	Node85 ge-2/0/21	Node117 ge-3/0/21	ge-X/0/21	Node devices
Node22 ge-0/0/22	Node54 ge-1/0/22	Node86 ge-2/0/22	Node118 ge-3/0/22	ge-X/0/22	Node devices
Node23 ge-0/0/23	Node55 ge-1/0/23	Node87 ge-2/0/23	Node119 ge-3/0/23	ge-X/0/23	Node devices
Node24 ge-0/0/24	Node56 ge-1/0/24	Node88 ge-2/0/24	Node120 ge-3/0/24	ge-X/0/24	Node devices
Node25 ge-0/0/25	Node57 ge-1/0/25	Node89 ge-2/0/25	Node121 ge-3/0/25	ge-X/0/25	Node devices
Node26 ge-0/0/26	Node58 ge-1/0/26	Node90 ge-2/0/26	Node122 ge-3/0/26	ge-X/0/26	Node devices
Node27 ge-0/0/27	Node59 ge-1/0/27	Node91 ge-2/0/27	Node123 ge-3/0/27	ge-X/0/27	Node devices
Node28 ge-0/0/28	Node60 ge-1/0/28	Node92 ge-2/0/28	Node124 ge-3/0/28	ge-X/0/28	Node devices
Node29 ge-0/0/29	Node61 ge-1/0/29	Node93 ge-2/0/29	Node125 ge-3/0/29	ge-X/0/29	Node devices
Node30 ge-0/0/30	Node62 ge-1/0/30	Node94 ge-2/0/30	Node126 ge-3/0/30	ge-X/0/30	Node devices
Node31 ge-0/0/31	Node63 ge-1/0/31	Node95 ge-2/0/31	Node127 ge-3/0/31	ge-X/0/31	Node devices

Table 85: QFX3000-G QFabric System Virtual Chassis Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3	Member Port Number	QFabric System Component
Reserved ge-0/0/32	Reserved ge-1/0/32	Reserved ge-2/0/32	Reserved ge-3/0/32	ge-X/0/32	Future use
...	...	...	...	...	...
Reserved ge-0/0/37	Reserved ge-1/0/37	Reserved ge-2/0/37	Reserved ge-3/0/37	ge-X/0/37	Future use
IC2 CB0 ge-0/0/38	IC2 CB1 ge-1/0/38	IC3 CB0 ge-2/0/38	IC3 CB1 ge-3/0/38	ge-X/0/38	Interconnect devices **NOTE:** On both Control Boards, use port 0 to connect to VC0, and port 1 to connect to VC1.
IC0 CB0 ge-0/0/39	IC0 CB1 ge-1/0/39	IC1 CB0 ge-2/0/39	IC1 CB1 ge-3/0/39	ge-X/0/39	Interconnect devices **NOTE:** On both Control Boards, use port 0 to connect to VC0, and port 1 to connect to VC1.
DG0 port 0 ge-0/0/40	DG0 port 1 ge-1/0/40	DG0 port 2 ge-2/0/40	Reserved ge-3/0/40	ge-X/0/40	Director device 0
DG1 port 0 ge-0/0/41	DG1 port 1 ge-1/0/41	DG1 port 2 ge-2/0/41	Reserved ge-3/0/41	ge-X/0/41	Director device 1
Reserved ge-0/0/42	Reserved ge-1/0/42	Reserved ge-2/0/42	Reserved ge-3/0/42	ge-X/0/42	Future use

Table 85: QFX3000-G QFabric System Virtual Chassis Control Plane Port Assignments *(continued)*

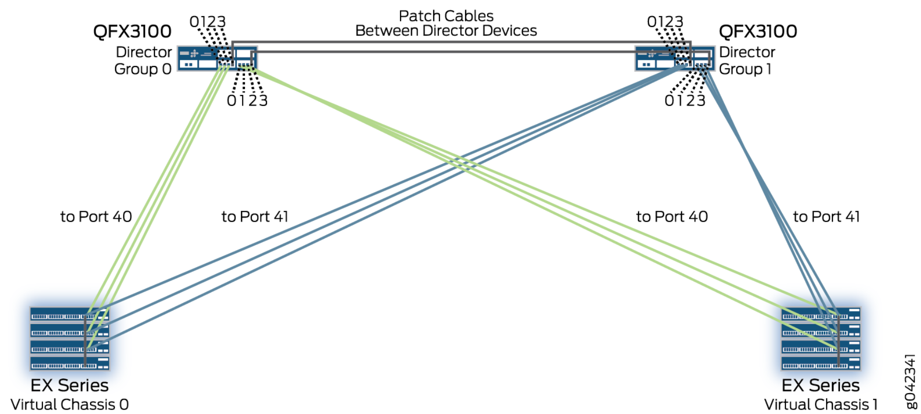
Member 0	Member 1	Member 2	Member 3	Member Port Number	QFabric System Component
...	...	...	...	...	...
Reserved ge-0/0/47	Reserved ge-1/0/47	Reserved ge-2/0/47	Reserved ge-3/0/47	ge-X/0/47	Future use
Inter-VC xe-0/1/0	Inter-VC xe-1/1/0	Inter-VC xe-2/1/0	Inter-VC xe-3/1/0	Inter-VC xe-X/1/0	Inter-Virtual Chassis LAG
Inter-VC xe-0/1/2	Inter-VC xe-1/1/2	Inter-VC xe-2/1/2	Inter-VC xe-3/1/2	Inter-VC xe-X/1/2	Inter-Virtual Chassis LAG

Next, connect the Director devices to the Virtual Chassis. In general, you want to accomplish the following:

- Connect three ports from one network module in a Director device to the first Virtual Chassis, and three ports from the second network module to the second Virtual Chassis. You need to repeat these connections from the second Director device to both Virtual Chassis to provide resiliency for the system.
- Connect the Director devices to each other and create a Director group. You can use either straight-through RJ-45 patch cables or crossover cables, because the Director devices contain autosensing modules. Connect one port from each network module on the first Director device to one port in each network module on the second Director device.

Figure 96 on page 341 shows the specific ports on the Director group that you must connect to the Virtual Chassis and interconnect between the Director devices.

Figure 96: QFX3000-G QFabric System Control Plane—Director Group to Virtual Chassis Connections



In this specific example, connect ports 0, 1, and 2 from module 0 on Director device DG0 to port 40 on Virtual Chassis VC0 (ge-0/0/40, ge-1/0/40, and ge-2/0/40), and connect ports 0, 1, and 2 from module 1 to port 40 on Virtual Chassis VC1 (ge-0/0/40, ge-1/0/40, and ge-2/0/40).

For Director device DG1, connect ports 0, 1, and 2 from module 0 to port 41 on Virtual Chassis VC0 (ge-0/0/41, ge-1/0/41, and ge-2/0/41), and connect ports 0, 1, and 2 from module 1 to port 41 on Virtual Chassis VC1 (ge-0/0/41, ge-1/0/41, and ge-2/0/41).

To form the Director group, connect module 0, port 3 on Director device DG0 to module 0, port 3 on Director device DG1. Similarly, connect module 1, port 3 on Director device DG0 to module 1, port 3 on Director device DG1. Table 86 on page 341 shows the port mappings for the Director group in this example.

Table 86: Director Group Port Mappings

Director Device	Virtual Chassis VC0	Virtual Chassis VC1
DG0	• Module 0, port 0 to ge-0/0/40 on VC0 • Module 0, port 1 to ge-1/0/40 on VC0 • Module 0, port 2 to ge-2/0/40 on VC0 • Module 0, port 3 to module 0, port 3 on DG1	• Module 1, port 0 to ge-0/0/40 on VC1 • Module 1, port 1 to ge-1/0/40 on VC1 • Module 1, port 2 to ge-2/0/40 on VC1 • Module 1, port 3 to module 1, port 3 on DG1
DG1	• Module 0, port 0 to ge-0/0/41 on VC0 • Module 0, port 1 to ge-1/0/41 on VC0 • Module 0, port 2 to ge-2/0/41 on VC0 • Module 0, port 3 to module 0, port 3 on DG0	• Module 1, port 0 to ge-0/0/41 on VC1 • Module 1, port 1 to ge-1/0/41 on VC1 • Module 1, port 2 to ge-2/0/41 on VC1 • Module 1, port 3 to module 1, port 3 on DG0

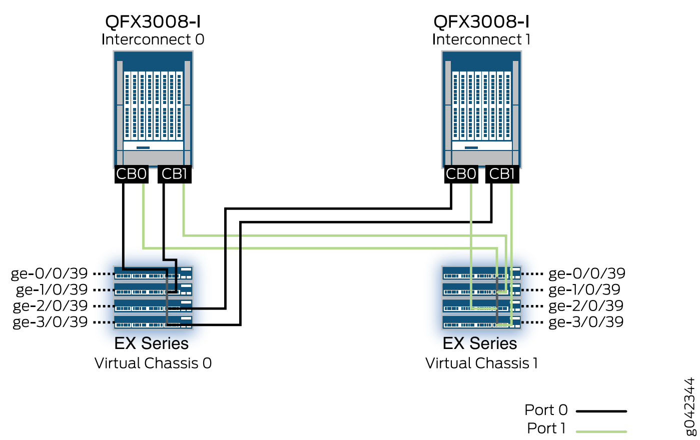
In the software, the ports of each network module are reversed, numbered from right to left, and incremented sequentially across modules. If you issue interface operational commands directly on the Director device, please note the following port mappings as shown in Table 87 on page 342:

Table 87: Hardware to Software Port Mappings for Director Device Network Modules

Network Module	Port 0	Port 1	Port 2	Port 3
Module 0	eth5	eth4	eth3	eth2
Module 1	eth9	eth8	eth7	eth6

Figure 97 on page 342 shows the specific ports on the Interconnect devices that you must connect to the Virtual Chassis. In general, connect one port from each Control Board module in an Interconnect device to the first Virtual Chassis, and a second port from each Control Board module to the second Virtual Chassis.

Figure 97: QFX3000-G QFabric System Control Plane—Interconnect Device to Virtual Chassis Connections



In this specific example, for both Interconnect devices IC0 and IC1, connect port 0 from CB0 and CB1 to Virtual Chassis VC0 and port 1 from CB0 and CB1 to Virtual Chassis VC1. Connect the port 0 cables to port 39 on Virtual Chassis VC0 (ge-0/0/39, ge-1/0/39, ge-2/0/39, and ge-3/0/39), and connect the port 1 cables to port 39 on Virtual Chassis VC1 (ge-0/0/39, ge-1/0/39, ge-2/0/39, and ge-3/0/39). Table 88 on page 342 shows the port mappings for the Interconnect devices in this example.

Table 88: Interconnect Device Port Mappings

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC0	• CB0, port 0 to ge-0/0/39 • CB1, port 0 to ge-1/0/39	• CB0, port 1 to ge-0/0/39 • CB1, port 1 to ge-1/0/39
IC1	• CB0, port 0 to ge-2/0/39 • CB1, port 0 to ge-3/0/39	• CB0, port 1 to ge-2/0/39 • CB1, port 1 to ge-3/0/39

As required, you can extend the number of Interconnect devices from two to four. For additional Interconnect devices IC2 and IC3, connect port 0 from CB0 and CB1 to Virtual Chassis VC0 and port 1 from CB0 and CB1 to Virtual Chassis VC1. Connect the port 0 cables to port 38 on Virtual Chassis VC0 (ge-0/0/38, ge-1/0/38, ge-2/0/38, and ge-3/0/38), and connect the port 1 cables to port 38 on Virtual Chassis VC1 (ge-0/0/38, ge-1/0/38, ge-2/0/38, and ge-3/0/38). Table 89 on page 343 shows the port mappings needed to extend the number of Interconnect devices in this example to four devices.

Table 89: Interconnect Device Port Mappings for Two Additional Devices

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC2	• CB0, port 0 to ge-0/0/38 • CB1, port 0 to ge-1/0/38	• CB0, port 1 to ge-0/0/38 • CB1, port 1 to ge-1/0/38
IC3	• CB0, port 0 to ge-2/0/38 • CB1, port 0 to ge-3/0/38	• CB0, port 1 to ge-2/0/38 • CB1, port 1 to ge-3/0/38

Figure 98 on page 343, Figure 99 on page 343, and Figure 100 on page 344 show the specific ports on the Node devices that you must connect to the Virtual Chassis. In general, connect the first management port from a Node device to the first Virtual Chassis, and the second management port to the second Virtual Chassis.

Figure 98: QFX3000-G QFabric System Control Plane—QFX3500 Node Device to Virtual Chassis Connections

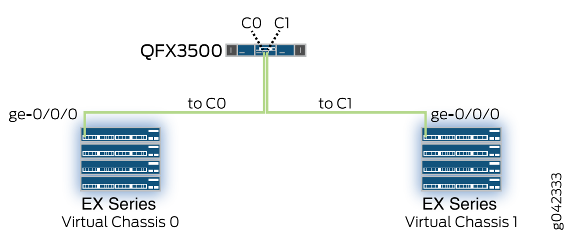


Figure 99: QFX3000-G QFabric System Control Plane—QFX3600 Node Device to Virtual Chassis Connections

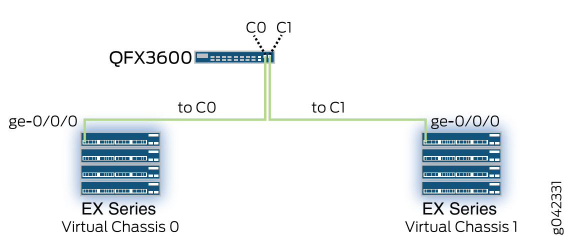
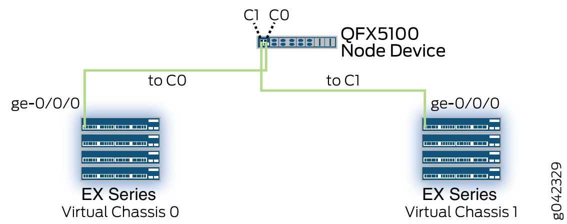


Figure 100: QFX3000-G QFabric System Control Plane—QFX5100 Node Device to Virtual Chassis Connections



In this specific example, for Node device Node0, connect port C0 (also known as me0) to Virtual Chassis 0 port ge-0/0/0, and connect port C1 (also known as me1) to Virtual Chassis 1 port ge-0/0/0.

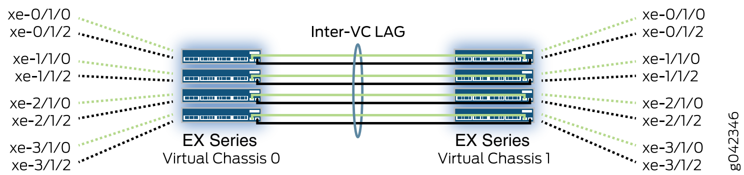
For the remaining seven Node devices, connect port C0 to the ge-0/0/*X* port on Virtual Chassis 0 that matches the Node device number. Similarly, connect port C1 to the port on Virtual Chassis 1 that matches the Node device number. For example, you would connect Node device Node5 to port ge-0/0/5. Table 90 on page 344 shows the full set of port mappings for the Node devices in this example.

Table 90: Node Device Port Mappings

Node Device	Virtual Chassis 0	Virtual Chassis 1
Node0	C0 to ge-0/0/0	C1 to ge-0/0/0
Node1	C0 to ge-0/0/1	C1 to ge-0/0/1
Node2	C0 to ge-0/0/2	C1 to ge-0/0/2
Node3	C0 to ge-0/0/3	C1 to ge-0/0/3
Node4	C0 to ge-0/0/4	C1 to ge-0/0/4
Node5	C0 to ge-0/0/5	C1 to ge-0/0/5
Node6	C0 to ge-0/0/6	C1 to ge-0/0/6
Node7	C0 to ge-0/0/7	C1 to ge-0/0/7

Figure 101 on page 345 shows the specific ports on the members of the first Virtual Chassis that you must connect to the members of the second Virtual Chassis. These connections create a link aggregation bundle (LAG) that provides redundancy and resiliency for the Virtual Chassis portion of the control plane. In general, connect each 10-Gigabit Ethernet uplink port from the first Virtual Chassis to the corresponding 10-Gigabit Ethernet uplink port on the second Virtual Chassis.

Figure 101: QFX3000-G QFabric System Control Plane—Inter-Virtual Chassis LAG Connections



In this specific example, for Virtual Chassis VC0, connect port xe-0/1/0 to Virtual Chassis VC1 port xe-0/1/0. For the remaining seven 10-Gigabit Ethernet uplink ports, connect each port from VC0 to the corresponding port on VC1. For example, you would connect the xe-2/1/2 port on VC0 to port xe-2/1/2 on VC1, and so on.

Table 91 on page 345 shows the full set of port mappings for the Virtual Chassis LAG connections in this example.

Table 91: Virtual Chassis LAG Port Mappings

VC0 and VC1	Member 0	Member 1	Member 2	Member 3
Uplink port 0	xe-0/1/0 to xe-0/1/0	xe-1/1/0 to xe-1/1/0	xe-2/1/0 to xe-2/1/0	xe-3/1/0 to xe-3/1/0
Uplink port 2	xe-0/1/2 to xe-0/1/2	xe-1/1/2 to xe-1/1/2	xe-2/1/2 to xe-2/1/2	xe-3/1/2 to xe-3/1/2

Configuration

CLI Quick Configuration

To quickly configure the QFabric system control plane Virtual Chassis, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

> **NOTE:** The configuration files for a QFabric system control plane network are also available for download from the QFX Series section of the Junos OS software download page at https://www.juniper.net/support/downloads/junos.html .

```
set groups qfabric system commit synchronize
set groups qfabric chassis redundancy graceful-switchover
set groups qfabric chassis aggregated-devices ethernet device-count 10
set groups qfabric chassis fpc 0 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 1 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 2 pic 1 sfpplus pic-mode 10g
```

```
set groups qfabric chassis fpc 3 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis lcd-menu fpc 0 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 1 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 2 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 3 menu-item maintenance-menu disable
set groups qfabric chassis alarm management-ethernet link-down ignore
set groups qfabric protocols rstp interface ae8.0 mode point-to-point
set groups qfabric protocols rstp interface all edge
set groups qfabric protocols rstp interface all no-root-port
set groups qfabric protocols rstp bpdu-block-on-edge
set groups qfabric protocols lldp interface all
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 110
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 111
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_2
  loss-priority low code-points 100
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_2
  loss-priority high code-points 101
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_0
  loss-priority low code-points 010
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_0
  loss-priority high code-points 001
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 110
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 111
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_2
  loss-priority low code-points 100
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_2
  loss-priority high code-points 101
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_0
  loss-priority low code-points 010
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_0
  loss-priority high code-points 001
set groups qfabric class-of-service forwarding-classes class class_3 queue-num 7
set groups qfabric class-of-service forwarding-classes class class_2 queue-num 2
set groups qfabric class-of-service forwarding-classes class class_0 queue-num 0
set groups qfabric class-of-service interfaces ge-*/0/* scheduler-map cpe_network_smap
set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers ieee-802.1 onep_qfabric_classifier
set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers inet-precedence IP_qfabric_classifier
set groups qfabric class-of-service interfaces ae* scheduler-map cpe_network_smap
set groups qfabric class-of-service interfaces ae* unit 0 classifiers ieee-802.1 onep_qfabric_classifier
set groups qfabric class-of-service interfaces ae* unit 0 classifiers inet-precedence IP_qfabric_classifier
```

```
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_3 scheduler
   scheduler_3
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_2 scheduler
   scheduler_2
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_0 scheduler
   scheduler_0
set groups qfabric class-of-service schedulers scheduler_3 buffer-size percent 30
set groups qfabric class-of-service schedulers scheduler_3 priority strict-high
set groups qfabric class-of-service schedulers scheduler_2 transmit-rate percent 75
set groups qfabric class-of-service schedulers scheduler_2 buffer-size percent 30
set groups qfabric class-of-service schedulers scheduler_2 priority low
set groups qfabric class-of-service schedulers scheduler_0 transmit-rate percent 25
set groups qfabric class-of-service schedulers scheduler_0 buffer-size percent 40
set groups qfabric class-of-service schedulers scheduler_0 priority low
set groups qfabric ethernet-switching-options nonstop-bridging
set groups qfabric ethernet-switching-options storm-control interface all bandwidth 10000
set groups qfabric vlans qfabric vlan-id 100
set groups qfabric vlans qfabric dot1q-tunneling
set groups qfabric-int interfaces <*> mtu 9216
set groups qfabric-int interfaces <*> unit 0 family ethernet-switching port-mode access
set groups qfabric-int interfaces <*> unit 0 family ethernet-switching vlan members qfabric
set groups qfabric-ae interfaces <*> aggregated-ether-options link-speed 1g
set groups qfabric-ae interfaces <*> aggregated-ether-options lacp active
set apply-groups qfabric
set interfaces interface-range Node_Device_Interfaces member "ge-[0-3]/0/[0-31]"
set interfaces interface-range Node_Device_Interfaces apply-groups qfabric-int
set interfaces interface-range Node_Device_Interfaces description "QFabric Node Device"
set interfaces interface-range Interconnect_Device_Interfaces member "ge-[0-3]/0/[38-39]"
set interfaces interface-range Interconnect_Device_Interfaces apply-groups qfabric-int
set interfaces interface-range Interconnect_Device_Interfaces description "QFabric Interconnect Device"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces member "ge-[0-3]/0/40"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces description "QFabric Director Device -
   DG0"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces ether-options 802.3ad ae0
set interfaces interface-range Director_Device_DG1_LAG_Interfaces member "ge-[0-3]/0/41"
set interfaces interface-range Director_Device_DG1_LAG_Interfaces description "QFabric Director Device -
   DG1"
set interfaces interface-range Director_Device_DG1_LAG_Interfaces ether-options 802.3ad ae1
set interfaces interface-range Director_Device_DG2_LAG_Interfaces member "ge-[0-3]/0/42"
set interfaces interface-range Director_Device_DG2_LAG_Interfaces description "QFabric Director Device -
   DG2"
set interfaces interface-range Director_Device_DG2_LAG_Interfaces ether-options 802.3ad ae2
set interfaces interface-range Director_Device_DG3_LAG_Interfaces member "ge-[0-3]/0/43"
```

```
set interfaces interface-range Director_Device_DG3_LAG_Interfaces description "QFabric Director Device -
   DG3"
set interfaces interface-range Director_Device_DG3_LAG_Interfaces ether-options 802.3ad ae3
set interfaces interface-range Director_Device_DG4_LAG_Interfaces member "ge-[0-3]/0/44"
set interfaces interface-range Director_Device_DG4_LAG_Interfaces description "QFabric Director Device -
   DG4"
set interfaces interface-range Director_Device_DG4_LAG_Interfaces ether-options 802.3ad ae4
set interfaces interface-range Director_Device_DG5_LAG_Interfaces member "ge-[0-3]/0/45"
set interfaces interface-range Director_Device_DG5_LAG_Interfaces description "QFabric Director Device -
   DG5"
set interfaces interface-range Director_Device_DG5_LAG_Interfaces ether-options 802.3ad ae5
set interfaces interface-range Director_Device_DG6_LAG_Interfaces member "ge-[0-3]/0/46"
set interfaces interface-range Director_Device_DG6_LAG_Interfaces description "QFabric Director Device -
   DG6"
set interfaces interface-range Director_Device_DG6_LAG_Interfaces ether-options 802.3ad ae6
set interfaces interface-range Director_Device_DG7_LAG_Interfaces member "ge-[0-3]/0/47"
set interfaces interface-range Director_Device_DG7_LAG_Interfaces description "QFabric Director Device -
   DG7"
set interfaces interface-range Director_Device_DG7_LAG_Interfaces ether-options 802.3ad ae7
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-3]/1/0"
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-3]/1/2"
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces description "QFabric Control Plane
   (Inter-VC LAG)"
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces ether-options 802.3ad ae8
set interfaces ae0 apply-groups qfabric-int
set interfaces ae0 apply-groups qfabric-ae
set interfaces ae0 description "QFabric Director Device - DG0"
set interfaces ae1 apply-groups qfabric-int
set interfaces ae1 apply-groups qfabric-ae
set interfaces ae1 description "QFabric Director Device - DG1"
set interfaces ae2 apply-groups qfabric-int
set interfaces ae2 apply-groups qfabric-ae
set interfaces ae2 description "QFabric Director Device - DG2"
set interfaces ae3 apply-groups qfabric-int
set interfaces ae3 apply-groups qfabric-ae
set interfaces ae3 description "QFabric Director Device - DG3"
set interfaces ae4 apply-groups qfabric-int
set interfaces ae4 apply-groups qfabric-ae
set interfaces ae4 description "QFabric Director Device - DG4"
set interfaces ae5 apply-groups qfabric-int
set interfaces ae5 apply-groups qfabric-ae
set interfaces ae5 description "QFabric Director Device - DG5"
set interfaces ae6 apply-groups qfabric-int
set interfaces ae6 apply-groups qfabric-ae
```

```
set interfaces ae6 description "QFabric Director Device - DG6"
set interfaces ae7 apply-groups qfabric-int
set interfaces ae7 apply-groups qfabric-ae
set interfaces ae7 description "QFabric Director Device - DG7"
set interfaces ae8 description "QFabric Control Plane (Inter-VC LAG)"
set interfaces ae8 mtu 9216
set interfaces ae8 aggregated-ether-options link-speed 10g
set interfaces ae8 aggregated-ether-options lacp active
set interfaces ae8 unit 0 family ethernet-switching vlan members qfabric
set system host-name qfabric-control-plane
set system services ssh
set system services telnet
set system services web-management http
set system syslog user * any emergency
set system syslog file messages any notice
set system syslog file messages authorization info
set system syslog file messages archive world-readable
set system syslog file messages explicit-priority
set system syslog file interactive-commands interactive-commands any
set system syslog file secure authorization info
set system syslog file default-log-messages any any
set system syslog file default-log-messages structured-data
set system syslog file console any error
set system syslog time-format millisecond
set interfaces vme unit 0 family inet address 192.168.157.26/24
set routing-options static route 0.0.0.0/0 next-hop 192.168.157.1
set virtual-chassis preprovisioned
set virtual-chassis member 0 role routing-engine
set virtual-chassis member 0 serial-number abc123
set virtual-chassis member 1 role routing-engine
set virtual-chassis member 1 serial-number def456
set virtual-chassis member 2 role line-card
set virtual-chassis member 2 serial-number ghi789
set virtual-chassis member 3 role line-card
set virtual-chassis member 3 serial-number jkl012
```

Step-by-Step Procedure

The following example requires that you navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a Virtual Chassis for the QFabric system control plane network:

1. Create a configuration group to define global QFabric system control plane properties. Enable commit synchronization and graceful switchover, set up the number of aggregated Ethernet devices, configure alarm and LCD management, activate loop prevention, nonstop bridging, and storm control, configure

Link Layer Discovery Protocol (LLDP), specify a global VLAN (VLAN 100) and 802.1q tunneling, define options for aggregated Ethernet interfaces, and enable the uplink module for 10-Gigabit Ethernet operation.

Enable class of service (CoS) for the QFabric system control plane network. Establish forwarding classes, priorities, scheduler maps, classifiers, and queues for three types of traffic: control traffic, interdevice traffic, and best-effort traffic. Apply the qfabric group settings to the configuration.

```
[edit]
user@switch# set groups qfabric system commit synchronize
user@switch# set groups qfabric chassis redundancy graceful-switchover
user@switch# set groups qfabric chassis aggregated-devices ethernet device-count 10
user@switch# set groups qfabric chassis fpc 0 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 1 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 2 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 3 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis lcd-menu fpc 0 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 1 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 2 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 3 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis alarm management-ethernet link-down ignore
user@switch# set groups qfabric protocols rstp interface ae8.0 mode point-to-point
user@switch# set groups qfabric protocols rstp interface all edge
user@switch# set groups qfabric protocols rstp interface all no-root-port
user@switch# set groups qfabric protocols rstp bpdu-block-on-edge
user@switch# set groups qfabric protocols lldp interface all
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_3 loss-priority low code-points 110
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_3 loss-priority low code-points 111
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_2 loss-priority low code-points 100
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_2 loss-priority high code-points 101
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_0 loss-priority low code-points 010
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_0 loss-priority high code-points 001
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_3 loss-priority low code-points 110
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_3 loss-priority low code-points 111
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_2 loss-priority low code-points 100
```

```
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
   forwarding-class class_2 loss-priority high code-points 101
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
   forwarding-class class_0 loss-priority low code-points 010
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
   forwarding-class class_0 loss-priority high code-points 001
user@switch# set groups qfabric class-of-service forwarding-classes class class_3 queue-num 7
user@switch# set groups qfabric class-of-service forwarding-classes class class_2 queue-num 2
user@switch# set groups qfabric class-of-service forwarding-classes class class_0 queue-num 0
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* scheduler-map cpe_network_smap
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers ieee-802.1
   onep_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers inet-precedence
   IP_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ae* scheduler-map cpe_network_smap
user@switch# set groups qfabric class-of-service interfaces ae* unit 0 classifiers ieee-802.1
   onep_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ae* unit 0 classifiers inet-precedence
   IP_qfabric_classifier
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
   class_3 scheduler scheduler_3
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
   class_2 scheduler scheduler_2
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
   class_0 scheduler scheduler_0
user@switch# set groups qfabric class-of-service schedulers scheduler_3 buffer-size percent 30
user@switch# set groups qfabric class-of-service schedulers scheduler_3 priority strict-high
user@switch# set groups qfabric class-of-service schedulers scheduler_2 transmit-rate percent 75
user@switch# set groups qfabric class-of-service schedulers scheduler_2 buffer-size percent 30
user@switch# set groups qfabric class-of-service schedulers scheduler_2 priority low
user@switch# set groups qfabric class-of-service schedulers scheduler_0 transmit-rate percent 25
user@switch# set groups qfabric class-of-service schedulers scheduler_0 buffer-size percent 40
user@switch# set groups qfabric class-of-service schedulers scheduler_0 priority low
user@switch# set groups qfabric ethernet-switching-options nonstop-bridging
user@switch# set groups qfabric ethernet-switching-options storm-control interface all bandwidth 10000
user@switch# set groups qfabric vlans qfabric vlan-id 100
user@switch# set groups qfabric vlans qfabric dot1q-tunneling
user@switch# set groups qfabric-int interfaces <*> mtu 9216
user@switch# set groups qfabric-int interfaces <*> unit 0 family ethernet-switching port-mode access
user@switch# set groups qfabric-int interfaces <*> unit 0 family ethernet-switching vlan members qfabric
user@switch# set groups qfabric-ae interfaces <*> aggregated-ether-options link-speed 1g
user@switch# set groups qfabric-ae interfaces <*> aggregated-ether-options lacp active
user@switch# set apply-groups qfabric
```

2. Configure interfaces for the QFabric system control plane network. Set the interface ranges where Node devices (0 through 31), Interconnect devices (38 and 39), and Director devices (40 and 41) connect to the control plane network through the Virtual Chassis. Configure the inter-Virtual Chassis LAG connections for the ae8 interface and apply the ae-interfaces configuration group to the remaining aggregated Ethernet interfaces (ae0 through ae7).

```
[edit]
user@switch# set interfaces interface-range Node_Device_Interfaces member "ge-[0-3]/0/[0-31]"
user@switch# set interfaces interface-range Node_Device_Interfaces apply-groups qfabric-int
user@switch# set interfaces interface-range Node_Device_Interfaces description "QFabric Node Device"
user@switch# set interfaces interface-range Interconnect_Device_Interfaces member "ge-[0-3]/0/[38-39]"
user@switch# set interfaces interface-range Interconnect_Device_Interfaces apply-groups qfabric-int
user@switch# set interfaces interface-range Interconnect_Device_Interfaces description "QFabric Interconnect
  Device"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces member "ge-[0-3]/0/40"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces description "QFabric
  Director Device - DG0"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces ether-options 802.3ad
  ae0
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces member "ge-[0-3]/0/41"
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces description "QFabric
  Director Device - DG1"
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces ether-options 802.3ad
  ae1
user@switch# set interfaces interface-range Director_Device_DG2_LAG_Interfaces member "ge-[0-3]/0/42"
user@switch# set interfaces interface-range Director_Device_DG2_LAG_Interfaces description "QFabric
  Director Device - DG2"
user@switch# set interfaces interface-range Director_Device_DG2_LAG_Interfaces ether-options 802.3ad
  ae2
user@switch# set interfaces interface-range Director_Device_DG3_LAG_Interfaces member "ge-[0-3]/0/43"
user@switch# set interfaces interface-range Director_Device_DG3_LAG_Interfaces description "QFabric
  Director Device - DG3"
user@switch# set interfaces interface-range Director_Device_DG3_LAG_Interfaces ether-options 802.3ad
  ae3
user@switch# set interfaces interface-range Director_Device_DG4_LAG_Interfaces member "ge-[0-3]/0/44"
user@switch# set interfaces interface-range Director_Device_DG4_LAG_Interfaces description "QFabric
  Director Device - DG4"
user@switch# set interfaces interface-range Director_Device_DG4_LAG_Interfaces ether-options 802.3ad
  ae4
user@switch# set interfaces interface-range Director_Device_DG5_LAG_Interfaces member "ge-[0-3]/0/45"
user@switch# set interfaces interface-range Director_Device_DG5_LAG_Interfaces description "QFabric
  Director Device - DG5"
user@switch# set interfaces interface-range Director_Device_DG5_LAG_Interfaces ether-options 802.3ad
  ae5
user@switch# set interfaces interface-range Director_Device_DG6_LAG_Interfaces member "ge-[0-3]/0/46"
```

```
user@switch# set interfaces interface-range Director_Device_DG6_LAG_Interfaces description "QFabric
   Director Device - DG6"
user@switch# set interfaces interface-range Director_Device_DG6_LAG_Interfaces ether-options 802.3ad
   ae6
user@switch# set interfaces interface-range Director_Device_DG7_LAG_Interfaces member "ge-[0-3]/0/47"
user@switch# set interfaces interface-range Director_Device_DG7_LAG_Interfaces description "QFabric
   Director Device - DG7"
user@switch# set interfaces interface-range Director_Device_DG7_LAG_Interfaces ether-options 802.3ad
   ae7
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-3]/1/0"
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-3]/1/2"
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces description "QFabric
   Control Plane (Inter-VC LAG)"
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces ether-options 802.3ad
   ae8
user@switch# set interfaces ae0 apply-groups qfabric-int
user@switch# set interfaces ae0 apply-groups qfabric-ae
user@switch# set interfaces ae0 description "QFabric Director Device - DG0"
user@switch# set interfaces ae1 apply-groups qfabric-int
user@switch# set interfaces ae1 apply-groups qfabric-ae
user@switch# set interfaces ae1 description "QFabric Director Device - DG1"
user@switch# set interfaces ae2 apply-groups qfabric-int
user@switch# set interfaces ae2 apply-groups qfabric-ae
user@switch# set interfaces ae2 description "QFabric Director Device - DG2"
user@switch# set interfaces ae3 apply-groups qfabric-int
user@switch# set interfaces ae3 apply-groups qfabric-ae
user@switch# set interfaces ae3 description "QFabric Director Device - DG3"
user@switch# set interfaces ae4 apply-groups qfabric-int
user@switch# set interfaces ae4 apply-groups qfabric-ae
user@switch# set interfaces ae4 description "QFabric Director Device - DG4"
user@switch# set interfaces ae5 apply-groups qfabric-int
user@switch# set interfaces ae5 apply-groups qfabric-ae
user@switch# set interfaces ae5 description "QFabric Director Device - DG5"
user@switch# set interfaces ae6 apply-groups qfabric-int
user@switch# set interfaces ae6 apply-groups qfabric-ae
user@switch# set interfaces ae6 description "QFabric Director Device - DG6"
user@switch# set interfaces ae7 apply-groups qfabric-int
user@switch# set interfaces ae7 apply-groups qfabric-ae
user@switch# set interfaces ae7 description "QFabric Director Device - DG7"
user@switch# set interfaces ae8 description "QFabric Control Plane (Inter-VC LAG)"
user@switch# set interfaces ae8 mtu 9216
user@switch# set interfaces ae8 aggregated-ether-options link-speed 10g
user@switch# set interfaces ae8 aggregated-ether-options lacp active
user@switch# set interfaces ae8 unit 0 family ethernet-switching vlan members qfabric
```

3. Configure settings to enable the Virtual Chassis to interoperate with your management network. Set a hostname, system services (such as Telnet), system log thresholds, management interface parameters, default routes, Virtual Chassis preprovisioning, and any additional preferences you might have.

```
[edit]
user@switch# set system host-name qfabric-control-plane
user@switch# set system services ssh
user@switch# set system services telnet
user@switch# set system services web-management http
user@switch# set system syslog user * any emergency
user@switch# set system syslog file messages any notice
user@switch# set system syslog file messages authorization info
user@switch# set system syslog file messages archive world-readable
user@switch# set system syslog file messages explicit-priority
user@switch# set system syslog file interactive-commands interactive-commands any
user@switch# set system syslog file secure authorization info
user@switch# set system syslog file default-log-messages any any
user@switch# set system syslog file default-log-messages structured-data
user@switch# set system syslog file console any error
user@switch# set system syslog time-format millisecond
user@switch# set interfaces vme unit 0 family inet address 192.168.157.26/24
user@switch# set routing-options static route 0.0.0.0/0 next-hop 192.168.157.1
user@switch# set virtual-chassis preprovisioned
user@switch# set virtual-chassis member 0 role routing-engine
user@switch# set virtual-chassis member 0 serial-number abc123
user@switch# set virtual-chassis member 1 role routing-engine
user@switch# set virtual-chassis member 1 serial-number def456
user@switch# set virtual-chassis member 2 role line-card
user@switch# set virtual-chassis member 2 serial-number ghi789
user@switch# set virtual-chassis member 3 role line-card
user@switch# set virtual-chassis member 3 serial-number jkl012
```

Results

To view the configuration, issue the **show** command in configuration mode or the **show configuration** command in operational mode. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

The following configuration is the standard configuration that applies universally to both Virtual Chassis in your QFabric system control plane network.

```
[edit]
groups {
  qfabric {
```

```
system {
    commit {
        synchronize;
    }
}
chassis {
    redundancy {
        graceful-switchover;
    }
    aggregated-devices {
        ethernet {
            device-count 10;
        }
    }
    alarm {
        management-ethernet {
            link-down ignore;
        }
    }
    fpc 0 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 1 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 2 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 3 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
```

```
            }
        }
    }
    lcd-menu {
        fpc 0 {
            menu-item {
                maintenance-menu disable;
            }
        }
        fpc 1 {
            menu-item {
                maintenance-menu disable;
            }
        }
        fpc 2 {
            menu-item {
                maintenance-menu disable;
            }
        }
        fpc 3 {
            menu-item {
                maintenance-menu disable;
            }
        }
    }
}
protocols {
    rstp {
        interface ae8.0 {
            mode point-to-point;
        }
        interface all {
            edge;
            no-root-port;
        }
        bpdu-block-on-edge;
    }
    lldp {
        interface all;
    }
}
class-of-service {
    classifiers {
        ieee-802.1 onep_qfabric_classifier {
```

```
            forwarding-class class_3 {
                loss-priority low code-points [ 110 111 ];
            }
            forwarding-class class_2 {
                loss-priority low code-points 100;
                loss-priority high code-points 101;
            }
            forwarding-class class_0 {
                loss-priority low code-points 010;
                loss-priority high code-points 001;
            }
        }
        inet-precedence IP_qfabric_classifier {
            forwarding-class class_3 {
                loss-priority low code-points [ 110 111 ];
            }
            forwarding-class class_2 {
                loss-priority low code-points 100;
                loss-priority high code-points 101;
            }
            forwarding-class class_0 {
                loss-priority low code-points 010;
                loss-priority high code-points 001;
            }
        }
    }
    forwarding-classes {
        class class_3 queue-num 7;
        class class_2 queue-num 2;
        class class_0 queue-num 0;
    }
    interfaces {
        ge-*/0/* {
            scheduler-map cpe_network_smap;
            unit 0 {
                classifiers {
                    ieee-802.1 onep_qfabric_classifier;
                    inet-precedence IP_qfabric_classifier;
                }
            }
        }
        ae* {
            scheduler-map cpe_network_smap;
            unit 0 {
```

```
                classifiers {
                    ieee-802.1 onep_qfabric_classifier;
                    inet-precedence IP_qfabric_classifier;
                }
            }
        }
    }
    scheduler-maps {
        cpe_network_smap {
            forwarding-class class_3 scheduler scheduler_3;
            forwarding-class class_2 scheduler scheduler_2;
            forwarding-class class_0 scheduler scheduler_0;
        }
    }
    schedulers {
        scheduler_3 {
            buffer-size percent 30;
            priority strict-high;
        }
        scheduler_2 {
            transmit-rate percent 75;
            buffer-size percent 30;
            priority low;
        }
        scheduler_0 {
            transmit-rate percent 25;
            buffer-size percent 40;
            priority low;
        }
    }
}
ethernet-switching-options {
    nonstop-bridging;
    storm-control {
        interface all {
            bandwidth 10000;
        }
    }
}
vlans {
    qfabric {
        vlan-id 100;
        dot1q-tunneling;
    }
```

```
        }
    }
    qfabric-int {
        interfaces {
            <*> {
                mtu 9216;
                unit 0 {
                    family ethernet-switching {
                        port-mode access;
                        vlan {
                            members qfabric;
                        }
                    }
                }
            }
        }
    }
    qfabric-ae {
        interfaces {
            <*> {
                aggregated-ether-options {
                    link-speed 1g;
                    lacp {
                        active;
                    }
                }
            }
        }
    }
}
apply-groups [qfabric];
interfaces {
    interface-range Node_Device_Interfaces {
        member "ge-[0-3]/0/[0-31]";
        description "QFabric Node Device";
        apply-groups qfabric-int;
    }
    interface-range Interconnect_Device_Interfaces {
        member "ge-[0-3]/0/[38-39]";
        description "QFabric Interconnect Device";
        apply-groups qfabric-int;
    }
    interface-range Director_Device_DG0_LAG_Interfaces {
        member "ge-[0-3]/0/40";
```

```
    description "QFabric Director Device - DG0";
    ether-options {
        802.3ad ae0;
    }
}
interface-range Director_Device_DG1_LAG_Interfaces {
    member "ge-[0-3]/0/41";
    description "QFabric Director Device - DG1";
    ether-options {
        802.3ad ae1;
    }
}
interface-range Director_Device_DG2_LAG_Interfaces {
    member "ge-[0-3]/0/42";
    description "QFabric Director Device - DG2";
    ether-options {
        802.3ad ae2;
    }
}
interface-range Director_Device_DG3_LAG_Interfaces {
    member "ge-[0-3]/0/43";
    description "QFabric Director Device - DG3";
    ether-options {
        802.3ad ae3;
    }
}
interface-range Director_Device_DG4_LAG_Interfaces {
    member "ge-[0-3]/0/44";
    description "QFabric Director Device - DG4";
    ether-options {
        802.3ad ae4;
    }
}
interface-range Director_Device_DG5_LAG_Interfaces {
    member "ge-[0-3]/0/45";
    description "QFabric Director Device - DG5";
    ether-options {
        802.3ad ae5;
    }
}
interface-range Director_Device_DG6_LAG_Interfaces {
    member "ge-[0-3]/0/46";
    description "QFabric Director Device - DG6";
    ether-options {
```

```
        802.3ad ae6;
    }
}
interface-range Director_Device_DG7_LAG_Interfaces {
    member "ge-[0-3]/0/47";
    description "QFabric Director Device - DG7";
    ether-options {
        802.3ad ae7;
    }
}
interface-range Control_Plane_Inter_VC_LAG_Interfaces {
    member "xe-[0-3]/1/0";
    member "xe-[0-3]/1/2";
    description "QFabric Control Plane (Inter-VC LAG)";
    ether-options {
        802.3ad ae8;
    }
}
ae0 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG0";
}
ae1 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG1";
}
ae2 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG2";
}
ae3 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG3";
}
ae4 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG4";
}
ae5 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG5";
}
ae6 {
    apply-groups [ qfabric-int qfabric-ae ];
```

```
        description "QFabric Director Device - DG6";
    }
    ae7 {
        apply-groups [ qfabric-int qfabric-ae ];
        description "QFabric Director Device - DG7";
    }
    ae8 {
        description "QFabric Control Plane (Inter-VC LAG)";
        mtu 9216;
        aggregated-ether-options {
            link-speed 10g;
            lacp {
                active;
            }
        }
        unit 0 {
            family ethernet-switching {
                vlan {
                    members qfabric;
                }
            }
        }
    }
}
```

The following portion of the configuration applies to the specific requirements of your management network. Modify this section to meet the needs of your network.

```
[edit]
system {
    host-name qfabric-control-plane;
    services {
        ssh;
        telnet;
        web-management {
            http;
        }
    }
    syslog {
        user * {
            any emergency;
        }
        file messages {
            any notice;
```

```
            authorization info;
            archive world-readable;
            explicit-priority;
        }
        file interactive-commands {
            interactive-commands any;
        }
        file secure {
            authorization info;
        }
        file default-log-messages {
            any any;
            structured-data;
        }
        file console {
            any error;
        }
        time-format millisecond;
    }
}
interfaces {
    vme {
        unit 0 {
            family inet {
                address 192.168.157.26/24;
            }
        }
    }
}
routing-options {
    static {
        route 0.0.0.0/0 next-hop 192.168.157.1;
    }
}
virtual-chassis {
    preprovisioned;
    member 0 {
        role routing-engine;
        serial-number abc123;
    }
    member 1 {
        role routing-engine;
        serial-number def456;
    }
```

```
    member 2 {
      role line-card;
      serial-number ghi789;
    }
    member 3 {
      role line-card;
      serial-number jkl012;
    }
  }
```

To verify the syntax of your configuration before committing it, enter **commit check** from configuration mode. If you are done configuring the device, enter **commit** from configuration mode.

Verification

IN THIS SECTION

Confirm that the Virtual Chassis configuration is working properly.

Verifying the QFabric System Control Plane—Virtual Chassis VC0

Purpose

Verify that your first Virtual Chassis is operational.

Action

Connect to the Junos OS CLI of Virtual Chassis VC0, either from your management network or from the console port of the master Virtual Chassis member. In operational mode, enter the **show virtual-chassis status** and **show interfaces terse** commands.

Sample Output

```
{master:0}
```

`user@vc0>` **show virtual-chassis status**

```
Virtual Chassis ID: c809.2c5d.9f7b
                                          Mastership            Neighbor List
Member ID  Status   Serial No    Model    priority    Role      ID  Interface
0 (FPC 0)  Prsnt    BP0210471476 ex4200-48t      128  Master*     1  vcp-1
1 (FPC 1)  Prsnt    BP0210460181 ex4200-48t      128  Backup      0  vcp-0
                                                                  2  vcp-1
2 (FPC 2)  Prsnt    BP0210458724 ex4200-48t      128  Linecard    1  vcp-0
                                                                  3  vcp-1
3 (FPC 3)  Prsnt    BP0210477189 ex4200-48t      128  Linecard    2  vcp-0

Member ID for next new member: 4 (FPC 4)
```

{master:0}

user@vc0> **show interfaces terse**

```
Interface               Admin Link Proto    Local                 Remote
ge-0/0/0                up    up
ge-0/0/0.0              up    up   eth-switch
ge-0/0/1                up    up
ge-0/0/1.0              up    up   eth-switch
ge-0/0/2                up    up
ge-0/0/2.0              up    up   eth-switch
ge-0/0/3                up    up
ge-0/0/3.0              up    up   eth-switch
ge-0/0/4                up    up
ge-0/0/4.0              up    up   eth-switch
ge-0/0/5                up    up
ge-0/0/5.0              up    up   eth-switch
ge-0/0/6                up    up
ge-0/0/6.0              up    up   eth-switch
ge-0/0/7                up    up
ge-0/0/7.0              up    up   eth-switch
ge-0/0/8                up    down
ge-0/0/8.0              up    down eth-switch
ge-0/0/9                up    down
ge-0/0/9.0              up    down eth-switch
ge-0/0/10               up    down
ge-0/0/10.0             up    down eth-switch
ge-0/0/11               up    down
ge-0/0/11.0             up    down eth-switch
ge-0/0/12               up    down
```

```
ge-0/0/12.0             up    down eth-switch
ge-0/0/13               up    down
ge-0/0/13.0             up    down eth-switch
ge-0/0/14               up    down
ge-0/0/14.0             up    down eth-switch
ge-0/0/15               up    down
ge-0/0/15.0             up    down eth-switch
ge-0/0/16               up    down
ge-0/0/16.0             up    down eth-switch
ge-0/0/17               up    down
ge-0/0/17.0             up    down eth-switch
ge-0/0/18               up    down
ge-0/0/18.0             up    down eth-switch
ge-0/0/19               up    down
ge-0/0/19.0             up    down eth-switch
ge-0/0/20               up    down
ge-0/0/20.0             up    down eth-switch
ge-0/0/21               up    down
ge-0/0/21.0             up    down eth-switch
ge-0/0/22               up    down
ge-0/0/22.0             up    down eth-switch
ge-0/0/23               up    down
ge-0/0/23.0             up    down eth-switch
ge-0/0/24               up    down
ge-0/0/24.0             up    down eth-switch
ge-0/0/25               up    down
ge-0/0/25.0             up    down eth-switch
ge-0/0/26               up    down
ge-0/0/26.0             up    down eth-switch
ge-0/0/27               up    down
ge-0/0/27.0             up    down eth-switch
ge-0/0/28               up    down
ge-0/0/28.0             up    down eth-switch
ge-0/0/29               up    down
ge-0/0/29.0             up    down eth-switch
ge-0/0/30               up    down
ge-0/0/30.0             up    down eth-switch
ge-0/0/31               up    down
ge-0/0/31.0             up    down eth-switch
ge-0/0/32               up    down
ge-0/0/33               up    down
ge-0/0/34               up    down
ge-0/0/35               up    down
ge-0/0/36               up    down
```

```
ge-0/0/36.0             up    down eth-switch
ge-0/0/37               up    down
ge-0/0/37.0             up    down eth-switch
ge-0/0/38               up    down
ge-0/0/38.0             up    down eth-switch
ge-0/0/39               up    up
ge-0/0/39.0             up    up   eth-switch
ge-0/0/40               up    up
ge-0/0/40.0             up    up   aenet    --> ae0.0
ge-0/0/41               up    up
ge-0/0/41.0             up    up   aenet    --> ae1.0
ge-0/0/42               up    down
ge-0/0/42.0             up    down aenet    --> ae2.0
ge-0/0/43               up    down
ge-0/0/43.0             up    down aenet    --> ae3.0
ge-0/0/44               up    down
ge-0/0/44.0             up    down aenet    --> ae4.0
ge-0/0/45               up    down
ge-0/0/45.0             up    down aenet    --> ae5.0
ge-0/0/46               up    down
ge-0/0/46.0             up    down aenet    --> ae6.0
ge-0/0/47               up    down
ge-0/0/47.0             up    down aenet    --> ae7.0
xe-0/1/0                up    up
xe-0/1/0.0              up    up   aenet    --> ae8.0
xe-0/1/1                up    down
xe-0/1/2                up    up
xe-0/1/2.0              up    up   aenet    --> ae8.0
xe-0/1/3                up    down
ge-1/0/0                up    down
ge-1/0/0.0              up    down eth-switch
ge-1/0/1                up    down
ge-1/0/1.0              up    down eth-switch
ge-1/0/2                up    down
ge-1/0/2.0              up    down eth-switch
ge-1/0/3                up    down
ge-1/0/3.0              up    down eth-switch
ge-1/0/4                up    down
ge-1/0/4.0              up    down eth-switch
ge-1/0/5                up    down
ge-1/0/5.0              up    down eth-switch
ge-1/0/6                up    down
ge-1/0/6.0              up    down eth-switch
ge-1/0/7                up    down
```

```
ge-1/0/7.0              up    down eth-switch
ge-1/0/8                up    down
ge-1/0/8.0              up    down eth-switch
ge-1/0/9                up    down
ge-1/0/9.0              up    down eth-switch
ge-1/0/10               up    down
ge-1/0/10.0             up    down eth-switch
ge-1/0/11               up    down
ge-1/0/11.0             up    down eth-switch
ge-1/0/12               up    down
ge-1/0/12.0             up    down eth-switch
ge-1/0/13               up    down
ge-1/0/13.0             up    down eth-switch
ge-1/0/14               up    down
ge-1/0/14.0             up    down eth-switch
ge-1/0/15               up    down
ge-1/0/15.0             up    down eth-switch
ge-1/0/16               up    down
ge-1/0/16.0             up    down eth-switch
ge-1/0/17               up    down
ge-1/0/17.0             up    down eth-switch
ge-1/0/18               up    down
ge-1/0/18.0             up    down eth-switch
ge-1/0/19               up    down
ge-1/0/19.0             up    down eth-switch
ge-1/0/20               up    down
ge-1/0/20.0             up    down eth-switch
ge-1/0/21               up    down
ge-1/0/21.0             up    down eth-switch
ge-1/0/22               up    down
ge-1/0/22.0             up    down eth-switch
ge-1/0/23               up    down
ge-1/0/23.0             up    down eth-switch
ge-1/0/24               up    down
ge-1/0/24.0             up    down eth-switch
ge-1/0/25               up    down
ge-1/0/25.0             up    down eth-switch
ge-1/0/26               up    down
ge-1/0/26.0             up    down eth-switch
ge-1/0/27               up    down
ge-1/0/27.0             up    down eth-switch
ge-1/0/28               up    down
ge-1/0/28.0             up    down eth-switch
ge-1/0/29               up    down
```

```
ge-1/0/29.0             up    down eth-switch
ge-1/0/30               up    down
ge-1/0/30.0             up    down eth-switch
ge-1/0/31               up    down
ge-1/0/31.0             up    down eth-switch
ge-1/0/32               up    down
ge-1/0/33               up    down
ge-1/0/34               up    down
ge-1/0/35               up    down
ge-1/0/36               up    down
ge-1/0/36.0             up    down eth-switch
ge-1/0/37               up    down
ge-1/0/37.0             up    down eth-switch
ge-1/0/38               up    down
ge-1/0/38.0             up    down eth-switch
ge-1/0/39               up    up
ge-1/0/39.0             up    up   eth-switch
ge-1/0/40               up    up
ge-1/0/40.0             up    up   aenet    --> ae0.0
ge-1/0/41               up    up
ge-1/0/41.0             up    up   aenet    --> ae1.0
ge-1/0/42               up    down
ge-1/0/42.0             up    down aenet    --> ae2.0
ge-1/0/43               up    down
ge-1/0/43.0             up    down aenet    --> ae3.0
ge-1/0/44               up    down
ge-1/0/44.0             up    down aenet    --> ae4.0
ge-1/0/45               up    down
ge-1/0/45.0             up    down aenet    --> ae5.0
ge-1/0/46               up    down
ge-1/0/46.0             up    down aenet    --> ae6.0
ge-1/0/47               up    down
ge-1/0/47.0             up    down aenet    --> ae7.0
xe-1/1/0                up    up
xe-1/1/0.0              up    up   aenet    --> ae8.0
xe-1/1/1                up    down
xe-1/1/2                up    up
xe-1/1/2.0              up    up   aenet    --> ae8.0
xe-1/1/3                up    down
ge-2/0/0                up    down
ge-2/0/0.0              up    down eth-switch
ge-2/0/1                up    down
ge-2/0/1.0              up    down eth-switch
ge-2/0/2                up    down
```

```
ge-2/0/2.0              up    down eth-switch
ge-2/0/3                up    down
ge-2/0/3.0              up    down eth-switch
ge-2/0/4                up    down
ge-2/0/4.0              up    down eth-switch
ge-2/0/5                up    down
ge-2/0/5.0              up    down eth-switch
ge-2/0/6                up    down
ge-2/0/6.0              up    down eth-switch
ge-2/0/7                up    down
ge-2/0/7.0              up    down eth-switch
ge-2/0/8                up    down
ge-2/0/8.0              up    down eth-switch
ge-2/0/9                up    down
ge-2/0/9.0              up    down eth-switch
ge-2/0/10               up    down
ge-2/0/10.0             up    down eth-switch
ge-2/0/11               up    down
ge-2/0/11.0             up    down eth-switch
ge-2/0/12               up    down
ge-2/0/12.0             up    down eth-switch
ge-2/0/13               up    down
ge-2/0/13.0             up    down eth-switch
ge-2/0/14               up    down
ge-2/0/14.0             up    down eth-switch
ge-2/0/15               up    down
ge-2/0/15.0             up    down eth-switch
ge-2/0/16               up    down
ge-2/0/16.0             up    down eth-switch
ge-2/0/17               up    down
ge-2/0/17.0             up    down eth-switch
ge-2/0/18               up    down
ge-2/0/18.0             up    down eth-switch
ge-2/0/19               up    down
ge-2/0/19.0             up    down eth-switch
ge-2/0/20               up    down
ge-2/0/20.0             up    down eth-switch
ge-2/0/21               up    down
ge-2/0/21.0             up    down eth-switch
ge-2/0/22               up    down
ge-2/0/22.0             up    down eth-switch
ge-2/0/23               up    down
ge-2/0/23.0             up    down eth-switch
ge-2/0/24               up    down
```

```
ge-2/0/24.0             up    down eth-switch
ge-2/0/25               up    down
ge-2/0/25.0             up    down eth-switch
ge-2/0/26               up    down
ge-2/0/26.0             up    down eth-switch
ge-2/0/27               up    down
ge-2/0/27.0             up    down eth-switch
ge-2/0/28               up    down
ge-2/0/28.0             up    down eth-switch
ge-2/0/29               up    down
ge-2/0/29.0             up    down eth-switch
ge-2/0/30               up    down
ge-2/0/30.0             up    down eth-switch
ge-2/0/31               up    down
ge-2/0/31.0             up    down eth-switch
ge-2/0/32               up    down
ge-2/0/33               up    down
ge-2/0/34               up    down
ge-2/0/35               up    down
ge-2/0/36               up    down
ge-2/0/36.0             up    down eth-switch
ge-2/0/37               up    down
ge-2/0/37.0             up    down eth-switch
ge-2/0/38               up    down
ge-2/0/38.0             up    down eth-switch
ge-2/0/39               up    up
ge-2/0/39.0             up    up   eth-switch
ge-2/0/40               up    up
ge-2/0/40.0             up    up   aenet    --> ae0.0
ge-2/0/41               up    up
ge-2/0/41.0             up    up   aenet    --> ae1.0
ge-2/0/42               up    down
ge-2/0/42.0             up    down aenet    --> ae2.0
ge-2/0/43               up    down
ge-2/0/43.0             up    down aenet    --> ae3.0
ge-2/0/44               up    down
ge-2/0/44.0             up    down aenet    --> ae4.0
ge-2/0/45               up    down
ge-2/0/45.0             up    down aenet    --> ae5.0
ge-2/0/46               up    down
ge-2/0/46.0             up    down aenet    --> ae6.0
ge-2/0/47               up    down
ge-2/0/47.0             up    down aenet    --> ae7.0
xe-2/1/0                up    up
```

```
xe-2/1/0.0              up    up   aenet    --> ae8.0
xe-2/1/1                up    down
xe-2/1/2                up    up
xe-2/1/2.0              up    up   aenet    --> ae8.0
xe-2/1/3                up    down
ge-3/0/0                up    down
ge-3/0/0.0              up    down eth-switch
ge-3/0/1                up    down
ge-3/0/1.0              up    down eth-switch
ge-3/0/2                up    down
ge-3/0/2.0              up    down eth-switch
ge-3/0/3                up    down
ge-3/0/3.0              up    down eth-switch
ge-3/0/4                up    down
ge-3/0/4.0              up    down eth-switch
ge-3/0/5                up    down
ge-3/0/5.0              up    down eth-switch
ge-3/0/6                up    down
ge-3/0/6.0              up    down eth-switch
ge-3/0/7                up    down
ge-3/0/7.0              up    down eth-switch
ge-3/0/8                up    down
ge-3/0/8.0              up    down eth-switch
ge-3/0/9                up    down
ge-3/0/9.0              up    down eth-switch
ge-3/0/10               up    down
ge-3/0/10.0             up    down eth-switch
ge-3/0/11               up    down
ge-3/0/11.0             up    down eth-switch
ge-3/0/12               up    down
ge-3/0/12.0             up    down eth-switch
ge-3/0/13               up    down
ge-3/0/13.0             up    down eth-switch
ge-3/0/14               up    down
ge-3/0/14.0             up    down eth-switch
ge-3/0/15               up    down
ge-3/0/15.0             up    down eth-switch
ge-3/0/16               up    down
ge-3/0/16.0             up    down eth-switch
ge-3/0/17               up    down
ge-3/0/17.0             up    down eth-switch
ge-3/0/18               up    down
ge-3/0/18.0             up    down eth-switch
ge-3/0/19               up    down
```

```
ge-3/0/19.0             up    down eth-switch
ge-3/0/20               up    down
ge-3/0/20.0             up    down eth-switch
ge-3/0/21               up    down
ge-3/0/21.0             up    down eth-switch
ge-3/0/22               up    down
ge-3/0/22.0             up    down eth-switch
ge-3/0/23               up    down
ge-3/0/23.0             up    down eth-switch
ge-3/0/24               up    down
ge-3/0/24.0             up    down eth-switch
ge-3/0/25               up    down
ge-3/0/25.0             up    down eth-switch
ge-3/0/26               up    down
ge-3/0/26.0             up    down eth-switch
ge-3/0/27               up    down
ge-3/0/27.0             up    down eth-switch
ge-3/0/28               up    down
ge-3/0/28.0             up    down eth-switch
ge-3/0/29               up    down
ge-3/0/29.0             up    down eth-switch
ge-3/0/30               up    down
ge-3/0/30.0             up    down eth-switch
ge-3/0/31               up    down
ge-3/0/31.0             up    down eth-switch
ge-3/0/32               up    down
ge-3/0/33               up    down
ge-3/0/34               up    down
ge-3/0/35               up    down
ge-3/0/36               up    down
ge-3/0/36.0             up    down eth-switch
ge-3/0/37               up    down
ge-3/0/37.0             up    down eth-switch
ge-3/0/38               up    down
ge-3/0/38.0             up    down eth-switch
ge-3/0/39               up    up
ge-3/0/39.0             up    up   eth-switch
ge-3/0/40               up    down
ge-3/0/40.0             up    down aenet    --> ae0.0
ge-3/0/41               up    down
ge-3/0/41.0             up    down aenet    --> ae1.0
ge-3/0/42               up    down
ge-3/0/42.0             up    down aenet    --> ae2.0
ge-3/0/43               up    down
```

```
ge-3/0/43.0             up    down aenet    --> ae3.0
ge-3/0/44               up    down
ge-3/0/44.0             up    down aenet    --> ae4.0
ge-3/0/45               up    down
ge-3/0/45.0             up    down aenet    --> ae5.0
ge-3/0/46               up    down
ge-3/0/46.0             up    down aenet    --> ae6.0
ge-3/0/47               up    down
ge-3/0/47.0             up    down aenet    --> ae7.0
xe-3/1/0                up    up
xe-3/1/0.0              up    up   aenet    --> ae8.0
xe-3/1/1                up    down
xe-3/1/2                up    up
xe-3/1/2.0              up    up   aenet    --> ae8.0
xe-3/1/3                up    down
vcp-0                   up    down
vcp-0.32768             up    down
vcp-1                   up    up
vcp-1.32768             up    up
ae0                     up    up
ae0.0                   up    up   eth-switch
ae1                     up    up
ae1.0                   up    up   eth-switch
ae2                     up    down
ae2.0                   up    down eth-switch
ae3                     up    down
ae3.0                   up    down eth-switch
ae4                     up    down
ae4.0                   up    down eth-switch
ae5                     up    down
ae5.0                   up    down eth-switch
ae6                     up    down
ae6.0                   up    down eth-switch
ae7                     up    down
ae7.0                   up    down eth-switch
ae8                     up    up
ae8.0                   up    up   eth-switch
ae9                     up    down
bme0                    up    up
bme0.32768              up    up   inet     128.0.0.1/2
                                            128.0.0.16/2
                                            128.0.0.32/2
                                   tnp      0x10
bme0.32770              up    up   eth-switch
```

```
bme0.32771              down  up   eth-switch
bme0.32772              down  up   eth-switch
dsc                     up    up
gre                     up    up
ipip                    up    up
jsrv                    up    up
jsrv.1                  up    up   inet     128.0.0.127/2
lo0                     up    up
lo0.0                   up    up   inet     10.255.195.96       --> 0/0
                                   iso
47.0005.80ff.f800.0000.0108.0001.0102.5519.5096
                                   inet6    abcd::10:255:195:96
                                            fe80::2ac0:da0f:fc31:1e80
lsi                     up    up
me0                     up    up
me0.0                   up    up   inet     10.94.195.96/24
mtun                    up    up
pimd                    up    up
pime                    up    up
tap                     up    up
vlan                    up    up
vme                     up    up   inet     192.168.157.26/24
```

Meaning

In the output of the **show virtual-chassis status** command, if all four members appear, the Virtual Chassis is operational.

In the output of the **show interfaces terse** command, if all interfaces that connect to the QFabric system devices are listed as up (such as ge-0/0/39, ge-1/0/39, ge-2/0/39, and ge-3/0/39 for the Interconnect devices; ge-0/0/40, ge-1/0/40, and ge-2/0/40 for the Director devices; ge-0/0/0 through ge-0/0/7 for the Node devices; and xe-0/1/0, xe-0/1/2, xe-1/1/0, xe-1/1/2, xe-2/1/0, xe-2/1/2, xe-3/1/0, and xe-3/1/2 for the inter-Virtual Chassis connections), the control plane is properly connected.

Verifying the QFabric System Control Plane—Virtual Chassis VC1

Purpose

Verify that your second Virtual Chassis is operational.

Action

Connect to the Junos OS CLI of Virtual Chassis VC1, either from your management network or from the console port of the master Virtual Chassis member. In operational mode, enter the **show virtual-chassis status** and **show interfaces terse** commands.

Sample Output

{master:0}

user@vc1> **show virtual-chassis status**

```
Virtual Chassis ID: c809.2c5d.9f8a
                                          Mastership            Neighbor List
Member ID  Status   Serial No    Model    priority    Role      ID  Interface
0 (FPC 0)  Prsnt    BP0210471477 ex4200-48t      128  Master*    1  vcp-1
1 (FPC 1)  Prsnt    BP0210460182 ex4200-48t      128  Backup     0  vcp-0
                                                                 2  vcp-1
2 (FPC 2)  Prsnt    BP0210458725 ex4200-48t      128  Linecard   1  vcp-0
                                                                 3  vcp-1
3 (FPC 3)  Prsnt    BP0210477180 ex4200-48t      128  Linecard   2  vcp-0

Member ID for next new member: 4 (FPC 4)
```

{master:0}

user@vc1> **show interfaces terse**

```
Interface               Admin Link Proto    Local                 Remote
ge-0/0/0                up    up
ge-0/0/0.0              up    up   eth-switch
ge-0/0/1                up    up
ge-0/0/1.0              up    up   eth-switch
ge-0/0/2                up    up
ge-0/0/2.0              up    up   eth-switch
ge-0/0/3                up    up
ge-0/0/3.0              up    up   eth-switch
ge-0/0/4                up    up
ge-0/0/4.0              up    up   eth-switch
ge-0/0/5                up    up
ge-0/0/5.0              up    up   eth-switch
ge-0/0/6                up    up
ge-0/0/6.0              up    up   eth-switch
ge-0/0/7                up    up
ge-0/0/7.0              up    up   eth-switch
ge-0/0/8                up    down
ge-0/0/8.0              up    down eth-switch
ge-0/0/9                up    down
```

```
ge-0/0/9.0              up    down eth-switch
ge-0/0/10               up    down
ge-0/0/10.0             up    down eth-switch
ge-0/0/11               up    down
ge-0/0/11.0             up    down eth-switch
ge-0/0/12               up    down
ge-0/0/12.0             up    down eth-switch
ge-0/0/13               up    down
ge-0/0/13.0             up    down eth-switch
ge-0/0/14               up    down
ge-0/0/14.0             up    down eth-switch
ge-0/0/15               up    down
ge-0/0/15.0             up    down eth-switch
ge-0/0/16               up    down
ge-0/0/16.0             up    down eth-switch
ge-0/0/17               up    down
ge-0/0/17.0             up    down eth-switch
ge-0/0/18               up    down
ge-0/0/18.0             up    down eth-switch
ge-0/0/19               up    down
ge-0/0/19.0             up    down eth-switch
ge-0/0/20               up    down
ge-0/0/20.0             up    down eth-switch
ge-0/0/21               up    down
ge-0/0/21.0             up    down eth-switch
ge-0/0/22               up    down
ge-0/0/22.0             up    down eth-switch
ge-0/0/23               up    down
ge-0/0/23.0             up    down eth-switch
ge-0/0/24               up    down
ge-0/0/24.0             up    down eth-switch
ge-0/0/25               up    down
ge-0/0/25.0             up    down eth-switch
ge-0/0/26               up    down
ge-0/0/26.0             up    down eth-switch
ge-0/0/27               up    down
ge-0/0/27.0             up    down eth-switch
ge-0/0/28               up    down
ge-0/0/28.0             up    down eth-switch
ge-0/0/29               up    down
ge-0/0/29.0             up    down eth-switch
ge-0/0/30               up    down
ge-0/0/30.0             up    down eth-switch
ge-0/0/31               up    down
```

```
ge-0/0/31.0             up    down eth-switch
ge-0/0/32               up    down
ge-0/0/33               up    down
ge-0/0/34               up    down
ge-0/0/35               up    down
ge-0/0/36               up    down
ge-0/0/36.0             up    down eth-switch
ge-0/0/37               up    down
ge-0/0/37.0             up    down eth-switch
ge-0/0/38               up    down
ge-0/0/38.0             up    down eth-switch
ge-0/0/39               up    up
ge-0/0/39.0             up    up   eth-switch
ge-0/0/40               up    up
ge-0/0/40.0             up    up   aenet    --> ae0.0
ge-0/0/41               up    up
ge-0/0/41.0             up    up   aenet    --> ae1.0
ge-0/0/42               up    down
ge-0/0/42.0             up    down aenet    --> ae2.0
ge-0/0/43               up    down
ge-0/0/43.0             up    down aenet    --> ae3.0
ge-0/0/44               up    down
ge-0/0/44.0             up    down aenet    --> ae4.0
ge-0/0/45               up    down
ge-0/0/45.0             up    down aenet    --> ae5.0
ge-0/0/46               up    down
ge-0/0/46.0             up    down aenet    --> ae6.0
ge-0/0/47               up    down
ge-0/0/47.0             up    down aenet    --> ae7.0
xe-0/1/0                up    up
xe-0/1/0.0              up    up   aenet    --> ae8.0
xe-0/1/1                up    down
xe-0/1/2                up    up
xe-0/1/2.0              up    up   aenet    --> ae8.0
xe-0/1/3                up    down
ge-1/0/0                up    down
ge-1/0/0.0              up    down eth-switch
ge-1/0/1                up    down
ge-1/0/1.0              up    down eth-switch
ge-1/0/2                up    down
ge-1/0/2.0              up    down eth-switch
ge-1/0/3                up    down
ge-1/0/3.0              up    down eth-switch
ge-1/0/4                up    down
```

```
ge-1/0/4.0              up    down eth-switch
ge-1/0/5                up    down
ge-1/0/5.0              up    down eth-switch
ge-1/0/6                up    down
ge-1/0/6.0              up    down eth-switch
ge-1/0/7                up    down
ge-1/0/7.0              up    down eth-switch
ge-1/0/8                up    down
ge-1/0/8.0              up    down eth-switch
ge-1/0/9                up    down
ge-1/0/9.0              up    down eth-switch
ge-1/0/10               up    down
ge-1/0/10.0             up    down eth-switch
ge-1/0/11               up    down
ge-1/0/11.0             up    down eth-switch
ge-1/0/12               up    down
ge-1/0/12.0             up    down eth-switch
ge-1/0/13               up    down
ge-1/0/13.0             up    down eth-switch
ge-1/0/14               up    down
ge-1/0/14.0             up    down eth-switch
ge-1/0/15               up    down
ge-1/0/15.0             up    down eth-switch
ge-1/0/16               up    down
ge-1/0/16.0             up    down eth-switch
ge-1/0/17               up    down
ge-1/0/17.0             up    down eth-switch
ge-1/0/18               up    down
ge-1/0/18.0             up    down eth-switch
ge-1/0/19               up    down
ge-1/0/19.0             up    down eth-switch
ge-1/0/20               up    down
ge-1/0/20.0             up    down eth-switch
ge-1/0/21               up    down
ge-1/0/21.0             up    down eth-switch
ge-1/0/22               up    down
ge-1/0/22.0             up    down eth-switch
ge-1/0/23               up    down
ge-1/0/23.0             up    down eth-switch
ge-1/0/24               up    down
ge-1/0/24.0             up    down eth-switch
ge-1/0/25               up    down
ge-1/0/25.0             up    down eth-switch
ge-1/0/26               up    down
```

```
ge-1/0/26.0             up    down eth-switch
ge-1/0/27               up    down
ge-1/0/27.0             up    down eth-switch
ge-1/0/28               up    down
ge-1/0/28.0             up    down eth-switch
ge-1/0/29               up    down
ge-1/0/29.0             up    down eth-switch
ge-1/0/30               up    down
ge-1/0/30.0             up    down eth-switch
ge-1/0/31               up    down
ge-1/0/31.0             up    down eth-switch
ge-1/0/32               up    down
ge-1/0/33               up    down
ge-1/0/34               up    down
ge-1/0/35               up    down
ge-1/0/36               up    down
ge-1/0/36.0             up    down eth-switch
ge-1/0/37               up    down
ge-1/0/37.0             up    down eth-switch
ge-1/0/38               up    down
ge-1/0/38.0             up    down eth-switch
ge-1/0/39               up    up
ge-1/0/39.0             up    up   eth-switch
ge-1/0/40               up    up
ge-1/0/40.0             up    up   aenet    --> ae0.0
ge-1/0/41               up    up
ge-1/0/41.0             up    up   aenet    --> ae1.0
ge-1/0/42               up    down
ge-1/0/42.0             up    down aenet    --> ae2.0
ge-1/0/43               up    down
ge-1/0/43.0             up    down aenet    --> ae3.0
ge-1/0/44               up    down
ge-1/0/44.0             up    down aenet    --> ae4.0
ge-1/0/45               up    down
ge-1/0/45.0             up    down aenet    --> ae5.0
ge-1/0/46               up    down
ge-1/0/46.0             up    down aenet    --> ae6.0
ge-1/0/47               up    down
ge-1/0/47.0             up    down aenet    --> ae7.0
xe-1/1/0                up    up
xe-1/1/0.0              up    up   aenet    --> ae8.0
xe-1/1/1                up    down
xe-1/1/2                up    up
xe-1/1/2.0              up    up   aenet    --> ae8.0
```

```
xe-1/1/3                up    down
ge-2/0/0                up    down
ge-2/0/0.0              up    down eth-switch
ge-2/0/1                up    down
ge-2/0/1.0              up    down eth-switch
ge-2/0/2                up    down
ge-2/0/2.0              up    down eth-switch
ge-2/0/3                up    down
ge-2/0/3.0              up    down eth-switch
ge-2/0/4                up    down
ge-2/0/4.0              up    down eth-switch
ge-2/0/5                up    down
ge-2/0/5.0              up    down eth-switch
ge-2/0/6                up    down
ge-2/0/6.0              up    down eth-switch
ge-2/0/7                up    down
ge-2/0/7.0              up    down eth-switch
ge-2/0/8                up    down
ge-2/0/8.0              up    down eth-switch
ge-2/0/9                up    down
ge-2/0/9.0              up    down eth-switch
ge-2/0/10               up    down
ge-2/0/10.0             up    down eth-switch
ge-2/0/11               up    down
ge-2/0/11.0             up    down eth-switch
ge-2/0/12               up    down
ge-2/0/12.0             up    down eth-switch
ge-2/0/13               up    down
ge-2/0/13.0             up    down eth-switch
ge-2/0/14               up    down
ge-2/0/14.0             up    down eth-switch
ge-2/0/15               up    down
ge-2/0/15.0             up    down eth-switch
ge-2/0/16               up    down
ge-2/0/16.0             up    down eth-switch
ge-2/0/17               up    down
ge-2/0/17.0             up    down eth-switch
ge-2/0/18               up    down
ge-2/0/18.0             up    down eth-switch
ge-2/0/19               up    down
ge-2/0/19.0             up    down eth-switch
ge-2/0/20               up    down
ge-2/0/20.0             up    down eth-switch
ge-2/0/21               up    down
```

```
ge-2/0/21.0             up    down eth-switch
ge-2/0/22               up    down
ge-2/0/22.0             up    down eth-switch
ge-2/0/23               up    down
ge-2/0/23.0             up    down eth-switch
ge-2/0/24               up    down
ge-2/0/24.0             up    down eth-switch
ge-2/0/25               up    down
ge-2/0/25.0             up    down eth-switch
ge-2/0/26               up    down
ge-2/0/26.0             up    down eth-switch
ge-2/0/27               up    down
ge-2/0/27.0             up    down eth-switch
ge-2/0/28               up    down
ge-2/0/28.0             up    down eth-switch
ge-2/0/29               up    down
ge-2/0/29.0             up    down eth-switch
ge-2/0/30               up    down
ge-2/0/30.0             up    down eth-switch
ge-2/0/31               up    down
ge-2/0/31.0             up    down eth-switch
ge-2/0/32               up    down
ge-2/0/33               up    down
ge-2/0/34               up    down
ge-2/0/35               up    down
ge-2/0/36               up    down
ge-2/0/36.0             up    down eth-switch
ge-2/0/37               up    down
ge-2/0/37.0             up    down eth-switch
ge-2/0/38               up    down
ge-2/0/38.0             up    down eth-switch
ge-2/0/39               up    up
ge-2/0/39.0             up    up   eth-switch
ge-2/0/40               up    up
ge-2/0/40.0             up    up   aenet    --> ae0.0
ge-2/0/41               up    up
ge-2/0/41.0             up    up   aenet    --> ae1.0
ge-2/0/42               up    down
ge-2/0/42.0             up    down aenet    --> ae2.0
ge-2/0/43               up    down
ge-2/0/43.0             up    down aenet    --> ae3.0
ge-2/0/44               up    down
ge-2/0/44.0             up    down aenet    --> ae4.0
ge-2/0/45               up    down
```

```
ge-2/0/45.0             up    down aenet    --> ae5.0
ge-2/0/46               up    down
ge-2/0/46.0             up    down aenet    --> ae6.0
ge-2/0/47               up    down
ge-2/0/47.0             up    down aenet    --> ae7.0
xe-2/1/0                up    up
xe-2/1/0.0              up    up   aenet    --> ae8.0
xe-2/1/1                up    down
xe-2/1/2                up    up
xe-2/1/2.0              up    up   aenet    --> ae8.0
xe-2/1/3                up    down
ge-3/0/0                up    down
ge-3/0/0.0              up    down eth-switch
ge-3/0/1                up    down
ge-3/0/1.0              up    down eth-switch
ge-3/0/2                up    down
ge-3/0/2.0              up    down eth-switch
ge-3/0/3                up    down
ge-3/0/3.0              up    down eth-switch
ge-3/0/4                up    down
ge-3/0/4.0              up    down eth-switch
ge-3/0/5                up    down
ge-3/0/5.0              up    down eth-switch
ge-3/0/6                up    down
ge-3/0/6.0              up    down eth-switch
ge-3/0/7                up    down
ge-3/0/7.0              up    down eth-switch
ge-3/0/8                up    down
ge-3/0/8.0              up    down eth-switch
ge-3/0/9                up    down
ge-3/0/9.0              up    down eth-switch
ge-3/0/10               up    down
ge-3/0/10.0             up    down eth-switch
ge-3/0/11               up    down
ge-3/0/11.0             up    down eth-switch
ge-3/0/12               up    down
ge-3/0/12.0             up    down eth-switch
ge-3/0/13               up    down
ge-3/0/13.0             up    down eth-switch
ge-3/0/14               up    down
ge-3/0/14.0             up    down eth-switch
ge-3/0/15               up    down
ge-3/0/15.0             up    down eth-switch
ge-3/0/16               up    down
```

```
ge-3/0/16.0             up    down eth-switch
ge-3/0/17               up    down
ge-3/0/17.0             up    down eth-switch
ge-3/0/18               up    down
ge-3/0/18.0             up    down eth-switch
ge-3/0/19               up    down
ge-3/0/19.0             up    down eth-switch
ge-3/0/20               up    down
ge-3/0/20.0             up    down eth-switch
ge-3/0/21               up    down
ge-3/0/21.0             up    down eth-switch
ge-3/0/22               up    down
ge-3/0/22.0             up    down eth-switch
ge-3/0/23               up    down
ge-3/0/23.0             up    down eth-switch
ge-3/0/24               up    down
ge-3/0/24.0             up    down eth-switch
ge-3/0/25               up    down
ge-3/0/25.0             up    down eth-switch
ge-3/0/26               up    down
ge-3/0/26.0             up    down eth-switch
ge-3/0/27               up    down
ge-3/0/27.0             up    down eth-switch
ge-3/0/28               up    down
ge-3/0/28.0             up    down eth-switch
ge-3/0/29               up    down
ge-3/0/29.0             up    down eth-switch
ge-3/0/30               up    down
ge-3/0/30.0             up    down eth-switch
ge-3/0/31               up    down
ge-3/0/31.0             up    down eth-switch
ge-3/0/32               up    down
ge-3/0/33               up    down
ge-3/0/34               up    down
ge-3/0/35               up    down
ge-3/0/36               up    down
ge-3/0/36.0             up    down eth-switch
ge-3/0/37               up    down
ge-3/0/37.0             up    down eth-switch
ge-3/0/38               up    down
ge-3/0/38.0             up    down eth-switch
ge-3/0/39               up    up
ge-3/0/39.0             up    up   eth-switch
ge-3/0/40               up    down
```

```
ge-3/0/40.0             up    down aenet    --> ae0.0
ge-3/0/41               up    down
ge-3/0/41.0             up    down aenet    --> ae1.0
ge-3/0/42               up    down
ge-3/0/42.0             up    down aenet    --> ae2.0
ge-3/0/43               up    down
ge-3/0/43.0             up    down aenet    --> ae3.0
ge-3/0/44               up    down
ge-3/0/44.0             up    down aenet    --> ae4.0
ge-3/0/45               up    down
ge-3/0/45.0             up    down aenet    --> ae5.0
ge-3/0/46               up    down
ge-3/0/46.0             up    down aenet    --> ae6.0
ge-3/0/47               up    down
ge-3/0/47.0             up    down aenet    --> ae7.0
xe-3/1/0                up    up
xe-3/1/0.0              up    up   aenet    --> ae8.0
xe-3/1/1                up    down
xe-3/1/2                up    up
xe-3/1/2.0              up    up   aenet    --> ae8.0
xe-3/1/3                up    down
vcp-0                   up    down
vcp-0.32768             up    down
vcp-1                   up    up
vcp-1.32768             up    up
ae0                     up    down
ae0.0                   up    down eth-switch
ae1                     up    down
ae1.0                   up    down eth-switch
ae2                     up    down
ae2.0                   up    down eth-switch
ae3                     up    down
ae3.0                   up    down eth-switch
ae4                     up    down
ae4.0                   up    down eth-switch
ae5                     up    down
ae5.0                   up    down eth-switch
ae6                     up    down
ae6.0                   up    down eth-switch
ae7                     up    down
ae7.0                   up    down eth-switch
ae8                     up    up
ae8.0                   up    up   eth-switch
ae9                     up    down
```

```
bme0                     up    up
bme0.32768               up    up   inet     128.0.0.1/2
                                             128.0.0.16/2
                                             128.0.0.32/2
                                    tnp      0x10
bme0.32770               up    up   eth-switch
bme0.32771               down  up   eth-switch
bme0.32772               down  up   eth-switch
dsc                      up    up
gre                      up    up
ipip                     up    up
jsrv                     up    up
jsrv.1                   up    up   inet     128.0.0.127/2
lo0                      up    up
lo0.0                    up    up   inet     10.255.195.97       --> 0/0
                                    iso
47.0005.80ff.f800.0000.0108.0001.0102.5519.5097
                                    inet6    abcd::10:255:195:97
                                             fe80::2ac0:da0f:fc31:1e81
lsi                      up    up
me0                      up    up
me0.0                    up    up   inet     10.94.195.97/24
mtun                     up    up
pimd                     up    up
pime                     up    up
tap                      up    up
vlan                     up    up
vme                      up    up   inet     192.168.157.27/24
```

Meaning

In the output of the **show virtual-chassis status** command, if all four members appear, the Virtual Chassis is operational.

In the output of the **show interfaces terse** command, if all interfaces that connect to the QFabric system devices are listed as up (such as ge-0/0/39, ge-1/0/39, ge-2/0/39, and ge-3/0/39 for the Interconnect devices; ge-0/0/40, ge-1/0/40, and ge-2/0/40 for the Director devices; ge-0/0/0 through ge-0/0/7 for the Node devices; and xe-0/1/0, xe-0/1/2, xe-1/1/0, xe-1/1/2, xe-2/1/0, xe-2/1/2, xe-3/1/0, and xe-3/1/2 for the inter-Virtual Chassis connections), the control plane is properly connected.

RELATED DOCUMENTATION

QFX3000-G QFabric System Installation Overview | 105

Example: Configuring a Fiber-Based Control Plane for the QFX3000-G QFabric System

IN THIS SECTION

This example shows you how to connect components and configure switches used by a fiber-based QFX3000-G QFabric system control plane network. Proper wiring of Director devices, Interconnect devices, and Node devices to the control plane switches, combined with a standard configuration, enables you to bring up the internal QFabric system management network and prepare your QFabric system for full operation.

Requirements

This example uses the following hardware and software components:

- One QFX3000-G QFabric system containing:
  - Two QFX3100 Director devices
  - Two QFX3008-I Interconnect devices
  - Eight QFX3500 Node devices
- Sixteen EX4200-24F switches, used to make two redundant Virtual Chassis with eight members apiece

NOTE: You can alternatively use eight EX4300-48P switches in place of sixteen EX4200-24F switches.

- Junos OS Release 12.3R6.6 for the EX Series switches used in the Virtual Chassis
- Junos OS Release 13.2X52-D10 for the QFabric system devices

Before you begin:

- Rack, mount, and install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, "Installing and Connecting a QFX3500 Device" on page 247, and "Installing and Connecting a QFX3600 or QFX3600-I Device" on page 226.
- Rack, mount, and install your Virtual Chassis hardware. For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*
- Create two Virtual Chassis of eight EX4200 member switches each or four EX4300 member switches each. For more information, see *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.

Overview

The QFX3000-G QFabric system control plane network connects the Director group, Interconnect devices, and Node devices in a QFabric system across a pair of redundant Virtual Chassis. By separating the management control plane from the data plane, the QFabric system can scale efficiently. The control plane network uses Gigabit Ethernet cabling and connections between components, and a 10-Gigabit Ethernet backbone between the redundant Virtual Chassis.

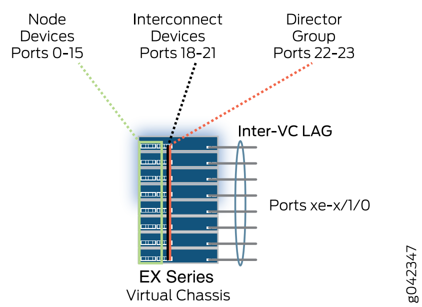
Specific ports have been reserved on the Virtual Chassis to connect to each of the QFabric system device types. Such design simplifies installation and facilitates timely deployment of a QFabric system. It also permits the use of a standard Virtual Chassis configuration included as part of this example. The standard configuration can scale from the minimum topology of eight Node devices shown in this example to the maximum topology of 128 Node devices for a fully implemented QFX3000-G QFabric system.

Topology

Figure 102 on page 389 shows the general port ranges where QFabric system devices must be connected to the Virtual Chassis. For each Virtual Chassis member, connect ports 0 through 15 to Node devices, ports 18 through 21 to Interconnect devices, and ports 22 and 23 to Director devices. Table 92 on page 390 shows the details of the QFabric system device-to-Virtual Chassis port mappings for a fiber-based control plane network.

NOTE: An equivalent example with EX4300-48P switches in place of EX4200-24F switches would use QFabric system device-to-Virtual Chassis port mappings described in "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333.

Figure 102: QFX3000-G QFabric System Fiber-Based Control Plane—Virtual Chassis Port Ranges



CAUTION:

- The control plane network within a QFabric system is a critical component of the system that should not be shared with other network traffic. In order to scale efficiently, the control plane network must be reserved for the QFabric system and its components. As a result, do not use the ports of the QFabric system control plane for any purpose other than to transport QFabric system control plane traffic. We neither recommend nor support the connection of other devices to the QFabric system control plane network.
- Do not install Junos Space and AI-Scripts (AIS) on the control plane network Virtual Chassis in a QFX3000-G QFabric system.

NOTE: Not all port numbers are represented in Table 92 on page 390, and ports 16 and 17 are reserved for future uses.

Table 92 on page 390 shows the specific mappings of QFabric system control plane network ports from the Virtual Chassis to the QFabric system components.

Table 92: QFX3000-G QFabric System Virtual Chassis Fiber-Based Control Plane Port Assignments

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member Port Number	QFabric System Component
Node0 ge-0/0/0	Node16 ge-1/0/0	Node32 ge-2/0/0	Node48 ge-3/0/0	Node64 ge-4/0/0	Node80 ge-5/0/0	Node96 ge-6/0/0	Node112 ge-7/0/0	ge-X/0/0	Node devices
Node1 ge-0/0/1	Node17 ge-1/0/1	Node33 ge-2/0/1	Node49 ge-3/0/1	Node65 ge-4/0/1	Node81 ge-5/0/1	Node97 ge-6/0/1	Node113 ge-7/0/1	ge-X/0/1	Node devices
Node2 ge-0/0/2	Node18 ge-1/0/2	Node34 ge-2/0/2	Node50 ge-3/0/2	Node66 ge-4/0/2	Node82 ge-5/0/2	Node98 ge-6/0/2	Node114 ge-7/0/2	ge-X/0/2	Node devices
Node3 ge-0/0/3	Node19 ge-1/0/3	Node35 ge-2/0/3	Node51 ge-3/0/3	Node67 ge-4/0/3	Node83 ge-5/0/3	Node99 ge-6/0/3	Node115 ge-7/0/3	ge-X/0/3	Node devices
Node4 ge-0/0/4	Node20 ge-1/0/4	Node36 ge-2/0/4	Node52 ge-3/0/4	Node68 ge-4/0/4	Node84 ge-5/0/4	Node100 ge-6/0/4	Node116 ge-7/0/4	ge-X/0/4	Node devices
Node5 ge-0/0/5	Node21 ge-1/0/5	Node37 ge-2/0/5	Node53 ge-3/0/5	Node69 ge-4/0/5	Node85 ge-5/0/5	Node101 ge-6/0/5	Node117 ge-7/0/5	ge-X/0/5	Node devices
Node6 ge-0/0/6	Node22 ge-1/0/6	Node38 ge-2/0/6	Node54 ge-3/0/6	Node70 ge-4/0/6	Node86 ge-5/0/6	Node102 ge-6/0/6	Node118 ge-7/0/6	ge-X/0/6	Node devices
Node7 ge-0/0/7	Node23 ge-1/0/7	Node39 ge-2/0/7	Node55 ge-3/0/7	Node71 ge-4/0/7	Node87 ge-5/0/7	Node103 ge-6/0/7	Node119 ge-7/0/7	ge-X/0/7	Node devices
Node8 ge-0/0/8	Node24 ge-1/0/8	Node40 ge-2/0/8	Node56 ge-3/0/8	Node72 ge-4/0/8	Node88 ge-5/0/8	Node104 ge-6/0/8	Node120 ge-7/0/8	ge-X/0/8	Node devices
Node9 ge-0/0/9	Node25 ge-1/0/9	Node41 ge-2/0/9	Node57 ge-3/0/9	Node73 ge-4/0/9	Node89 ge-5/0/9	Node105 ge-6/0/9	Node121 ge-7/0/9	ge-X/0/9	Node devices
Node10 ge-0/0/10	Node26 ge-1/0/10	Node42 ge-2/0/10	Node58 ge-3/0/10	Node74 ge-4/0/10	Node90 ge-5/0/10	Node106 ge-6/0/10	Node122 ge-7/0/10	ge-X/0/10	Node devices

Table 92: QFX3000-G QFabric System Virtual Chassis Fiber-Based Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member Port Number	QFabric System Component
Node11 ge-0/0/11	Node27 ge-1/0/11	Node43 ge-2/0/11	Node59 ge-3/0/11	Node75 ge-4/0/11	Node91 ge-5/0/11	Node107 ge-6/0/11	Node123 ge-7/0/11	ge-X/0/11	Node devices
Node12 ge-0/0/12	Node28 ge-1/0/12	Node44 ge-2/0/12	Node60 ge-3/0/12	Node76 ge-4/0/12	Node92 ge-5/0/12	Node108 ge-6/0/12	Node124 ge-7/0/12	ge-X/0/12	Node devices
Node13 ge-0/0/13	Node29 ge-1/0/13	Node45 ge-2/0/13	Node61 ge-3/0/13	Node77 ge-4/0/13	Node93 ge-5/0/13	Node109 ge-6/0/13	Node125 ge-7/0/13	ge-X/0/13	Node devices
Node14 ge-0/0/14	Node30 ge-1/0/14	Node46 ge-2/0/14	Node62 ge-3/0/14	Node78 ge-4/0/14	Node94 ge-5/0/14	Node110 ge-6/0/14	Node126 ge-7/0/14	ge-X/0/14	Node devices
Node15 ge-0/0/15	Node31 ge-1/0/15	Node47 ge-2/0/15	Node63 ge-3/0/15	Node79 ge-4/0/15	Node95 ge-5/0/15	Node111 ge-6/0/15	Node127 ge-7/0/15	ge-X/0/15	Node devices
Reserved ge-0/0/16	Reserved ge-1/0/16	Reserved ge-2/0/16	Reserved ge-3/0/16	Reserved ge-4/0/16	Reserved ge-5/0/16	Reserved ge-6/0/16	Reserved ge-7/0/16	ge-X/0/16	Future use
Reserved ge-0/0/17	Reserved ge-1/0/17	Reserved ge-2/0/17	Reserved ge-3/0/17	Reserved ge-4/0/17	Reserved ge-5/0/17	Reserved ge-6/0/17	Reserved ge-7/0/17	ge-X/0/17	Future use

Table 92: QFX3000-G QFabric System Virtual Chassis Fiber-Based Control Plane Port Assignments *(continued)*

Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member Port Number	QFabric System Component
IC2 CB0 ge-0/0/18	IC2 CB1 ge-1/0/18	IC3 CB0 ge-2/0/18	IC3 CB1 ge-3/0/18	Reserved ge-4/0/18	Reserved ge-5/0/18	Reserved ge-6/0/18	Reserved ge-7/0/18	ge-X/0/18	Interconnect devices NOTE: On both Control Boards, use port 0 to connect to VC0, and port 1 to connect to VC1.
IC0 CB0 ge-0/0/19	IC0 CB1 ge-1/0/19	IC1 CB0 ge-2/0/19	IC1 CB1 ge-3/0/19	Reserved ge-4/0/19	Reserved ge-5/0/19	Reserved ge-6/0/19	Reserved ge-7/0/19	ge-X/0/19	Interconnect devices NOTE: On both Control Boards, use port 0 to connect to VC0, and port 1 to connect to VC1.
Reserved ge-0/0/20	Reserved ge-1/0/20	Reserved ge-2/0/20	Reserved ge-3/0/20	Reserved ge-4/0/20	Reserved ge-5/0/20	Reserved ge-6/0/20	Reserved ge-7/0/20	ge-X/0/20	Interconnect devices
Reserved ge-0/0/21	Reserved ge-1/0/21	Reserved ge-2/0/21	Reserved ge-3/0/21	Reserved ge-4/0/21	Reserved ge-5/0/21	Reserved ge-6/0/21	Reserved ge-7/0/21	ge-X/0/21	Interconnect devices

Table 92: QFX3000-G QFabric System Virtual Chassis Fiber-Based Control Plane Port Assignments *(continued)*

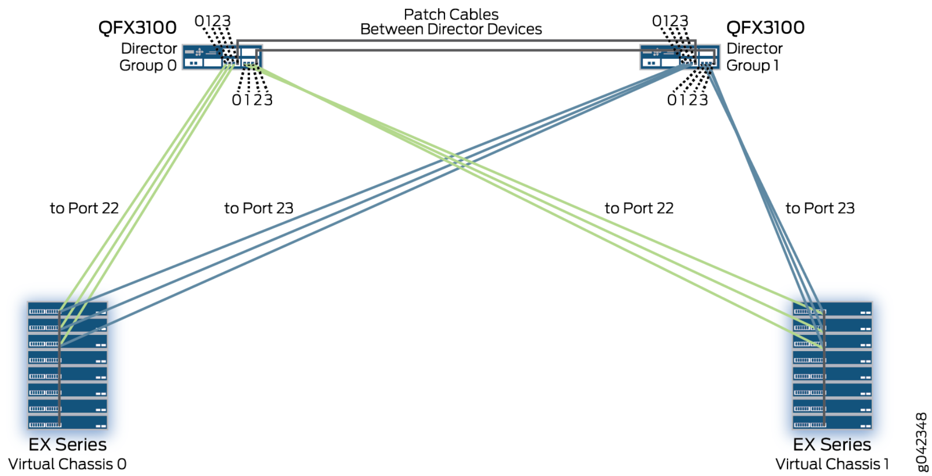
Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7	Member Port Number	QFabric System Component
DG0 port 0 ge-0/0/22	DG0 port 1 ge-1/0/22	DG0 port 2 ge-2/0/22	Reserved ge-3/0/22	Reserved ge-4/0/22	Reserved ge-5/0/22	Reserved ge-6/0/22	Reserved ge-7/0/22	ge-X/0/22	Director device 0
DG1 port 0 ge-0/0/23	DG1 port 1 ge-1/0/23	DG1 port 2 ge-2/0/23	Reserved ge-3/0/23	Reserved ge-4/0/23	Reserved ge-5/0/23	Reserved ge-6/0/23	Reserved ge-7/0/23	ge-X/0/23	Director device 1
Inter-VC xe-0/1/0	Inter-VC xe-1/1/0	Inter-VC xe-2/1/0	Inter-VC xe-3/1/0	Inter-VC xe-4/1/0	Inter-VC xe-5/1/0	Inter-VC xe-6/1/0	Inter-VC xe-7/1/0	Inter-VC xe-X/1/0	Inter-Virtual Chassis LAG
Inter-VC xe-0/1/2	Inter-VC xe-1/1/2	Inter-VC xe-2/1/2	Inter-VC xe-3/1/2	Inter-VC xe-4/1/2	Inter-VC xe-5/1/2	Inter-VC xe-6/1/2	Inter-VC xe-7/1/2	Inter-VC xe-X/1/2	Inter-Virtual Chassis LAG

Next, connect the Director devices to the Virtual Chassis. In general, you want to accomplish the following:

- Connect three ports from one network module in a Director device to the first Virtual Chassis, and three ports from the second network module to the second Virtual Chassis. You need to repeat these connections from the second Director device to both Virtual Chassis to provide resiliency for the system.
- Connect the Director devices to each other and create a Director group. Connect one port from each network module on the first Director device to one port in each network module on the second Director device.

Figure 103 on page 394 shows the specific ports on the Director group that you must connect to the Virtual Chassis and interconnect between the Director devices.

Figure 103: QFX3000-G QFabric System Fiber-Based Control Plane—Director Group to Virtual Chassis Connections



In this specific example, connect ports 0, 1, and 2 from module 0 on Director device DG0 to port 22 on Virtual Chassis VC0 (ge-0/0/22, ge-1/0/22, and ge-2/0/22), and connect ports 0, 1, and 2 from module 1 to port 22 on Virtual Chassis VC1 (ge-0/0/22, ge-1/0/22, and ge-2/0/22).

For Director device DG1, connect ports 0, 1, and 2 from module 0 to port 23 on Virtual Chassis VC0 (ge-0/0/23, ge-1/0/23, and ge-2/0/23), and connect ports 0, 1, and 2 from module 1 to port 23 on Virtual Chassis VC1 (ge-0/0/23, ge-1/0/23, and ge-2/0/23).

To form the Director group, connect module 0, port 3 on Director device DG0 to module 0, port 3 on Director device DG1. Similarly, connect module 1, port 3 on Director device DG0 to module 1, port 3 on Director device DG1. Table 93 on page 394 shows the port mappings for the Director group in this example.

Table 93: Director Group Port Mappings

Director Device	Virtual Chassis VC0	Virtual Chassis VC1
DG0	• Module 0, port 0 to ge-0/0/22 on VC0 • Module 0, port 1 to ge-1/0/22 on VC0 • Module 0, port 2 to ge-2/0/22 on VC0 • Module 0, port 3 to module 0, port 3 on DG1	• Module 1, port 0 to ge-0/0/22 on VC1 • Module 1, port 1 to ge-1/0/22 on VC1 • Module 1, port 2 to ge-2/0/22 on VC1 • Module 1, port 3 to module 1, port 3 on DG1
DG1	• Module 0, port 0 to ge-0/0/23 on VC0 • Module 0, port 1 to ge-1/0/23 on VC0 • Module 0, port 2 to ge-2/0/23 on VC0 • Module 0, port 3 to module 0, port 3 on DG0	• Module 1, port 0 to ge-0/0/23 on VC1 • Module 1, port 1 to ge-1/0/23 on VC1 • Module 1, port 2 to ge-2/0/23 on VC1 • Module 1, port 3 to module 1, port 3 on DG0

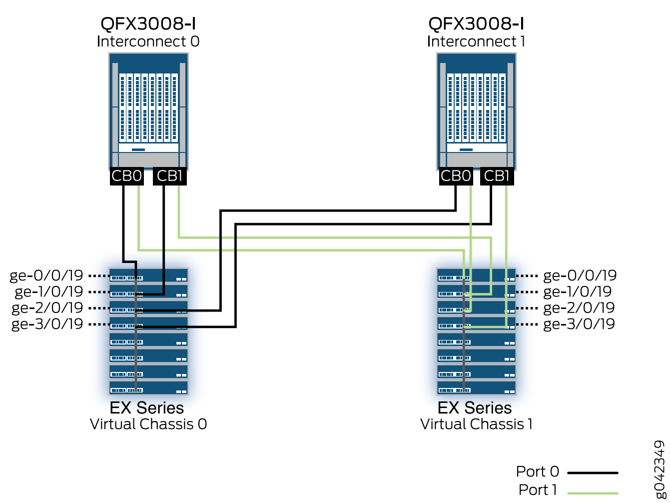
In the software, the ports of each network module are reversed, numbered from right to left, and incremented sequentially across modules. If you issue interface operational commands directly on the Director device, please note the following port mappings as shown in Table 87 on page 342:

Table 94: Hardware to Software Port Mappings for Director Device Network Modules

Network Module	Port 0	Port 1	Port 2	Port 3
Module 0	eth5	eth4	eth3	eth2
Module 1	eth9	eth8	eth7	eth6

Figure 104 on page 395 shows the specific ports on the Interconnect devices that you must connect to the Virtual Chassis. In general, connect one port from each Control Board module in an Interconnect device to the first Virtual Chassis, and a second port from each Control Board module to the second Virtual Chassis.

Figure 104: QFX3000-G QFabric System Fiber-Based Control Plane—Interconnect Device to Virtual Chassis Connections



In this specific example, for both Interconnect devices IC0 and IC1, connect port 0 from CB0 and CB1 to Virtual Chassis VC0 and port 1 from CB0 and CB1 to Virtual Chassis VC1. Connect the port 0 cables to port 19 on Virtual Chassis VC0 (ge-0/0/19, ge-1/0/19, ge-2/0/19, and ge-3/0/19), and connect the port 1 cables to port 19 on Virtual Chassis VC1 (ge-0/0/19, ge-1/0/19, ge-2/0/19, and ge-3/0/19). Table 95 on page 396 shows the port mappings for the Interconnect devices in this example.

Table 95: Interconnect Device Port Mappings

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC0	• CB0, port 0 to ge-0/0/19 • CB1, port 0 to ge-1/0/19	• CB0, port 1 to ge-0/0/19 • CB1, port 1 to ge-1/0/19
IC1	• CB0, port 0 to ge-2/0/19 • CB1, port 0 to ge-3/0/19	• CB0, port 1 to ge-2/0/19 • CB1, port 1 to ge-3/0/19

As required, you can extend the number of Interconnect devices from two to four. For additional Interconnect devices IC2 and IC3, connect port 0 from CB0 and CB1 to Virtual Chassis VC0 and port 1 from CB0 and CB1 to Virtual Chassis VC1. Connect the port 0 cables to port 18 on Virtual Chassis VC0 (ge-0/0/18, ge-1/0/18, ge-2/0/18, and ge-3/0/18), and connect the port 1 cables to port 18 on Virtual Chassis VC1 (ge-0/0/18, ge-1/0/18, ge-2/0/18, and ge-3/0/18). Table 96 on page 396 shows the port mappings needed to extend the number of Interconnect devices in this example to four devices.

Table 96: Interconnect Device Port Mappings for Two Additional Devices

Interconnect Device	Virtual Chassis VC0	Virtual Chassis VC1
IC2	• CB0, port 0 to ge-0/0/18 • CB1, port 0 to ge-1/0/18	• CB0, port 1 to ge-0/0/18 • CB1, port 1 to ge-1/0/18
IC3	• CB0, port 0 to ge-2/0/18 • CB1, port 0 to ge-3/0/18	• CB0, port 1 to ge-2/0/18 • CB1, port 1 to ge-3/0/18

Figure 105 on page 396, Figure 106 on page 397, and Figure 107 on page 397 show the specific ports on the Node devices that you must connect to the Virtual Chassis. In general, connect the first management port from a Node device to the first Virtual Chassis, and the second management port to the second Virtual Chassis.

Figure 105: QFX3000-G QFabric System Fiber-Based Control Plane—QFX3500 Node Device to Virtual Chassis Connections

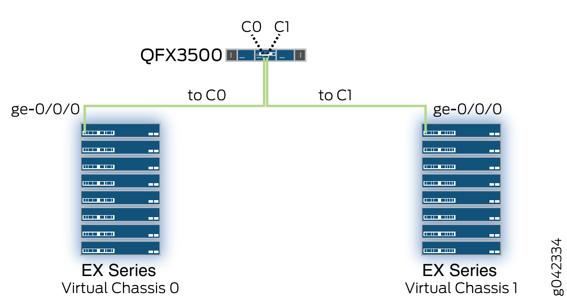


Figure 106: QFX3000-G QFabric System Fiber-Based Control Plane—QFX3600 Node Device to Virtual Chassis Connections

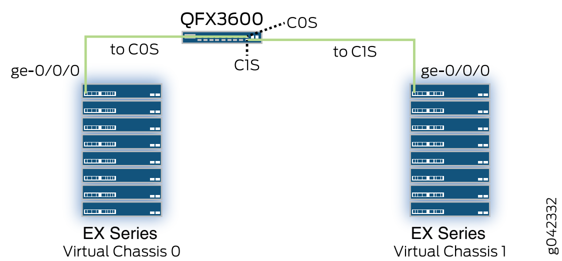
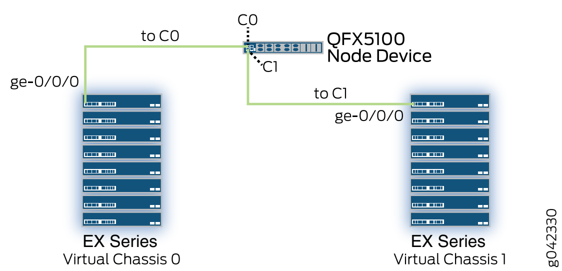


Figure 107: QFX3000-G QFabric System Fiber-Based Control Plane—QFX5100 Node Device to Virtual Chassis Connections



In this specific example, for Node device Node0, connect port C0 (also known as me0) to Virtual Chassis 0 port ge-0/0/0, and connect port C1 (also known as me1) to Virtual Chassis 1 port ge-0/0/0.

For the remaining seven Node devices, connect port C0 to the ge-0/0/*X* port on Virtual Chassis 0 that matches the Node device number. Similarly, connect port C1 to the port on Virtual Chassis 1 that matches the Node device number. For example, you would connect Node device Node5 to port ge-0/0/5. Table 90 on page 344 shows the full set of port mappings for the Node devices in this example.

Table 97: Node Device Port Mappings

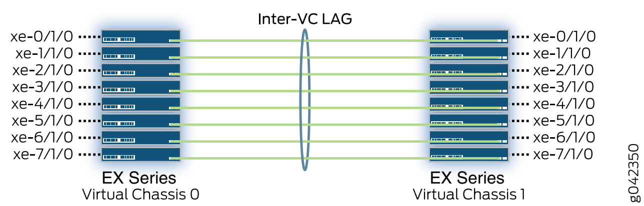
Node Device	Virtual Chassis 0	Virtual Chassis 1
Node0	C0 to ge-0/0/0	C1 to ge-0/0/0
Node1	C0 to ge-0/0/1	C1 to ge-0/0/1
Node2	C0 to ge-0/0/2	C1 to ge-0/0/2
Node3	C0 to ge-0/0/3	C1 to ge-0/0/3
Node4	C0 to ge-0/0/4	C1 to ge-0/0/4

Table 97: Node Device Port Mappings *(continued)*

Node Device	Virtual Chassis 0	Virtual Chassis 1
Node5	C0 to ge-0/0/5	C1 to ge-0/0/5
Node6	C0 to ge-0/0/6	C1 to ge-0/0/6
Node7	C0 to ge-0/0/7	C1 to ge-0/0/7

Figure 108 on page 398 shows the specific ports on the members of the first Virtual Chassis that you must connect to the members of the second Virtual Chassis. These connections create a link aggregation bundle (LAG) that provides redundancy and resiliency for the Virtual Chassis portion of the control plane. In general, connect each 10-Gigabit Ethernet uplink port from the first Virtual Chassis to the corresponding 10-Gigabit Ethernet uplink port on the second Virtual Chassis.

Figure 108: QFX3000-G QFabric System Fiber-Based Control Plane—Inter-Virtual Chassis LAG Connections



In this specific example, for Virtual Chassis VC0, connect port xe-0/1/0 to Virtual Chassis VC1 port xe-0/1/0. For the remaining seven 10-Gigabit Ethernet uplink ports, connect each port from VC0 to the corresponding port on VC1. For example, you would connect the xe-1/1/0 port on VC0 to port xe-1/1/0 on VC1, and so on.

Table 91 on page 345 shows the full set of port mappings for the Virtual Chassis LAG connections in this example.

Table 98: Virtual Chassis LAG Port Mappings

VC0 and VC1	Member 0	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6	Member 7
Uplink port 0	xe-0/1/0 to xe-0/1/0	xe-1/1/0 to xe-1/1/0	xe-2/1/0 to xe-2/1/0	xe-3/1/0 to xe-3/1/0	xe-4/1/0 to xe-4/1/0	xe-5/1/0 to xe-5/1/0	xe-6/1/0 to xe-6/1/0	xe-7/1/0 to xe-7/1/0

Configuration

CLI Quick Configuration

To quickly configure the QFabric system control plane Virtual Chassis, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

> **NOTE:**
>
> - The control plane network configuration is identical for both Virtual Chassis described in this example. Load and commit the same configuration into both VC0 and VC1.
>
> The configuration files for a QFabric system control plane network are also available for download from the QFX Series section of the Junos OS software download page at https://www.juniper.net/support/downloads/junos.html.

```
set groups qfabric system commit synchronize
set groups qfabric chassis redundancy graceful-switchover
set groups qfabric chassis aggregated-devices ethernet device-count 10
set groups qfabric chassis alarm management-ethernet link-down ignore
set groups qfabric chassis fpc 0 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 1 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 2 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 3 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 4 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 5 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 6 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis fpc 7 pic 1 sfpplus pic-mode 10g
set groups qfabric chassis lcd-menu fpc 0 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 1 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 2 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 3 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 4 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 5 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 6 menu-item maintenance-menu disable
set groups qfabric chassis lcd-menu fpc 7 menu-item maintenance-menu disable
set groups qfabric protocols rstp interface ae8.0 mode point-to-point
set groups qfabric protocols rstp interface all edge
set groups qfabric protocols rstp interface all no-root-port
set groups qfabric protocols rstp bpdu-block-on-edge
set groups qfabric protocols lldp interface all
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 110
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_3
  loss-priority low code-points 111
```

```
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_2
    loss-priority low code-points 100
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_2
    loss-priority high code-points 101
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_0
    loss-priority low code-points 010
set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class class_0
    loss-priority high code-points 001
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_3
    loss-priority low code-points 110
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_3
    loss-priority low code-points 111
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_2
    loss-priority low code-points 100
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_2
    loss-priority high code-points 101
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_0
    loss-priority low code-points 010
set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier forwarding-class class_0
    loss-priority high code-points 001
set groups qfabric class-of-service forwarding-classes class class_3 queue-num 7
set groups qfabric class-of-service forwarding-classes class class_2 queue-num 2
set groups qfabric class-of-service forwarding-classes class class_0 queue-num 0
set groups qfabric class-of-service interfaces ge-*/0/* scheduler-map cpe_network_smap
set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers ieee-802.1 onep_qfabric_classifier
set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers inet-precedence IP_qfabric_classifier
set groups qfabric class-of-service interfaces ae* scheduler-map cpe_network_smap
set groups qfabric class-of-service interfaces ae* unit 0 classifiers ieee-802.1 onep_qfabric_classifier
set groups qfabric class-of-service interfaces ae* unit 0 classifiers inet-precedence IP_qfabric_classifier
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_3 scheduler
    scheduler_3
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_2 scheduler
    scheduler_2
set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class class_0 scheduler
    scheduler_0
set groups qfabric class-of-service schedulers scheduler_3 buffer-size percent 30
set groups qfabric class-of-service schedulers scheduler_3 priority strict-high
set groups qfabric class-of-service schedulers scheduler_2 transmit-rate percent 75
set groups qfabric class-of-service schedulers scheduler_2 buffer-size percent 30
set groups qfabric class-of-service schedulers scheduler_2 priority low
set groups qfabric class-of-service schedulers scheduler_0 transmit-rate percent 25
set groups qfabric class-of-service schedulers scheduler_0 buffer-size percent 40
set groups qfabric class-of-service schedulers scheduler_0 priority low
set groups qfabric ethernet-switching-options nonstop-bridging
```

```
set groups qfabric ethernet-switching-options storm-control interface all bandwidth 10000
set groups qfabric vlans qfabric vlan-id 100
set groups qfabric vlans qfabric dot1q-tunneling
set groups qfabric-int interfaces <*> mtu 9216
set groups qfabric-int interfaces <*> unit 0 family ethernet-switching port-mode access
set groups qfabric-int interfaces <*> unit 0 family ethernet-switching vlan members qfabric
set groups qfabric-ae interfaces <*> aggregated-ether-options link-speed 1g
set groups qfabric-ae interfaces <*> aggregated-ether-options lacp active
set apply-groups qfabric
set interfaces interface-range Node_Device_Interfaces member "ge-[0-7]/0/[0-15]"
set interfaces interface-range Node_Device_Interfaces apply-groups qfabric-int
set interfaces interface-range Node_Device_Interfaces description "QFabric Node Device"
set interfaces interface-range Interconnect_Device_Interfaces member "ge-[0-7]/0/[18-21]"
set interfaces interface-range Interconnect_Device_Interfaces apply-groups qfabric-int
set interfaces interface-range Interconnect_Device_Interfaces description "QFabric Interconnect Device"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces member "ge-[0-7]/0/22"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces description "QFabric Director Device -
  DG0"
set interfaces interface-range Director_Device_DG0_LAG_Interfaces ether-options 802.3ad ae0
set interfaces interface-range Director_Device_DG1_LAG_Interfaces member "ge-[0-7]/0/23"
set interfaces interface-range Director_Device_DG1_LAG_Interfaces description "QFabric Director Device -
  DG1"
set interfaces interface-range Director_Device_DG1_LAG_Interfaces ether-options 802.3ad ae1
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-7]/1/0"
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces description "QFabric Control Plane
  (Inter-VC LAG)"
set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces ether-options 802.3ad ae8
set interfaces ae0 apply-groups qfabric-int
set interfaces ae0 apply-groups qfabric-ae
set interfaces ae0 description "QFabric Director Device - DG0"
set interfaces ae1 apply-groups qfabric-int
set interfaces ae1 apply-groups qfabric-ae
set interfaces ae1 description "QFabric Director Device - DG1"
set interfaces ae8 description "QFabric Control Plane (Inter-VC LAG)"
set interfaces ae8 mtu 9216
set interfaces ae8 aggregated-ether-options link-speed 10g
set interfaces ae8 aggregated-ether-options lacp active
set interfaces ae8 unit 0 family ethernet-switching vlan members qfabric
set system host-name qfabric-control-plane
set system services ssh
set system services telnet
set system services web-management http
set system syslog user * any emergency
set system syslog file messages any notice
```

```
set system syslog file messages authorization info
set system syslog file messages archive world-readable
set system syslog file messages explicit-priority
set system syslog file interactive-commands interactive-commands any
set system syslog file secure authorization info
set system syslog file default-log-messages any any
set system syslog file default-log-messages structured-data
set system syslog file console any error
set system syslog time-format millisecond
set interfaces vme unit 0 family inet address 192.168.157.26/24
set routing-options static route 0.0.0.0/0 next-hop 192.168.157.1
set virtual-chassis preprovisioned
set virtual-chassis member 0 role routing-engine
set virtual-chassis member 0 serial-number abc123
set virtual-chassis member 1 role routing-engine
set virtual-chassis member 1 serial-number def456
set virtual-chassis member 2 role line-card
set virtual-chassis member 2 serial-number ghi789
set virtual-chassis member 3 role line-card
set virtual-chassis member 3 serial-number jkl012
set virtual-chassis member 4 role line-card
set virtual-chassis member 4 serial-number mno321
set virtual-chassis member 5 role line-card
set virtual-chassis member 5 serial-number pqr654
set virtual-chassis member 6 role line-card
set virtual-chassis member 6 serial-number stu987
set virtual-chassis member 7 role line-card
set virtual-chassis member 7 serial-number vwx210
```

Step-by-Step Procedure

The following example requires that you navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a Virtual Chassis for the QFabric system control plane network:

1. Create a configuration group to define global QFabric system control plane properties. Enable commit synchronization and graceful switchover, set up the number of aggregated Ethernet devices, enable 10-Gigabit Ethernet mode on the inter-VC links, configure alarm and LCD management, activate loop prevention, nonstop bridging, and storm control, configure Link Layer Discovery Protocol (LLDP), specify a global VLAN (VLAN 100) and 802.1q tunneling, and define options for aggregated Ethernet interfaces.

   Enable class of service (CoS) for the QFabric system control plane network. Establish forwarding classes, priorities, scheduler maps, classifiers, and queues for three types of traffic: control traffic, interdevice traffic, and best-effort traffic. Apply the qfabric group settings to the configuration.

```
[edit]
user@switch# set groups qfabric system commit synchronize
user@switch# set groups qfabric chassis redundancy graceful-switchover
user@switch# set groups qfabric chassis aggregated-devices ethernet device-count 10
user@switch# set groups qfabric chassis alarm management-ethernet link-down ignore
user@switch# set groups qfabric chassis fpc 0 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 1 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 2 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 3 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 4 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 5 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 6 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis fpc 7 pic 1 sfpplus pic-mode 10g
user@switch# set groups qfabric chassis lcd-menu fpc 0 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 1 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 2 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 3 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 4 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 5 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 6 menu-item maintenance-menu disable
user@switch# set groups qfabric chassis lcd-menu fpc 7 menu-item maintenance-menu disable
user@switch# set groups qfabric protocols rstp interface ae8.0 mode point-to-point
user@switch# set groups qfabric protocols rstp interface all edge
user@switch# set groups qfabric protocols rstp interface all no-root-port
user@switch# set groups qfabric protocols rstp bpdu-block-on-edge
user@switch# set groups qfabric protocols lldp interface all
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_3 loss-priority low code-points 110
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_3 loss-priority low code-points 111
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_2 loss-priority low code-points 100
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_2 loss-priority high code-points 101
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_0 loss-priority low code-points 010
user@switch# set groups qfabric class-of-service classifiers ieee-802.1 onep_qfabric_classifier forwarding-class
  class_0 loss-priority high code-points 001
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_3 loss-priority low code-points 110
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_3 loss-priority low code-points 111
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_2 loss-priority low code-points 100
```

```
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_2 loss-priority high code-points 101
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_0 loss-priority low code-points 010
user@switch# set groups qfabric class-of-service classifiers inet-precedence IP_qfabric_classifier
  forwarding-class class_0 loss-priority high code-points 001
user@switch# set groups qfabric class-of-service forwarding-classes class class_3 queue-num 7
user@switch# set groups qfabric class-of-service forwarding-classes class class_2 queue-num 2
user@switch# set groups qfabric class-of-service forwarding-classes class class_0 queue-num 0
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* scheduler-map cpe_network_smap
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers ieee-802.1
  onep_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ge-*/0/* unit 0 classifiers inet-precedence
  IP_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ae* scheduler-map cpe_network_smap
user@switch# set groups qfabric class-of-service interfaces ae* unit 0 classifiers ieee-802.1
  onep_qfabric_classifier
user@switch# set groups qfabric class-of-service interfaces ae* unit 0 classifiers inet-precedence
  IP_qfabric_classifier
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
  class_3 scheduler scheduler_3
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
  class_2 scheduler scheduler_2
user@switch# set groups qfabric class-of-service scheduler-maps cpe_network_smap forwarding-class
  class_0 scheduler scheduler_0
user@switch# set groups qfabric class-of-service schedulers scheduler_3 buffer-size percent 30
user@switch# set groups qfabric class-of-service schedulers scheduler_3 priority strict-high
user@switch# set groups qfabric class-of-service schedulers scheduler_2 transmit-rate percent 75
user@switch# set groups qfabric class-of-service schedulers scheduler_2 buffer-size percent 30
user@switch# set groups qfabric class-of-service schedulers scheduler_2 priority low
user@switch# set groups qfabric class-of-service schedulers scheduler_0 transmit-rate percent 25
user@switch# set groups qfabric class-of-service schedulers scheduler_0 buffer-size percent 40
user@switch# set groups qfabric class-of-service schedulers scheduler_0 priority low
user@switch# set groups qfabric ethernet-switching-options nonstop-bridging
user@switch# set groups qfabric ethernet-switching-options storm-control interface all bandwidth 10000
user@switch# set groups qfabric vlans qfabric vlan-id 100
user@switch# set groups qfabric vlans qfabric dot1q-tunneling
user@switch# set groups qfabric-int interfaces <*> mtu 9216
user@switch# set groups qfabric-int interfaces <*> unit 0 family ethernet-switching port-mode access
user@switch# set groups qfabric-int interfaces <*> unit 0 family ethernet-switching vlan members qfabric
user@switch# set groups qfabric-ae interfaces <*> aggregated-ether-options link-speed 1g
user@switch# set groups qfabric-ae interfaces <*> aggregated-ether-options lacp active
user@switch# set apply-groups qfabric
```

2. Configure interfaces for the QFabric system control plane network. Set the interface ranges where Node devices (0 through 15), Interconnect devices (18 and 19), and Director devices (22 and 23) connect to the control plane network through the Virtual Chassis. Configure the inter-Virtual Chassis LAG connections for the ae8 interface and apply the ae-interfaces configuration group to the Director group aggregated Ethernet interfaces (ae0 and ae1).

```
[edit]
user@switch# set interfaces interface-range Node_Device_Interfaces member "ge-[0-7]/0/[0-15]"
user@switch# set interfaces interface-range Node_Device_Interfaces apply-groups qfabric-int
user@switch# set interfaces interface-range Node_Device_Interfaces description "QFabric Node Device"
user@switch# set interfaces interface-range Interconnect_Device_Interfaces member "ge-[0-7]/0/[18-21]"
user@switch# set interfaces interface-range Interconnect_Device_Interfaces apply-groups qfabric-int
user@switch# set interfaces interface-range Interconnect_Device_Interfaces description "QFabric Interconnect
  Device"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces member "ge-[0-7]/0/22"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces description "QFabric
  Director Device - DG0"
user@switch# set interfaces interface-range Director_Device_DG0_LAG_Interfaces ether-options 802.3ad
  ae0
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces member "ge-[0-7]/0/23"
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces description "QFabric
  Director Device - DG1"
user@switch# set interfaces interface-range Director_Device_DG1_LAG_Interfaces ether-options 802.3ad
  ae1
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces member "xe-[0-7]/1/0"
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces description "QFabric
  Control Plane (Inter-VC LAG)"
user@switch# set interfaces interface-range Control_Plane_Inter_VC_LAG_Interfaces ether-options 802.3ad
  ae8
user@switch# set interfaces ae0 apply-groups qfabric-int
user@switch# set interfaces ae0 apply-groups qfabric-ae
user@switch# set interfaces ae0 description "QFabric Director Device - DG0"
user@switch# set interfaces ae1 apply-groups qfabric-int
user@switch# set interfaces ae1 apply-groups qfabric-ae
user@switch# set interfaces ae1 description "QFabric Director Device - DG1"
user@switch# set interfaces ae8 description "QFabric Control Plane (Inter-VC LAG)"
user@switch# set interfaces ae8 mtu 9216
user@switch# set interfaces ae8 aggregated-ether-options link-speed 10g
user@switch# set interfaces ae8 aggregated-ether-options lacp active
user@switch# set interfaces ae8 unit 0 family ethernet-switching vlan members qfabric
```

3. Configure settings to enable the Virtual Chassis to interoperate with your management network. Set a hostname, system services (such as Telnet and SSH), system log thresholds, management interface

parameters, default routes, Virtual Chassis preprovisioning, and any additional preferences you might have.

```
[edit]
user@switch# set system host-name qfabric-control-plane
user@switch# set system services ssh
user@switch# set system services telnet
user@switch# set system services web-management http
user@switch# set system syslog user * any emergency
user@switch# set system syslog file messages any notice
user@switch# set system syslog file messages authorization info
user@switch# set system syslog file messages archive world-readable
user@switch# set system syslog file messages explicit-priority
user@switch# set system syslog file interactive-commands interactive-commands any
user@switch# set system syslog file secure authorization info
user@switch# set system syslog file default-log-messages any any
user@switch# set system syslog file default-log-messages structured-data
user@switch# set system syslog file console any error
user@switch# set system syslog time-format millisecond
user@switch# set interfaces vme unit 0 family inet address 192.168.157.26/24
user@switch# set routing-options static route 0.0.0.0/0 next-hop 192.168.157.1
user@switch# set virtual-chassis preprovisioned
user@switch# set virtual-chassis member 0 role routing-engine
user@switch# set virtual-chassis member 0 serial-number abc123
user@switch# set virtual-chassis member 1 role routing-engine
user@switch# set virtual-chassis member 1 serial-number def456
user@switch# set virtual-chassis member 2 role line-card
user@switch# set virtual-chassis member 2 serial-number ghi789
user@switch# set virtual-chassis member 3 role line-card
user@switch# set virtual-chassis member 3 serial-number jkl012
user@switch# set virtual-chassis member 4 role line-card
user@switch# set virtual-chassis member 4 serial-number mno321
user@switch# set virtual-chassis member 5 role line-card
user@switch# set virtual-chassis member 5 serial-number pqr654
user@switch# set virtual-chassis member 6 role line-card
user@switch# set virtual-chassis member 6 serial-number stu987
user@switch# set virtual-chassis member 7 role line-card
user@switch# set virtual-chassis member 7 serial-number vwx210
```

Results

To view the configuration, issue the **show** command in configuration mode or the **show configuration** command in operational mode. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

The following configuration is the standard configuration that applies universally to both Virtual Chassis in your QFabric system control plane network.

```
groups {
  qfabric {
    system {
      commit {
        synchronize;
      }
    }
    chassis {
      redundancy {
        graceful-switchover;
      }
      aggregated-devices {
        ethernet {
          device-count 10;
        }
      }
      fpc 0 {
        pic 1 {
          sfpplus {
            pic-mode 10g;
          }
        }
      }
      fpc 1 {
        pic 1 {
          sfpplus {
            pic-mode 10g;
          }
        }
      }
      fpc 2 {
        pic 1 {
          sfpplus {
            pic-mode 10g;
          }
        }
      }
      fpc 3 {
        pic 1 {
          sfpplus {
            pic-mode 10g;
          }
```

```
        }
    }
    fpc 4 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 5 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 6 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    fpc 7 {
        pic 1 {
            sfpplus {
                pic-mode 10g;
            }
        }
    }
    alarm {
        management-ethernet {
            link-down ignore;
        }
    }
    lcd-menu {
        fpc 0 {
            menu-item {
                maintenance-menu disable;
            }
        }
        fpc 1 {
            menu-item {
                maintenance-menu disable;
```

```
                }
            }
            fpc 2 {
                menu-item {
                    maintenance-menu disable;
                }
            }
            fpc 3 {
                menu-item {
                    maintenance-menu disable;
                }
            }
            fpc 4 {
                menu-item {
                    maintenance-menu disable;
                }
            }
            fpc 5 {
                menu-item {
                    maintenance-menu disable;
                }
            }
            fpc 6 {
                menu-item {
                    maintenance-menu disable;
                }
            }
            fpc 7 {
                menu-item {
                    maintenance-menu disable;
                }
            }
        }
    }
    protocols {
        rstp {
            interface ae8.0 {
                mode point-to-point;
            }
            interface all {
                edge;
                no-root-port;
            }
            bpdu-block-on-edge;
```

```
        }
        lldp {
            interface all;
        }
    }
    class-of-service {
        classifiers {
            ieee-802.1 onep_qfabric_classifier {
                forwarding-class class_3 {
                    loss-priority low code-points [ 110 111 ];
                }
                forwarding-class class_2 {
                    loss-priority low code-points 100;
                    loss-priority high code-points 101;
                }
                forwarding-class class_0 {
                    loss-priority low code-points 010;
                    loss-priority high code-points 001;
                }
            }
            inet-precedence IP_qfabric_classifier {
                forwarding-class class_3 {
                    loss-priority low code-points [ 110 111 ];
                }
                forwarding-class class_2 {
                    loss-priority low code-points 100;
                    loss-priority high code-points 101;
                }
                forwarding-class class_0 {
                    loss-priority low code-points 010;
                    loss-priority high code-points 001;
                }
            }
        }
        forwarding-classes {
            class class_3 queue-num 7;
            class class_2 queue-num 2;
            class class_0 queue-num 0;
        }
        interfaces {
            ge-*/0/* {
                scheduler-map cpe_network_smap;
                unit 0 {
                    classifiers {
```

```
                ieee-802.1 onep_qfabric_classifier;
                inet-precedence IP_qfabric_classifier;
            }
        }
    }
    ae* {
        scheduler-map cpe_network_smap;
        unit 0 {
            classifiers {
                ieee-802.1 onep_qfabric_classifier;
                inet-precedence IP_qfabric_classifier;
            }
        }
    }
}
scheduler-maps {
    cpe_network_smap {
        forwarding-class class_3 scheduler scheduler_3;
        forwarding-class class_2 scheduler scheduler_2;
        forwarding-class class_0 scheduler scheduler_0;
    }
}
schedulers {
    scheduler_3 {
        buffer-size percent 30;
        priority strict-high;
    }
    scheduler_2 {
        transmit-rate percent 75;
        buffer-size percent 30;
        priority low;
    }
    scheduler_0 {
        transmit-rate percent 25;
        buffer-size percent 40;
        priority low;
    }
}
}
ethernet-switching-options {
    nonstop-bridging;
    storm-control {
        interface all {
            bandwidth 10000;
```

```
                }
            }
        }
        vlans {
            qfabric {
                vlan-id 100;
                dot1q-tunneling;
            }
        }
    }
    qfabric-int {
        interfaces {
            <*> {
                mtu 9216;
                unit 0 {
                    family ethernet-switching {
                        port-mode access;
                        vlan {
                            members qfabric;
                        }
                    }
                }
            }
        }
    }
    qfabric-ae {
        interfaces {
            <*> {
                aggregated-ether-options {
                    link-speed 1g;
                    lacp {
                        active;
                    }
                }
            }
        }
    }
}
apply-groups [qfabric];
interfaces {
    interface-range Node_Device_Interfaces {
        member "ge-[0-7]/0/[0-15]";
        description "QFabric Node Device";
        apply-groups qfabric-int;
```

```
}
interface-range Interconnect_Device_Interfaces {
    member "ge-[0-7]/0/[18-21]";
    description "QFabric Interconnect Device";
    apply-groups qfabric-int;
}
interface-range Director_Device_DG0_LAG_Interfaces {
    member "ge-[0-7]/0/22";
    description "QFabric Director Device - DG0";
    ether-options {
        802.3ad ae0;
    }
}
interface-range Director_Device_DG1_LAG_Interfaces {
    member "ge-[0-7]/0/23";
    description "QFabric Director Device - DG1";
    ether-options {
        802.3ad ae1;
    }
}
interface-range Control_Plane_Inter_VC_LAG_Interfaces {
    member "xe-[0-7]/1/0";
    description "QFabric Control Plane (Inter-VC LAG)";
    ether-options {
        802.3ad ae8;
    }
}
ae0 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG0";
}
ae1 {
    apply-groups [ qfabric-int qfabric-ae ];
    description "QFabric Director Device - DG1";
}
ae8 {
    description "QFabric Control Plane (Inter-VC LAG)";
    mtu 9216;
    aggregated-ether-options {
        link-speed 10g;
        lacp {
            active;
        }
    }
```

```
            unit 0 {
                family ethernet-switching {
                    vlan {
                        members qfabric;
                    }
                }
            }
        }
    }
```

The following portion of the configuration applies to the specific requirements of your management network. Modify this section to meet the needs of your network.

```
    [edit]
    system {
        host-name qfabric-control-plane;
        services {
            ssh;
            telnet;
            web-management {
                http;
            }
        }
        syslog {
            user * {
                any emergency;
            }
            file messages {
                any notice;
                authorization info;
                archive world-readable;
                explicit-priority;
            }
            file interactive-commands {
                interactive-commands any;
            }
            file secure {
                authorization info;
            }
            file default-log-messages {
                any any;
                structured-data;
            }
            file console {
```

```
            any error;
        }
        time-format millisecond;
    }
}
interfaces {
    vme {
        unit 0 {
            family inet {
                address 192.168.157.26/24;
            }
        }
    }
}
routing-options {
    static {
        route 0.0.0.0/0 next-hop 192.168.157.1;
    }
}
virtual-chassis {
    preprovisioned;
    member 0 {
        role routing-engine;
        serial-number abc123;
    }
    member 1 {
        role routing-engine;
        serial-number def456;
    }
    member 2 {
        role line-card;
        serial-number ghi789;
    }
    member 3 {
        role line-card;
        serial-number jkl012;
    }
    member 4 {
        role line-card;
        serial-number mno321;
    }
    member 5 {
        role line-card;
        serial-number pqr654;
```

```
        }
        member 6 {
            role line-card;
            serial-number stu987;
        }
        member 7 {
            role line-card;
            serial-number vwx210;
        }
    }
```

To verify the syntax of your configuration before committing it, enter **commit check** from configuration mode. If you are done configuring the device, enter **commit** from configuration mode.

Verification

IN THIS SECTION

Confirm that the Virtual Chassis configuration is working properly.

Verifying the QFabric System Control Plane—Virtual Chassis VC0

Purpose

Verify that your first Virtual Chassis is operational.

Action

Connect to the Junos OS CLI of Virtual Chassis VC0, either from your management network or from the console port of the master Virtual Chassis member. In operational mode, enter the **show virtual-chassis status** and **show interfaces terse** commands.

Sample Output

```
{master:0}
```

`user@vc0>` **show virtual-chassis status**

```
Preprovisioned Virtual Chassis
Virtual Chassis ID: c809.2c5d.9f7b
Virtual Chassis Mode: Enabled
                                           Mstr           Mixed Neighbor List
Member ID  Status   Serial No    Model     prio  Role      Mode ID  Interface
0 (FPC 0)  Prsnt    BP0210471476 ex4200-24f 129  Master*      N  7  vcp-0
                                                                 1  vcp-1
1 (FPC 1)  Prsnt    BP0210460181 ex4200-24f 129  Backup       N  2  vcp-0
                                                                 0  vcp-1
2 (FPC 2)  Prsnt    BP0210458724 ex4200-24f   0  Linecard     N  3  vcp-0
                                                                 1  vcp-1
3 (FPC 3)  Prsnt    BP0210477189 ex4200-24f   0  Linecard     N  4  vcp-0
                                                                 2  vcp-1
4 (FPC 4)  Prsnt    BP0210471467 ex4200-24f   0  Linecard     N  5  vcp-0
                                                                 3  vcp-1
5 (FPC 5)  Prsnt    BP0210460118 ex4200-24f   0  Linecard     N  6  vcp-0
                                                                 4  vcp-1
6 (FPC 6)  Prsnt    BP0210458742 ex4200-24f   0  Linecard     N  7  vcp-0
                                                                 5  vcp-1
7 (FPC 7)  Prsnt    BP0210477198 ex4200-24f   0  Linecard     N  0  vcp-0
                                                                 6  vcp-1
```

{master:0}

user@vc0> **show interfaces terse**

```
Interface               Admin Link Proto    Local                 Remote
ge-0/0/0                up    up
ge-0/0/0.0              up    up   eth-switch
ge-0/0/1                up    up
ge-0/0/1.0              up    up   eth-switch
ge-0/0/2                up    up
ge-0/0/2.0              up    up   eth-switch
ge-0/0/3                up    up
ge-0/0/3.0              up    up   eth-switch
ge-0/0/4                up    up
ge-0/0/4.0              up    up   eth-switch
ge-0/0/5                up    up
ge-0/0/5.0              up    up   eth-switch
ge-0/0/6                up    up
ge-0/0/6.0              up    up   eth-switch
ge-0/0/7                up    up
```

```
ge-0/0/7.0              up    up   eth-switch
ge-0/0/19               up    up
ge-0/0/19.0             up    up   eth-switch
ge-0/0/22               up    up
ge-0/0/22.0             up    up   aenet    --> ae0.0
ge-0/0/23               up    up
ge-0/0/23.0             up    up   aenet    --> ae1.0
xe-0/1/0                up    up
xe-0/1/0.0              up    up   aenet    --> ae8.0
xe-0/1/2                up    up
ge-1/0/19               up    up
ge-1/0/19.0             up    up   eth-switch
ge-1/0/22               up    up
ge-1/0/22.0             up    up   aenet    --> ae0.0
ge-1/0/23               up    up
ge-1/0/23.0             up    up   aenet    --> ae1.0
xe-1/1/0                up    up
xe-1/1/0.0              up    up   aenet    --> ae8.0
xe-1/1/2                up    up
ge-2/0/19               up    up
ge-2/0/19.0             up    up   eth-switch
ge-2/0/22               up    up
ge-2/0/22.0             up    up   aenet    --> ae0.0
ge-2/0/23               up    up
ge-2/0/23.0             up    up   aenet    --> ae1.0
xe-2/1/0                up    up
xe-2/1/0.0              up    up   aenet    --> ae8.0
xe-2/1/2                up    up
ge-3/0/19               up    up
ge-3/0/19.0             up    up   eth-switch
xe-3/1/0                up    up
xe-3/1/0.0              up    up   aenet    --> ae8.0
xe-3/1/2                up    up
xe-4/1/0                up    up
xe-4/1/0.0              up    up   aenet    --> ae8.0
xe-4/1/2                up    up
xe-5/1/0                up    up
xe-5/1/0.0              up    up   aenet    --> ae8.0
xe-5/1/2                up    up
xe-6/1/0                up    up
xe-6/1/0.0              up    up   aenet    --> ae8.0
xe-6/1/2                up    up
xe-7/1/0                up    up
xe-7/1/0.0              up    up   aenet    --> ae8.0
```

```
xe-7/1/2                up    up
vcp-0                   up    up
vcp-0.32768             up    up
vcp-1                   up    up
vcp-1.32768             up    up
ae0                     up    up
ae0.0                   up    up   eth-switch
ae1                     up    up
ae1.0                   up    up   eth-switch
ae2                     up    down
ae3                     up    down
ae4                     up    down
ae5                     up    down
ae6                     up    down
ae7                     up    down
ae8                     up    up
ae8.0                   up    up   eth-switch
ae9                     up    down
bme0                    up    up
bme0.32768              up    up   inet     128.0.0.1/2
                                            128.0.0.16/2
                                            128.0.0.32/2
                                   tnp      0x10
bme0.32770              up    up   eth-switch
bme0.32771              down  up   eth-switch
bme0.32772              down  up   eth-switch
bme0.32773              down  up   eth-switch
bme0.32774              down  up   eth-switch
bme0.32775              down  up   eth-switch
bme0.32776              down  up   eth-switch
dsc                     up    up
gre                     up    up
ipip                    up    up
lo0                     up    up
lo0.0                   up    up   inet     10.255.195.96      --> 0/0
                                   iso
47.0005.80ff.f800.0000.0108.0001.0102.5519.5096
                                   inet6    abcd::10.255.195.96
                                            fe80::21f:120f:fc39:6d80
lsi                     up    up
me0                     up    up
mtun                    up    up
pimd                    up    up
pime                    up    up
```

```
tap                     up    up
vlan                    up    up
vme                     up    up
vme0.0                  up    up   inet      192.168.157.26/24
```

Meaning

In the output of the **show virtual-chassis status** command, if all eight members appear, the Virtual Chassis is operational.

In the output of the **show interfaces terse** command, if all interfaces that connect to the QFabric system devices are listed as up (such as ge-0/0/0 through ge-0/0/7 for the Node devices; ge-0/0/19, ge-1/0/19, ge-2/0/19, and ge-3/0/19 for the Interconnect devices; ge-0/0/22, ge-0/0/23, ge-1/0/22, ge-1/0/23, ge-2/0/22, and ge-2/0/23 for the Director devices; and xe-0/1/0, xe-1/1/0, xe-2/1/0, xe-3/1/0, xe-4/1/0, xe-5/1/0, xe-6/1/0, and xe-7/1/0 for the inter-Virtual Chassis connections), the control plane is properly connected.

Verifying the QFabric System Control Plane—Virtual Chassis VC1

Purpose

Verify that your second Virtual Chassis is operational.

Action

Connect to the Junos OS CLI of Virtual Chassis VC1, either from your management network or from the console port of the master Virtual Chassis member. In operational mode, enter the **show virtual-chassis status** and **show interfaces terse** commands.

Sample Output

`{master:0}`

`user@vc1>` **show virtual-chassis status**

```

Preprovisioned Virtual Chassis
Virtual Chassis ID: c809.2c5d.9f8a
Virtual Chassis Mode: Enabled
                                            Mstr           Mixed Neighbor List
Member ID  Status   Serial No    Model      prio  Role      Mode  ID  Interface
0 (FPC 0)  Prsnt    BP0210471477 ex4200-24f 129   Master*      N   7  vcp-0
                                                                   1  vcp-1
1 (FPC 1)  Prsnt    BP0210460182 ex4200-24f 129   Backup       N   2  vcp-0
```

```
                                                                    0  vcp-1
2 (FPC 2)  Prsnt    BP0210458725 ex4200-24f   0  Linecard     N  3  vcp-0
                                                                    1  vcp-1
3 (FPC 3)  Prsnt    BP0210477180 ex4200-24f   0  Linecard     N  4  vcp-0
                                                                    2  vcp-1
4 (FPC 4)  Prsnt    BP0210471478 ex4200-24f   0  Linecard     N  5  vcp-0
                                                                    3  vcp-1
5 (FPC 5)  Prsnt    BP0210460128 ex4200-24f   0  Linecard     N  6  vcp-0
                                                                    4  vcp-1
6 (FPC 6)  Prsnt    BP0210458752 ex4200-24f   0  Linecard     N  7  vcp-0
                                                                    5  vcp-1
7 (FPC 7)  Prsnt    BP0210477108 ex4200-24f   0  Linecard     N  0  vcp-0
                                                                    6  vcp-1
```

{master:0}

user@vc1> **show interfaces terse**

```
Interface               Admin Link Proto    Local                 Remote
ge-0/0/0                up    up
ge-0/0/0.0              up    up   eth-switch
ge-0/0/1                up    up
ge-0/0/1.0              up    up   eth-switch
ge-0/0/2                up    up
ge-0/0/2.0              up    up   eth-switch
ge-0/0/3                up    up
ge-0/0/3.0              up    up   eth-switch
ge-0/0/4                up    up
ge-0/0/4.0              up    up   eth-switch
ge-0/0/5                up    up
ge-0/0/5.0              up    up   eth-switch
ge-0/0/6                up    up
ge-0/0/6.0              up    up   eth-switch
ge-0/0/7                up    up
ge-0/0/7.0              up    up   eth-switch
ge-0/0/19               up    up
ge-0/0/19.0             up    up   eth-switch
ge-0/0/22               up    up
ge-0/0/22.0             up    up   aenet    --> ae0.0
ge-0/0/23               up    up
ge-0/0/23.0             up    up   aenet    --> ae1.0
xe-0/1/0                up    up
xe-0/1/0.0              up    up   aenet    --> ae8.0
```

```
xe-0/1/2                up    up
ge-1/0/19               up    up
ge-1/0/19.0             up    up   eth-switch
ge-1/0/22               up    up
ge-1/0/22.0             up    up   aenet    --> ae0.0
ge-1/0/23               up    up
ge-1/0/23.0             up    up   aenet    --> ae1.0
xe-1/1/0                up    up
xe-1/1/0.0              up    up   aenet    --> ae8.0
xe-1/1/2                up    up
ge-2/0/19               up    up
ge-2/0/19.0             up    up   eth-switch
ge-2/0/22               up    up
ge-2/0/22.0             up    up   aenet    --> ae0.0
ge-2/0/23               up    up
ge-2/0/23.0             up    up   aenet    --> ae1.0
xe-2/1/0                up    up
xe-2/1/0.0              up    up   aenet    --> ae8.0
xe-2/1/2                up    up
ge-3/0/19               up    up
ge-3/0/19.0             up    up   eth-switch
xe-3/1/0                up    up
xe-3/1/0.0              up    up   aenet    --> ae8.0
xe-3/1/2                up    up
xe-4/1/0                up    up
xe-4/1/0.0              up    up   aenet    --> ae8.0
xe-4/1/2                up    up
xe-5/1/0                up    up
xe-5/1/0.0              up    up   aenet    --> ae8.0
xe-5/1/2                up    up
xe-6/1/0                up    up
xe-6/1/0.0              up    up   aenet    --> ae8.0
xe-6/1/2                up    up
xe-7/1/0                up    up
xe-7/1/0.0              up    up   aenet    --> ae8.0
xe-7/1/2                up    up
vcp-0                   up    up
vcp-0.32768             up    up
vcp-1                   up    up
vcp-1.32768             up    up
ae0                     up    down
ae0.0                   up    down eth-switch
ae1                     up    down
ae1.0                   up    down eth-switch
```

```
ae2                     up    down
ae3                     up    down
ae4                     up    down
ae5                     up    down
ae6                     up    down
ae7                     up    down
ae8                     up    up
ae8.0                   up    up   eth-switch
ae9                     up    down
bme0                    up    up
bme0.32768              up    up   inet     128.0.0.1/2
                                            128.0.0.16/2
                                            128.0.0.32/2
                                   tnp      0x10
bme0.32770              up    up   eth-switch
bme0.32771              down  up   eth-switch
bme0.32772              down  up   eth-switch
bme0.32773              down  up   eth-switch
bme0.32774              down  up   eth-switch
bme0.32775              down  up   eth-switch
bme0.32776              down  up   eth-switch
dsc                     up    up
gre                     up    up
ipip                    up    up
lo0                     up    up
lo0.0                   up    up   inet     10.255.195.97      --> 0/0
                                   iso
47.0005.80ff.f800.0000.0108.0001.0102.5519.5097
                                   inet6    abcd::10.255.195.97
                                            fe80::21f:120f:fc39:6d81
lsi                     up    up
me0                     up    up
mtun                    up    up
pimd                    up    up
pime                    up    up
tap                     up    up
vlan                    up    up
vme                     up    up
vme0.0                  up    up   inet     192.168.157.27/24
```

Meaning

In the output of the **show virtual-chassis status** command, if all eight members appear, the Virtual Chassis is operational.

In the output of the **show interfaces terse** command, if all interfaces that connect to the QFabric system devices are listed as up (such as ge-0/0/0 through ge-0/0/7 for the Node devices; ge-0/0/19, ge-1/0/19, ge-2/0/19, and ge-3/0/19 for the Interconnect devices; ge-0/0/22, ge-0/0/23, ge-1/0/22, ge-1/0/23, ge-2/0/22, and ge-2/0/23 for the Director devices; and xe-0/1/0, xe-1/1/0, xe-2/1/0, xe-3/1/0, xe-4/1/0, xe-5/1/0, xe-6/1/0, and xe-7/1/0 for the inter-Virtual Chassis connections), the control plane is properly connected.

NOTE: The ae0 and ae1 LAG connections on Virtual Chassis VC1 appear as **down** in the output of the **show interfaces terse** command because they are the backup connections to the Director devices. The active, primary LAG connections are typically on Virtual Chassis VC0.

RELATED DOCUMENTATION

QFX3000-G QFabric System Installation Overview | 105
Installing and Connecting a QFX3100 Director Device | 153
Installing and Connecting a QFX3008-I Interconnect Device | 165
Installing and Connecting a QFX3500 Device | 247
Installing and Connecting a QFX3600 or QFX3600-I Device | 226
Installing and Connecting an EX4200 Switch
Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)
Understanding the QFabric System Control Plane | 47

Importing a QFX3000-G QFabric System Control Plane Virtual Chassis Configuration with a USB Flash Drive

There are two methods of importing the configuration file to the QFabric control plane Virtual Chassis. You can load the configuration file onto a USB flash drive from the Juniper Networks software download site before inserting the USB flash drive into the Virtual Chassis USB port, or you can copy and paste the configuration from the following example (see "Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane" on page 333).

Before you begin:

- Rack, mount, and install your QFabric system hardware (Director group, Interconnect devices, and Node devices). For more information, see "Installing and Connecting a QFX3100 Director Device" on page 153, "Installing and Connecting a QFX3008-I Interconnect Device" on page 165, and "Installing and Connecting a QFX3500 Device" on page 247.
- Rack, mount, and install your Virtual Chassis hardware (EX4200 switches or EX4300 switches). For more information, see *Installing and Connecting an EX4200 Switch* or *Installing and Connecting an EX4300 Switch*.
- Create two Virtual Chassis of four members each. For more information, see *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)* or *Configuring an EX2300, EX3400, or EX4300 Virtual Chassis*.
- Select a USB flash drive that meets the QFabric control plane Virtual Chassis USB port specifications. See *USB Port Specifications for an EX Series Switch*.
- Use a computer or other device to load the configuration file from the Internet and copy it to the USB flash drive.

To import the Virtual Chassis configuration file into a USB flash drive:

1. In a browser, go to https://www.juniper.net/support/downloads/junos.html .

   The Junos Platforms Download Software page appears.

   > **NOTE:** To access the download site, you must have a service contract with Juniper Networks and an access account. If you need help obtaining an account, complete the registration form at the Juniper Networks website
   > https://www.juniper.net/registration/Register.jsp .

2. Click **QFX3100** in the **QFX Series** section.

   The QFX3100 Download Software page appears.

3. From the **Release** list, select the number of the software version for which you want to download the Virtual Chassis configuration file.

4. Select the **Software** tab and then click **QFX3000-G QFabric System - Control Plane Virtual Chassis Configuration** in the **QFabric System Install Package and Media** section.

   A login page appears.

5. Enter your user ID and password and press **Enter**.
6. Read the End User License Agreement, select the **I agree** option button, and then click **Proceed**.
7. Save the Virtual Chassis configuration file onto the USB flash drive using your computer or other device.
8. Remove the USB flash drive from the computer or other device.
9. Insert the USB flash drive into the USB port on the EX4200 or EX4300 switch.
10. Save the file to **/var/home/*username*** .
11. Load the configuration file into the switch.

```
user@switch# load override filename
```

12. Commit the configuration.

```
user@switch# commit
Load complete
```

13. Remove the USB flash drive from the switch.

RELATED DOCUMENTATION

Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane | 333

Generating the MAC Address Range for a QFabric System

Each QFabric system requires a range of reserved MAC addresses that is assigned by Juniper Networks. You must specify the MAC address range when you perform the initial setup of the QFX3100 Director group (see “Performing the QFabric System Initial Setup on a QFX3100 Director Group” on page 428). Additionally, refer to Activate Your QFabric System for more information.

When you purchase a QFabric system, you receive an e-mail containing a software serial number from Juniper Networks. You can use the software serial number to generate the MAC address range for your QFabric system.

To generate the MAC address range for a QFabric system:

1. In a browser, log in to the Juniper Networks License Management System at https://www.juniper.net/lcrs/license.do.

   The Manage Product Licenses page appears.

   > **NOTE:** To access the licensing site, you must have a service contract with Juniper Networks and an access account. If you need help obtaining an account, complete the registration form at the Juniper Networks website https://www.juniper.net/registration/Register.jsp .

2. On the Generate Licenses tab, select **QFX Series Product** from the drop-down list, and click **Go**.

   The Generate Licenses - QFX Series Product page appears.

3. Select the **QFX Series Product Fabric** option button, and click **Continue**.

   The Generate Licenses - QFX Series Product Fabrics page appears.

4. In the **Software Serial No** field, enter the software serial number for your QFabric system, and press the Tab key.

   The starting MAC address and number of MAC addresses for your QFabric system are displayed.

5. (Optional) Click **Download/Email MAC Address** to download or e-mail the MAC address range.

   The Download/Email MAC Address page appears.

   To download the MAC address range:

   - Select the **Download to this computer** option button, and click **OK**.

   To e-mail the MAC address range:

   - Select the **Send e-mail to *e-mail ID*** option button, and click **OK**.

RELATED DOCUMENTATION

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

Performing the QFabric System Initial Setup on a QFX3100 Director Group

You must perform the initial setup of the QFX3100 Director group through the console port. (Before configuring the QFX3100 Director group, see "Installing and Connecting a QFX3100 Director Device" on page 153.)

Before you begin connecting and configuring a QFX3100 Director group, set the following parameter values on the console server or PC:

- Baud Rate—9600
- Flow Control—None
- Data—8
- Parity—None
- Stop Bits—1
- DCD State—Disregard

> **NOTE:** When you use the SecureCRT client to connect to a Director device for the initial setup of a QFabric system, the backspace key does not work. As a workaround, use the Shift+Delete key combination in SecureCRT as a backspace key equivalent or use a different UNIX client to support the backspace key natively.

The initial setup requires that you specify certain values for your QFabric system. These include:

- Software serial number for your QFabric system (found in the e-mail containing the software serial number that you received from Juniper Networks when you purchased your QFabric system)
- IP addresses and a default gateway IP address for your QFabric system default partition
- IP addresses for your Director group device management ports
- Range of reserved MAC addresses for your QFabric system (see "Generating the MAC Address Range for a QFabric System" on page 426 or Activate Your QFabric System for this information)
- Root password for your Director group
- Root password for the QFabric system components such as the Node devices, Interconnect devices, and infrastructure

Performing an Initial Setup

The initial setup can be performed either manually or by using a previously saved backup configuration.

To connect and configure the QFX3100 Director group manually from the console:

1. Connect the console port of one of the Director devices to a laptop or PC using an RJ-45 to DB-9 rollover cable. An RJ-45 to DB-9 rollover cable is supplied with each QFX3100 Director device. The console (**CONSOLE**) port is located on the front panel of the device.

2. Log in as **root**. If the software booted before you connected to the console port, you might need to press the Enter key for the prompt to appear.

   ```
   dg0 login: root
   ```

   > **NOTE:** The prompt is either **dg0 login** or **dg1 login** depending on the Director device to which you connected your cable.

3. For manual configuration or for initial installation, enter **no** when prompted to specify the backup file. The current Director device configuration is displayed.

   ```
   Initial Configuration
   Before you can access the QFabric system, you must complete the initial
   setup of the Director group by using the steps that follow. If the initial
   setup procedure does not complete successfully, log out of the Director
   device and then log back in to restart this setup menu.
   Continue? [y/n]: y
   You may enter the configuration manually or restore from a backup.
   Specify a backup file? [y/n]: n
   Existing local configuration:
   ```

4. Enter the IP addresses and prefixes for both Director devices.

   > **NOTE:** The Director group devices and QFabric system default partition IP addresses must be on the same subnet as your management network.

   ```
   Please enter the Director Group 0 IP address and prefix: ip address/prefix
   ```

   ```
   Please enter the Director Group 1 IP address and prefix: ip address/prefix
   ```

```
Please enter the Director Group Subnet Mask: subnet mask
```

5. Enter the gateway IP address for the Director group.

```
Please enter the Director Group gateway IP address: gateway ip address
```

6. Enter the default partition IP address. (You will use this address to log in to the QFabric system on subsequent connections.)

```
Please enter the QFabric default partition IP address: ip address
```

7. (Optional) Enter the IPv6 addresses for both Director devices and the gateway IPv6 address for the Director group.

```
Would you like to input IPv6 addresses for Director Group nodes? (y/n): y
Please enter the Director Group 0 IPv6 address or 'y' to use /0: IPv6 address
Please enter the Director Group 1 IPv6 address or 'y' to use /0: IPv6 address
Please enter the Director Group gateway IPv6 address or 'y' to use /0 : IPv6 address
```

8. Enter the MAC address information.

```
Please enter the starting MAC address: mac address
```

```
Please enter the number of MAC addresses: number of mac addresses
```

> **NOTE:** The minimum number of MAC addresses accepted is 4000.

9. Enter the QFabric system software serial number.

```
Please enter the QFabric serial ID: serial id
```

10. Create the Director device root password.

```
Please enter a Director device root password: director-device-password
Please re-enter password: director-device password
```

11. Create a password for the QFabric system components.

NOTE: If you need to change the component password after the QFabric system is operational, issue the **device-authentication** statement at the **[edit system]** hierarchy level in the QFabric default partition CLI.

```
Please enter a password for QFabric components (Node devices, Interconnect
devices, and infrastructure): component-password
Please re-enter password: component-password
Note: please record your passwords for recovery purposes.
```

CAUTION: Carefully save your passwords for future reference, because some cannot be recovered on a QFabric system.

12. Enter the QFabric system platform type.

```
Supported platform types:
1. QFX3000-G
2. QFX3000-M
Please select product type: number corresponding to platform type
```

13. Confirm the initial configuration. Ensure that the information is accurate before proceeding.

```
Does the following configuration appear correct?
```

```
    Director Group 0 IPv4/Prefix              [10.94.200.9/24]
    Director Group 1 IPv4/Prefix              [10.94.200.10/24]
    Director Group IPv4 Gateway               [10.94.200.250]
    Director Group 0 IPv6/Prefix              [2000:1:2:3::a5e:c809/64]
    Director Group 1 IPv6/Prefix              [2000:1:2:3::a5e:c80a/64]
    Director Group IPv6 Gateway
[2000:0001:0002:0003:0226:88ff:fe7b:e880]
    QFabric Default Partition (IPv6 address) [2000:1:2:3::0a5e:c802/64]
    QFabric Serial ID                         [qfsn-0123456789]
    Director Device Password                  [********]
```

NOTE: Only addresses of the IP version(s) you entered will appear in the configuration.

14. Confirm the initial setup.

```
[y/n]: y
```

CAUTION: Resetting this initial configuration requires assistance from Juniper Networks customer support or "Performing a QFabric System Recovery Installation on the Director Group" on page 894. As a result, make sure you are certain the values you entered are correct before you enter **yes**.

15. The director device displays the configuration.

```
Saving temporary configuration...
Configuring peer...
Configuring local interfaces...
Configuring interface eth0 with [10.49.214.74/24:10.49.214.254]
Configured interface eth0 with [10.49.214.74/24:10.49.214.254]
Configuring QFabric software with an initial pool of 4000 MAC addresses
[00:11:00:00:00:00 - 00:11:00:00:0f:3b]
Configuring QFabric address [10.49.214.150]
Reconfiguring QFabric software static configuration
Applying the new Director device password
Applying the QFabric component password
First install initial configuration, generating and sharing SSH keys.
First install initial configuration, generating SSH keys.
Configuration complete. Director Group services will auto start within 30
seconds.
```

Restoring a Backup Configuration

Before you restore a backup configuration for the Director group:

- You must have a backup configuration file. You create the backup file with the **request system software configuration-backup** command and save it on an external USB flash drive.
- If you need to reinstall the system software, perform that operation first (see "Performing a QFabric System Recovery Installation on the Director Group" on page 894).

To connect and configure the Director group with a backup configuration:

1. Log in as **root**. If the software booted before you connected to the console port, you might need to press the Enter key for the prompt to appear.

   ```
   dg0 login: root
   ```

   > **NOTE:** The prompt is either **dg0 login** or **dg1 login** depending on the Director device to which you connected your cable.

2. To use a previously saved backup configuration, enter **yes** when prompted to specify the backup file and then enter the path and filename of the backup configuration.

   ```
   Specify a back up file? [y/n]: y
   ```

   ```
   Please specify the full path of the configuration backup file: path/filename
   ```

3. Confirm the restoration of the configuration from the backup. Ensure that the information is accurate before proceeding.

   ```
   Does the following configuration appear correct?
   ```

   ```
       Director Group 0 IP/Prefix              [10.49.214.74/24]
       Director Group 1 IP/Prefix              [10.49.214.75/24]
       Director Group Gateway                  [10.49.214.254]
       Starting MAC address                    [00:11:00:00:00:00]
       Number of MAC addresses                 [4000]
       QFabric Default Partition IP            [10.49.214.150]
       QFabric serial ID                       [qfsn-123456789]
       Director Device Password                [********]
   ```

```
    QFabric component Password                    [********]
    Product Type:                                 [QFX3000-G]
```

4. Confirm the backup restoration.

```
[y/n]: y
```

The Director device displays the configuration.

```
Saving temporary configuration...
Configuring peer...
Configuring local interfaces...
Configuring interface eth0 with [10.49.214.74/24:10.49.214.254]
Configured interface eth0 with [10.49.214.74/24:10.49.214.254]
Configuring QFabric software with an initial pool of 4000 MAC addresses
[00:11:00:00:00:00 - 00:11:00:00:0f:3b]
Configuring QFabric address [10.49.214.150]
Reconfiguring QFabric software static configuration
Applying the new Director device password
Applying the QFabric component password
Configuration complete. Director Group services will auto start within 30
seconds.
```

RELATED DOCUMENTATION

Generating the MAC Address Range for a QFabric System | **426**

Gaining Access to the QFabric System Through the Default Partition | **439**

QFabric System Initial and Default Configuration Information | **323**

Installing and Connecting a QFX3100 Director Device | **153**

Performing a QFabric System Recovery Installation on the Director Group | **894**

request system software configuration-backup

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CHAPTER 17

QFabric System Configuration

IN THIS CHAPTER

Understanding QFabric System Administration Tasks and Utilities

The following items describe QFabric system components, common administration tasks that you perform on the QFabric system, or utilities that help you to manage the QFabric system and its components.

- **Converting the device mode (QFX3500 and QFX3600 devices)**—Enables you to convert a QFX3500, QFX3600, or QFX5100 device into a Node device so it can be deployed within a QFabric system. By default, QFX3500, QFX3600, and QFX5100 devices operate in *standalone* mode. Before the devices can participate within a QFabric system environment, you must change the device mode for the switch to *node-device* mode. To convert a QFX3500, QFX3600, or QFX5100 device from standalone mode to Node device mode, connect to the console port of the device, issue the **request chassis device-mode node-device** command, verify the future device mode with the **show chassis device-mode** command, connect the management port of the device to the QFabric system control plane, and reboot the device.

  NOTE:

  - Before you convert the device mode, you must upgrade the software on your standalone device to a QFabric system Node and Interconnect device software package that matches the QFabric system complete software package used by your QFabric system. For example, if the complete software package for your QFabric system is named **jinstall-qfabric-11.3X30.6.rpm**, you need to install the **jinstall-qfx-11.3X30.6-domestic-signed.tgz** package on your standalone device. Matching the two software packages ensures a smooth and successful addition of the device to the QFabric system inventory.
  - Converting the device mode erases the switch configuration. We recommend that you save your configuration to an external server or USB flash drive before executing the device mode conversion commands and rebooting the switch.

- **QFabric system control plane Ethernet network (EX4200 or EX4300 switches to support the QFabric system)**—Provides a separate control plane network within the QFabric system to handle management traffic. This design enables the data plane network to focus on efficient, low-latency delivery of data, voice, and video traffic.

  - The QFX3000-G QFabric system control plane uses two sets of four EX4200 or EX4300 switches each, configured as a pair of Virtual Chassis to connect all components within the QFabric system. The dual Virtual Chassis architecture provides redundancy and high availability to ensure reliable QFabric system operation for the Director group, the Interconnect devices, and the Node devices.
  - The QFX3000-M QFabric system control plane uses two EX4200 or EX4300 switches to connect all components within the QFabric system. The two EX4200 or EX4300 switches provide redundancy and high availability to ensure reliable QFabric system operation for the Director group, the Interconnect devices, and the Node devices.

  Because the level of detail necessary to fully understand the control plane connections, cabling, topology, and configuration is beyond the scope of this topic, see:

  - “Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane” on page 333 for information about a QFX3000-G QFabric system with a copper-based control plane

- *Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane* for information about a QFX3000-M QFabric system with a copper or fiber-based control plane

- **QFabric system data plane network**—Provides a separate network to handle rapid delivery of data plane traffic. The data plane uses QSFP+ interfaces and fiber-optic cabling to connect QFabric system components at speeds of 40 Gbps. By creating a redundant set of connections between the Node devices and the backplane-like Interconnect devices, the data plane enables the Node devices to appear as if they are directly connected to one another in a single tier. To view the connection status of the QFabric system data plane, issue the **show chassis fabric connectivity** command.

- **Director group (QFX3100 Director devices within a QFabric system)**—Provides a redundant, resilient platform that manages the QFabric system components. Two QFX3100 Director devices work together to ensure high availability of the system and load-balance system processes, such as the command-line interface (CLI) and shared storage. To configure the Director group for operation, install and cable two Director devices as a Director group, connect to the console port of one of the Director devices, and perform the initial setup. The setup script starts automatically the first time you power on the Director device. For more information, see "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428. To monitor the status of the Director group, log in to the QFabric system default partition and issue the **show fabric administration inventory director-group status** command.

- **Automatic detection and configuration of QFabric system components**—Enables QFabric system components to join the QFabric system automatically. When you install the QFabric system, activate the control plane and Director group, and power on the Node and Interconnect devices, the Director group recognizes these devices, sends each device its own portion of the Junos OS configuration, and adds them to the QFabric system inventory. By default, each individual Node device is placed into a unique server Node group that contains only that single Node device. No configuration is required for the default assignments. The default settings can be overridden when you add Node devices into a redundant server Node group (containing a pair of Node devices) or a network Node group (that can contain up to eight Node devices, run routing protocols, and connect to external networks).

- **QFabric system Routing Engines**—Support the QFabric system by providing virtual, redundant instances of Junos OS that run on the Director group. The Routing Engines perform fabric management tasks, maintain control of the fabric, and host the operation of routing protocols for network Node groups. Because they are generated in pairs, the Routing Engines provide additional high availability for the QFabric system. No configuration is required. To view the status of the QFabric system Routing Engines, issue the **show fabric administration inventory infrastructure** command.

- **QFabric system command-line interface**—Enables you to configure all components of the QFabric system from a single location by using the Junos OS CLI. To access this central location, you need to log in to the QFabric system default partition (an IP address you specify during the initial setup of the Director group). For more information, see "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

  Most existing Junos OS configuration statements and operational mode commands are supported (for example, interfaces, VLANs, protocols, and firewall filters).

To view QFabric system components and check connectivity of the system, issue the **show fabric administration inventory** commands.

- **Alias configuration for Director devices, Interconnect devices, and Node devices**—Enables you to set user-defined aliases for QFabric system Director devices, Interconnect devices, and Node devices to facilitate usability of the QFabric system as it scales. Aliased names appear in the output of many QFabric system operational commands, such as **show fabric administration inventory**. To map the hardware serial number of a Director device, Interconnect device or Node device to a user-defined name, see "Configuring Aliases for the QFabric System" on page 452.
- **Node group configuration**—Enables you to cluster several Node devices together to provide redundancy, resiliency, and high availability at the ingress and egress points of the QFabric system. There are two types of Node groups you can configure:
  - **Redundant server Node group**—Enables the grouped Node devices to connect the QFabric system to local servers and storage devices. A redundant server Node group can contain a maximum of two Node devices and supports LAG connections that can span both devices.

    NOTE: The Node devices in a redundant server Node group must be of the same type, such as a QFX3500 Node, a QFX3600 Node, or a QFX5100 Node. For example, you cannot add a QFX3500 and a QFX3600 Node device to the same redundant server Node group.

  - **Network Node group**—Enables the grouped Node devices to connect the QFabric system to external networks and run routing protocols such as BGP and OSPF. A network Node group can contain up to eight Node devices and supports LAG connections.

    NOTE:
    - The name of the network Node group in the default partition, *NW-NG-0*, is preset. You must use this name when adding Node devices to the network Node group. You cannot specify a different name.
    - When you configure routing protocols on the QFabric system, you must use interfaces from the Node devices assigned to the network Node group. If you try to configure routing protocols on interfaces from the Node devices assigned to server Node groups, the configuration commit operation fails.

To configure a redundant server Node group, include two Node devices with the **node-device *node-device-name*** statement at the **[edit fabric resources node-group *node-group-name*]** hierarchy level.

To configure a network Node group, include the **network-domain** statement at the **[edit fabric resources node-group NW-NG-0]** hierarchy level. In addition, include between two and eight Node devices with the **node-device *node-device-name*** statement at the **[edit fabric resources node-group NW-NG-0]** hierarchy level.

RELATED DOCUMENTATION

Converting the Device Mode for a QFabric System Component | 326

Example: Configuring the Virtual Chassis for a Copper-Based QFX3000-G QFabric System Control Plane | 333

Example: Configuring EX Series Switches for the QFX3000-M QFabric System Control Plane

show chassis fabric connectivity | 808

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

show fabric administration inventory director-group status | 845

show fabric administration inventory infrastructure | 852

show fabric administration inventory | 839

Configuring Aliases for the QFabric System | 452

Configuring Node Groups for the QFabric System | 476

Gaining Access to the QFabric System Through the Default Partition

This topic explains how to log in to the QFabric system default partition so you can access the Junos OS command-line interface (CLI) and configure the system.

Before you access the QFabric system default partition:

- Install the QFabric system hardware components, including connecting the network and power cables.
- Convert any QFX3500, QFX3600, or QFX5100 standalone devices to *node-device* mode.
- Connect all components to the control plane Ethernet network.
- Turn on the Director group and run the initial setup script. Remember to write down the IP address of the default partition, which must be on the same subnetwork as your management network.

To access the default partition:

1. Open an SSH connection to the QFabric default partition. Use the IP address you set for the default partition as part of the QFabric initial setup procedure. In your network, you can simplify access to the QFabric system by mapping the default partition IP address to a name.

   `[root@customer ~]#` **ssh root@192.168.1.49**

   ```
   Last login: Fri Sep  2 21:34:54 2011 from customer
   Juniper QFabric Director 11.3.5043 2011-08-26 18:05:21 UTC
   ```

```
RUNNING ON DIRECTOR DEVICE : dg1
root@qfabric>
```

NOTE: The QFabric system is load balanced, so the CLI session might be hosted on either Director device **DG0** or **DG1**.

2. Enter configuration mode (the default mode in the QFabric system is **configure private**), configure a root password and hostname for the default partition, and assign QFabric administrator privileges to the root user.

   `root@qfabric>` **configure**

   ```
   warning: Using private edit on QF/Director
   warning: uncommitted changes will be discarded on exit
   Entering configuration mode

   [edit]
   ```

   `root@qfabric#` **set system root-authentication plain-text-password**

   ```
   New password: My-Password
   Retype new password: My-Password
   ```

   `root@qfabric#` **set system root-authentication remote-debug-permission qfabric-admin**

   `root@qfabric#` **set system host-name my-qfabric**

   ```

   [edit]
   ```

   `root@qfabric#` **commit**

   ```
   commit complete

   [edit]
   root@my-qfabric#
   ```

3. Configure your QFabric system as needed. You can configure routing protocols, interfaces, VLANs, and other features as needed. Keep in mind that interfaces require the four-level interface naming convention (device-name:*fpc*/*pic*/*port*).

RELATED DOCUMENTATION

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

QFabric System Initial and Default Configuration Information | 323

Understanding Interfaces on the QFabric System | 14

Example: Configuring QFabric System Login Classes

IN THIS SECTION

This example shows you how to assign the correct login class to users so they can access components within a QFabric system.

Requirements

This example uses the following hardware and software components:

- One QFX3000-G QFabric system containing:
  - Two QFX3100 Director devices
  - Two QFX3008-I Interconnect devices
  - Eight QFX3500 Node devices
  - Junos OS Release 12.2 for these QFX Series components
- Eight EX4200 switches, used to make two redundant Virtual Chassis with four members apiece
- Junos OS Release 12.1R1.9 for the EX Series switches used in the Virtual Chassis

Before you begin:

- Perform the initial setup of the QFabric system on the Director group, which includes the creation of a username and password for the QFabric system components. See "Performing the QFabric System Initial Setup on a QFX3100 Director Group" on page 428.

Overview

The QFabric system offers three special preset login classes that provide different levels of access to individual components within a QFabric system (such as Node devices and Interconnect devices). The *qfabric-admin* class provides the ability to log in to individual QFabric system components and manage them. The *qfabric-operator* class enables the user to log in to individual components and view component-level operations and configurations. The *qfabric-user* class prevents access to individual QFabric system components.

You include these classes in your configuration at the **[edit system login user *username* authentication remote-debug-permission]** hierarchy level. The key task is to decide which class you should apply to users based on their need to access QFabric system components.

> **NOTE:** To set QFabric system login classes for a root user, include the **remote-debug-permission** statement at the **[edit system root-authentication]** hierarchy level and specify the qfabric-admin class.

If you assign the qfabric-admin or the qfabric-operator class to a user, the QFabric system maps the user to a list of authorized users who are permitted to access components. To facilitate ease of use, the QFabric system uses the component password you specified during the initial setup of the Director group. When users assigned the qfabric-admin or the qfabric-operator class log in to a component by issuing the **request component login** operational mode command, the QFabric system verifies the class and sends the username and password to the component. The component accepts these credentials and permits access.

> **NOTE:**
> - The three QFabric system login classes give access to the components only. To provide access to the QFabric system as a whole through the default partition command-line interface (CLI), you must configure the usual Junos OS login classes or permissions (such as the *super-user* class). For more information about login classes, see *Junos OS Login Classes Overview*.
> - If you have completed the QFabric system initial setup and the system is operational, you can change the component password by issuing the **device-authentication** statement at the **[edit system]** hierarchy level in the QFabric default partition CLI.

Topology

This example defines three users: Adam, Oscar, and Ulf. Adam needs to manage QFabric system components, Oscar needs limited access, and Ulf should not have any access to the components. As a result, assign the qfabric-admin class to Adam, the qfabric-operator class to Oscar, and the qfabric-user class to Ulf. However, all three users should have all permissions to access the QFabric system CLI.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set system login class all-qfabric permissions all
set system login user Adam class all-qfabric
set system login user Adam authentication encrypted-password "$1$aoYSFkvE$G/dYqsTV5iSvVW2sND69U."
set system login user Adam authentication remote-debug-permission qfabric-admin
set system login user Oscar class all-qfabric
set system login user Oscar authentication encrypted-password "$1$3e.3wJQ8$31SrzV0.efdRbk.ZJncKm0"
set system login user Oscar authentication remote-debug-permission qfabric-operator
set system login user Ulf class all-qfabric
set system login user Ulf authentication encrypted-password "$1$qt9Ncm0o$okNYSN8O4fVITE/SHBdYj0"
set system login user Ulf authentication remote-debug-permission qfabric-user
```

Step-by-Step Procedure

The following example requires that you navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To provide the same access to the QFabric system CLI for all users, but different QFabric system component-level access to different users:

1. Define and provide all-qfabric access and passwords to all three users. This administrator-defined class provides full permissions, enabling the users to log in to the QFabric system default partition and use the CLI. Alternatively, you can assign the super-user class to these users to accomplish the same goal.

```
[edit]
user@qfabric# set system login class all-qfabric permissions all
user@qfabric# set system login user Adam class all-qfabric
user@qfabric# set system login user Adam authentication encrypted-password
  "$1$aoYSFkvE$G/dYqsTV5iSvVW2sND69U."
user@qfabric# set system login user Oscar class all-qfabric
user@qfabric# set system login user Oscar authentication encrypted-password
  "$1$3e.3wJQ8$31SrzV0.efdRbk.ZJncKm0"
```

```
user@qfabric# set system login user Ulf class all-qfabric
user@qfabric# set system login user Ulf authentication encrypted-password
  "$1$qt9Ncm0o$okNYSN8O4fVITE/SHBdYj0"
```

2. Provide qfabric-admin component access to Adam so he can manage QFabric system components.

```
[edit]
user@qfabric# set system login user Adam authentication remote-debug-permission qfabric-admin
```

3. Provide qfabric-operator component access to Oscar so he can view the CLI at the QFabric system components.

```
[edit]
user@qfabric# set system login user Oscar authentication remote-debug-permission qfabric-operator
```

4. Assign qfabric-user component restrictions to Ulf to prevent him from accessing the QFabric system components.

```
[edit]
user@qfabric# set system login user Ulf authentication remote-debug-permission qfabric-user
```

Results

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show** command output includes only the configuration that is relevant to this example.

```
[edit]
system {
  login {
    class all-qfabric {
      permissions all;
    }
    user Adam {
      class all-qfabric;
      authentication {
        encrypted-password "$1$aoYSFkvE$G/dYqsTV5iSvVW2sND69U."; ## SECRET-DATA
        remote-debug-permission qfabric-admin;
      }
```

```
        }
        user Oscar {
            class all-qfabric;
            authentication {
                encrypted-password "$1$3e.3wJQ8$31SrzV0.efdRbk.ZJncKm0"; ## SECRET-DATA
                remote-debug-permission qfabric-operator;
            }
        }
        user Ulf {
            class all-qfabric;
            authentication {
                encrypted-password "$1$qt9Ncm0o$okNYSN8O4fVITE/SHBdYj0"; ## SECRET-DATA
                remote-debug-permission qfabric-user;
            }
        }
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

IN THIS SECTION

Confirm that the QFabric system and component-level access configuration is working properly for all three users. Adam, Oscar, and Ulf should have equivalent, full-permission access to the QFabric system CLI. Adam should have management-level access to components. Oscar should have read-only access to components. Ulf should have no component-level access.

Verifying qfabric-admin Access

Purpose

Verify that Adam can access the QFabric system CLI at the default partition and manage QFabric system components.

Action

From a management station on your network, issue the **ssh *user*@qfabric** command and enter the password to open an SSH session for Adam to the QFabric system. Issue the **?** command to view the CLI operational mode commands that Adam has permission to use on the QFabric system default partition.

```
> ssh Adam@qfabric.network.net
Warning: Permanently added 'qfabric.network.net' (RSA) to the list of known hosts.
Adam@qfabric.network.net's password:
Last login: Sun Nov 20 14:12:29 2011 from 192.168.28.19
Juniper QFabric Director 11.3.5510 2011-10-21 16:31:44 UTC


RUNNING ON DIRECTOR DEVICE : dg0
Adam@qfabric>

Adam@qfabric> ?
Possible completions:
  clear                Clear information in the system
  configure            Manipulate software configuration information
  file                 Perform file operations
  help                 Provide help information
  load                 Load information from file
  op                   Invoke an operation script
  ping                 Ping remote target
  quit                 Exit the management session
  request              Make system-level requests
  restart              Restart software process
  save                 Save information to file
  set                  Set CLI properties, date/time, craft interface message
  show                 Show system information
  telnet               Telnet to another host
  test                 Perform diagnostic debugging
  traceroute           Trace route to remote host
```

Issue the **request component login ?** command to view the components that Adam can access. Next, issue the **request component login *component-name*** command to log in to a Node device without being prompted for a username or password.

```
Adam@qfabric> request component login ?
Possible completions:
  <[Enter]>            Execute this command
  <node-name>          Inventory name for the remote node
  BBAK0372             Node device
  BBAK0394             Node device
```

```
  DRE-0                Diagnostic routing engine
  EE3093               Node device
  FC-0                 Fabric control
  FC-1                 Fabric control
  FM-0                 Fabric manager
  NW-NG-0              Node group
  WS001/RE0            Interconnect device control board
  WS001/RE1            Interconnect device control board
  |                    Pipe through a command

Adam@qfabric> request component login EE3093
Warning: Permanently added 'qfnode-ee3093,169.254.128.14' (RSA) to the list of
known hosts.
--- JUNOS 11.3I built 2011-11-04 12:46:16 UTC
{master}
```

Finally, issue the **?** command to view the CLI operational mode commands that Adam has the permission to use on the Node device. Notice that the CLI prompt now indicates Adam's component access level (**qfabric-admin**) as the username and the Node device identifier (**EE3093**) as the host.

```
qfabric-admin@EE3093> ?
Possible completions:
  clear                Clear information in the system
  file                 Perform file operations
  help                 Provide help information
  load                 Load information from file
  monitor              Show real-time debugging information
  mtrace               Trace multicast path from source to receiver
  op                   Invoke an operation script
  ping                 Ping remote target
  quit                 Exit the management session
  request              Make system-level requests
  restart              Restart software process
  save                 Save information to file
  set                  Set CLI properties, date/time, craft interface message
  show                 Show system information
  ssh                  Start secure shell on another host
  start                Start shell
  telnet               Telnet to another host
  test                 Perform diagnostic debugging
  traceroute           Trace route to remote host
```

Meaning

The output shows that Adam has received the proper permissions to access the QFabric system CLI and log in to individual components with management-level access.

Verifying qfabric-operator Access

Purpose

Verify that Oscar can access the QFabric system CLI at the default partition and view the CLI on the QFabric system components.

Action

From a management station on your network, issue the **ssh *user*@qfabric** command and enter the password to open an SSH session for Oscar to the QFabric system. Issue the **?** command to view the CLI operational mode commands that Oscar has permission to use on the QFabric system default partition. Notice that these permissions are the same as those given to Adam.

```
> ssh Oscar@qfabric.network.net
Warning: Permanently added 'qfabric.network.net' (RSA) to the list of known hosts.
Oscar@qfabric.network.net's password:
Last login: Sun Nov 19 19:21:29 2011 from 192.168.28.14
Juniper QFabric Director 11.3.5510 2011-10-22 18:33:41 UTC


RUNNING ON DIRECTOR DEVICE : dg1
Oscar@qfabric>

Oscar@qfabric> ?
Possible completions:
  clear                Clear information in the system
  configure            Manipulate software configuration information
  file                 Perform file operations
  help                 Provide help information
  load                 Load information from file
  op                   Invoke an operation script
  ping                 Ping remote target
  quit                 Exit the management session
  request              Make system-level requests
  restart              Restart software process
  save                 Save information to file
  set                  Set CLI properties, date/time, craft interface message
  show                 Show system information
  telnet               Telnet to another host
  test                 Perform diagnostic debugging
  traceroute           Trace route to remote host
```

Issue the **request component login *component-name*** command to log in to a Node device without being prompted for a username or password.

```
Oscar@qfabric> request component login EE3093
Warning: Permanently added 'qfnode-ee3093,169.254.128.14' (RSA) to the list of
known hosts.
--- JUNOS 11.3I built 2011-11-04 12:46:16 UTC
{master}
```

Finally, issue the **?** command to view the CLI operational mode commands that Oscar has permission to use on the Node device. Notice that the CLI prompt now indicates Oscar's component access level (**qfabric-operator**) as the username and the Node device identifier (**EE3093**) as the host. Additionally, Oscar has fewer CLI commands available than Adam because of Oscar's read-only qfabric-operator login class.

```
qfabric-operator@EE3093> ?
Possible completions:
  file                 Perform file operations
  help                 Provide help information
  load                 Load information from file
  op                   Invoke an operation script
  quit                 Exit the management session
  request              Make system-level requests
  save                 Save information to file
  set                  Set CLI properties, date/time, craft interface message
  show                 Show system information
  start                Start shell
  test                 Perform diagnostic debugging
```

Meaning

The output shows that Oscar has full permissions to access the QFabric system CLI, but only read-only access when he logs in to individual components. Oscar's permissions on the QFabric system are the same as Adam's, but Oscar has fewer permissions than Adam on the Node device.

Verifying qfabric-user Access

Purpose

Verify that Ulf has full access to the QFabric system CLI at the default partition but cannot access the QFabric system components.

Action

From a management station on your network, issue the **ssh *user*@qfabric** command and enter the password to open an SSH session for Ulf to the QFabric system. Issue the **?** command to view the CLI operational mode commands that Ulf has permission to use on the QFabric system default partition. Notice that these permissions are the same as those given to Adam and Oscar.

```
> ssh Ulf@qfabric.network.net
Warning: Permanently added 'qfabric.network.net' (RSA) to the list of known hosts.
Ulf@qfabric.network.net's password:
Last login: Sun Nov 17 17:12:24 2011 from 192.168.28.22
Juniper QFabric Director 11.3.5510 2011-10-23 19:23:31 UTC


RUNNING ON DIRECTOR DEVICE : dg0
Ulf@qfabric>

Ulf@qfabric> ?
Possible completions:
  clear                Clear information in the system
  configure            Manipulate software configuration information
  file                 Perform file operations
  help                 Provide help information
  load                 Load information from file
  op                   Invoke an operation script
  ping                 Ping remote target
  quit                 Exit the management session
  request              Make system-level requests
  restart              Restart software process
  save                 Save information to file
  set                  Set CLI properties, date/time, craft interface message
  show                 Show system information
  telnet               Telnet to another host
  test                 Perform diagnostic debugging
  traceroute           Trace route to remote host
```

When Ulf issues the **request component login *component-name*** command, the Node device denies his access attempt.

```
Ulf@qfabric> request component login EE3093
error: User Ulf does not have sufficient permissions to login to device EE3093
```

Meaning

The output shows that Ulf has full permissions to access the QFabric system CLI in the same way as Adam and Oscar. However, unlike Adam and Oscar, Ulf cannot access individual components because of the qfabric-user login class assigned to him.

RELATED DOCUMENTATION

Understanding QFabric System Login Classes | 72

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

Junos OS Login Classes Overview

Example: Configuring RADIUS Authentication on a QFabric System

RADIUS authentication is a method of authenticating users who are attempting to access a network device. On a QFabric system, users are load balanced on each of the Director devices. Each Director device needs to be able to communicate with the RADIUS server. Packets sent to the RADIUS server originate from the Director device IP addresses.

The following example shows how to configure RADIUS authentication on the QFabric system:

Perform the following steps to configure RADIUS authentication on the QFabric system:

1. Configure the order in which the authentication methods are used.

   For example:

   `user@switch #` **set system authentication-order [radius password]**

   In this example, RADIUS authentication is the first authentication method that Junos OS will use when a user logs into the system.

2. Configure the IP address of the RADIUS server and the secret password. The secret password on the switch must match the secret password on the RADIUS server.

   For example:

   `user@switch #` **set system radius-server 172.28.36.108 secret testing123**

3. Assign the login class and the template account for the user.

   For example:

   `user@switch #` **set system login user remote class super-user**

Here are the results of your configuration:

```
[edit]
system {
    authentication-order [ radius password ];
    login {
        user remote {
            class super-ruser;
        ]
        ]
    }
    radius--server {
        172.28.36.108 {
        secret test123
    }
}
```

RELATED DOCUMENTATION

Configuring RADIUS Authentication (QFX Series or OCX Series)

Configuring Aliases for the QFabric System

This topic explains how to configure aliases for components of the QFabric system, such as Director devices, Interconnect devices, and Node devices. Aliases replace the hardware serial numbers of components, making it easier to identify system devices and simplify configuration tasks.

Before you create aliases in a QFabric system:

- Issue one of the **show fabric administration inventory** commands to view the components that are available for aliasing and their hardware serial numbers.

NOTE: The following rules apply to QFabric component alias naming:

- Alias names must use alphabetic (A through Z and a through z), numeric (0 through 9), or dash (-) characters.
- The maximum length of an alias name is 30 characters.
- Alias names are case sensitive. For example, MY-NG-1 and my-ng-1 refer to different components.
- You cannot use the reserved names **all**, **fabric**, or **director-group** as an alias name.

To create an alias for a Node device:

1. Discover the serial number of the Node device you wish to rename by issuing the **set fabric aliases node-device ?** context-sensitive help command.

   root@qfabric# **set fabric aliases node-device ?**

   ```
   Possible completions:
     <aliasable-item-name>   The name of the item to be aliased
     BBAK8309             Node device
     BBAK8283             Node device
     BBAK8891             Node device
     BBAK8868             Node device
     BBAK8276             Node device
     BBAK8273             Node device
   [edit]
   ```

   As an alternate way to discover the serial number for a Node device, issue the **show fabric administration inventory node-devices** command. In this case, the serial numbers for the Node devices are **BBAK8309BBAK8283BBAK8891BBAK8868BBAK8276** and **BBAK8273**.

   root@qfabric> show fabric administration inventory node-devices

   ```
   Item                     Identifier               Connection      Configuration
   Node device
     BBAK8309                                        Connected
     BBAK8283                                        Connected
     BBAK8891                                        Connected
     BBAK8868                                        Connected
     BBAK8276                                        Connected
     BBAK8273                                        Connected
   ```

2. Specify the serial number of the Node device and the desired alias name by including the **node-device** statement at the **[edit fabric aliases]** hierarchy level.

   [edit fabric aliases]
   root@qfabric# **set node-device BBAK8309 Node0**
   root@qfabric# **set node-device BBAK8283 Node1**
   root@qfabric# **set node-device BBAK8891 Node2**
   root@qfabric# **set node-device BBAK8868 Node3**
   root@qfabric# **set node-device BBAK8276 Node4**
   root@qfabric# **set node-device BBAK8273 Node5**

3. Review your configuration and issue the **commit** command.

[edit]
root@qfabric# **show fabric**

```
aliases {
    node-device BBAK8309 {
        Node0;
    }
    node-device BBAK8283 {
        Node1;
    }
    node-device BBAK8891 {
        Node2;
    }
    node-device BBAK8868 {
        Node3;
    }
    node-device BBAK8276 {
        Node4;
    }
    node-device BBAK8273 {
        Node5;
    }
}
```

[edit]
root@qfabric# **commit**

```
commit complete
```

4. To view that your aliases are operational, issue the **show fabric administration inventory node-devices** command.

root@qfabric> **show fabric administration inventory node-devices**

```
Item                    Identifier              Connection      Configuration
Node device
  node0                 BBAK8309                Connected
  node1                 BBAK8283                Connected
  node2                 BBAK8891                Connected
  node3                 BBAK8868                Connected
  node4                 BBAK8276                Connected
  node5                 BBAK8273                Connected
```

NOTE: If you attempt to commit all configuration settings for a new Node group (such as the Node group itself, aliasing, and other features) at the same time, the commit operation might appear to succeed when it actually has failed. For this reason, we recommend configuring and verifying Node groups and aliases first, followed by configuring and verifying other features. Establishing the Node groups and aliases first enables the QFabric system to reject any potentially unsupported configuration. The resulting commit errors indicate where the configuration problem lies. To verify the establishment of Node groups and aliases before configuring other features, issue the **show fabric administration inventory** command.

To create an alias for a Node group:

- Specify a name for the Node group when you include the **node-group** statement at the **[edit fabric resources]** hierarchy level.

> **NOTE:** You cannot use the **aliases** statement at the **[edit fabric]** hierarchy level to create an aliased name for a Node group.

To create an alias for a Director device:

1. Discover the serial number of the Director device you wish to rename by issuing the **set fabric aliases director-device ?** context-sensitive help command.

   `root@qfabric#` **set fabric aliases director-device ?**

```
Possible completions:
  <aliasable-item-name>   The name of the item to be aliased
  0281052011000001     Director device
  0281052011000032     Director device
[edit]
```

   As an alternate way to discover the serial number for a Director device, issue the **show fabric administration inventory director-group status** command. In this case, the serial number for Director device DG0 is **0281052011000001** and the serial number for Director device DG1 is **0281052011000032**.

   root@qfabric> show fabric administration inventory director-group status

```
Director Group Status Tue Jun  5 15:11:26 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.49.215.38    8%  17363152k   4   3 days, 20:55 hrs
 dg1    online backup   10.49.215.39    6%  20157440k   3   3 days, 20:55 hrs

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    0281052011000001 online  master

  Master Services
  ---------------
  Database Server                online
  Load Balancer Director         online
  QFabric Partition Address      online

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
  Volume ID:4                    optimal
```

```
  Physical ID:1                    online
  Physical ID:0                    online
  SCSI ID:1                        100%
  SCSI ID:0                        100%


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 5.4G 395G  2%   /
  99M  16M  79M   17%  /boot
  93G  7.3G 86G   8%   /pbdata

  Director Group Processes
  ------------------------
  Director Group Manager           online
  Partition Manager                online
  Software Mirroring               online
  Shared File System master        online
  Secure Shell Process             online
  Network File System              online
  DHCP Server master               online     master
  FTP Server                       online
  Syslog                           online
  Distributed Management           online
  SNMP Trap Forwarder              online
  SNMP Process                     online
  Platform Management              online

  Interface Link Status
  ---------------------
  Management Interface             up
  Control Plane Bridge             up
  Control Plane LAG                up
  CP Link [0/2]                    up
  CP Link [0/1]                    up
  CP Link [0/0]                    up
  CP Link [1/2]                    down
  CP Link [1/1]                    down
  CP Link [1/0]                    down
  Crossover LAG                    up
  CP Link [0/3]                    up
  CP Link [1/3]                    up

 Member Device Id/Alias  Status  Role
```

```
------ ---------------- ------- ---------
dg1    0281052011000032 online  backup

 Director Group Managed Services
 -------------------------------
 Shared File System             online
 Network File System            online
 Virtual Machine Server         online
 Load Balancer/DHCP             online

 Hard Drive Status
 ----------------
 Volume ID:8                    optimal
 Physical ID:1                  online
 Physical ID:0                  online
 SCSI ID:1                      100%
 SCSI ID:0                      100%


 Size  Used Avail Used% Mounted on
 ----  ---- ----- ----- ----------
 423G 5.5G 395G  2%   /
 99M  16M  79M   17%  /boot
 93G  7.3G 86G   8%   /pbdata

 Director Group Processes
 ------------------------
 Director Group Manager         online
 Partition Manager              online
 Software Mirroring             online
 Shared File System master      online
 Secure Shell Process           online
 Network File System            online
 DHCP Server master             online     backup
 FTP Server                     online
 Syslog                         online
 Distributed Management         online
 SNMP Trap Forwarder            online
 SNMP Process                   online
 Platform Management            online

 Interface Link Status
 ---------------------
 Management Interface           up
```

```
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

2. Specify the serial number of the Director device and the desired alias name by including the **director-device** statement at the **[edit fabric aliases]** hierarchy level.

   ```
   [edit fabric aliases]
   root@qfabric# set director-device 0281052011000001 Director0
   root@qfabric# set director-device 0281052011000032 Director1
   ```

3. Review your configuration and issue the **commit** command.

   ```
   [edit]
   root@qfabric# show fabric
   ```

   ```
   aliases {
       director-device 0281052011000001 {
           Director0;
       }
       director-device 0281052011000032 {
           Director1;
       }
   }
   ```

   ```
   [edit]
   root@qfabric# commit
   ```

   ```
   commit complete
   ```

4. To view that your aliases are operational, issue the **show fabric administration inventory director-group status** command. In this case, the serial numbers in the **Device Id/Alias** field have been replaced with the **Director0** and **Director1** aliased names.

   ```
   root@qfabric> show fabric administration inventory director-group status
   ```

```
Director Group Status Tue Jun  5 15:11:26 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.49.215.38    8%  17363152k   4   3 days, 20:55 hrs
 dg1    online backup   10.49.215.39    6%  20157440k   3   3 days, 20:55 hrs

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    Director0        online  master

  Master Services
  ---------------
  Database Server                online
  Load Balancer Director         online
  QFabric Partition Address      online

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
  Volume ID:4                    optimal
  Physical ID:1                  online
  Physical ID:0                  online
  SCSI ID:1                      100%
  SCSI ID:0                      100%


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 5.4G 395G  2%   /
  99M  16M  79M   17%  /boot
  93G  7.3G 86G   8%   /pbdata

  Director Group Processes
  ------------------------
  Director Group Manager         online
  Partition Manager              online
  Software Mirroring             online
```

```
  Shared File System master      online
  Secure Shell Process           online
  Network File System            online
  DHCP Server master             online     master
  FTP Server                     online
  Syslog                         online
  Distributed Management         online
  SNMP Trap Forwarder            online
  SNMP Process                   online
  Platform Management            online

  Interface Link Status
  ---------------------
  Management Interface           up
  Control Plane Bridge           up
  Control Plane LAG              up
  CP Link [0/2]                  up
  CP Link [0/1]                  up
  CP Link [0/0]                  up
  CP Link [1/2]                  down
  CP Link [1/1]                  down
  CP Link [1/0]                  down
  Crossover LAG                  up
  CP Link [0/3]                  up
  CP Link [1/3]                  up

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg1    Director1        online  backup

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
  Volume ID:8                    optimal
  Physical ID:1                  online
  Physical ID:0                  online
  SCSI ID:1                      100%
  SCSI ID:0                      100%
```

```
Size  Used Avail Used% Mounted on
----  ---- ----- ----- ----------
423G 5.5G 395G  2%   /
99M  16M  79M   17%  /boot
93G  7.3G 86G   8%   /pbdata

Director Group Processes
------------------------
Director Group Manager         online
Partition Manager              online
Software Mirroring             online
Shared File System master      online
Secure Shell Process           online
Network File System            online
DHCP Server master             online     backup
FTP Server                     online
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

To create an alias for an Interconnect device:

1. Discover the serial number of the Interconnect device you wish to rename by issuing the **set fabric aliases interconnect-device ?** context-sensitive help command.

   `root@qfabric#` **set fabric aliases interconnect-device ?**

   ```
   Possible completions:
     <aliasable-item-name>   The name of the item to be aliased
     IC-F1249             Interconnect device
     IC-F4912             Interconnect device
   [edit]
   ```

   As an alternate way to discover the serial number for an Interconnect device, issue the **show fabric administration inventory interconnect-devices** command. In this case, the serial numbers for the Interconnect devices are **IC-F1249** and **IC-F4912**.

   root@qfabric> show fabric administration inventory interconnect-devices

   ```
   Item                        Identifier              Connection      Configuration
   Interconnect device
     IC-F1249                                          Connected       Configured
       F1249/RE0                                       Connected
     IC-F4912                                          Connected       Configured
       F4912/RE0                                       Connected
   ```

2. Specify the serial number of the Interconnect device and the desired alias name by including the **interconnect-device** statement at the **[edit fabric aliases]** hierarchy level.

   `[edit fabric aliases]`
   `root@qfabric#` **set interconnect-device IC-F1249 Interconnect0**
   `root@qfabric#` **set interconnect-device IC-F4912 Interconnect1**

3. Review your configuration and issue the **commit** command.

   `[edit]`
   `root@qfabric#` **show fabric**

   ```
   aliases {
       interconnect-device IC-F1249 {
           Interconnect0;
       }
       interconnect-device IC-F4912 {
           Interconnect1;
   ```

```
    }
}
```

```
[edit]
root@qfabric# commit
```

```
commit complete
```

4. To view that your aliases are operational, issue the **show fabric administration inventory interconnect-devices** command.

```
root@qfabric> show fabric administration inventory interconnect-devices
```

```
Item                    Identifier              Connection      Configuration
Interconnect device
  Interconnect0         IC-F1249                Connected       Configured
    F1249/RE0                                   Connected
  Interconnect1         IC-F4912                Connected       Configured
    F4912/RE0                                   Connected
```

RELATED DOCUMENTATION

aliases | 520
show fabric administration inventory | 839
show fabric administration inventory director-group status | 845
show fabric administration inventory interconnect-devices | 856
show fabric administration inventory node-devices | 859
Understanding the Director Group | 24
Understanding Interconnect Devices | 27
Understanding Node Devices | 31

Configuring the Port Type on QFX3600 Node Devices

The QFX3600 Node device provides 16 40-Gbps QSFP+ ports. By default, four ports (labeled **Q0** through **Q3**) operate as 40-gigabit data plane (*fte*) uplink ports for uplink connections between your Node device and your Interconnect devices. Twelve ports (labeled **Q4** through **Q15**) operate as 10-Gigabit Ethernet (*xe*) ports to support 48 10-Gigabit Ethernet interfaces for connections to either endpoint systems or external networks. Optionally, you can choose to configure ports Q0 through Q7 to operate as 40-gigabit data plane uplink ports, and ports Q2 through Q15 to operate as 10-Gigabit Ethernet or 40-Gigabit Ethernet (*xle*) ports.

NOTE: You can use QSFP+ to four SFP+ breakout cables or QSFP+ transceivers with fiber breakout cables to connect the 10-Gigabit Ethernet ports to other devices.

NOTE: When you delete the port type configuration for an individual port or a block of ports, the ports return to operating in their default port type. For example, when you delete the 40-Gigabit Ethernet (xle) port configuration for port Q4, the port returns to operating as a 10-Gigabit Ethernet (xe) port.

NOTE: When the 40-Gigabit Ethernet (xle) ports of a QFX3600 Node device carry traffic at the full line rate, loss of untagged Layer 2 or Layer 3 traffic going across the fabric might occur, as well as increased latency on the Node device. Such effects result from the addition of a 4-byte header to packets traversing the uplink ports on the Node device. The percentage of traffic loss depends on the size of the packets: the greater the packet size, the lower the traffic loss and vice versa. This problem does not affect tagged traffic.

This topic explains how to configure the port type on QFX3600 Node devices.

Before you configure the port type on QFX3600 Node devices:

- Make sure your QFabric system is operational.
- Issue the **show fabric administration inventory node-groups** command to display the existing Node groups and the Node devices in each Node group.

NOTE:

- Only ports Q0 through Q7 can be configured to operate as 40-gigabit data plane (fte) uplink ports.
- Only ports Q2 through Q15 can be configured to operate as 10-Gigabit Ethernet (xe) or 40-Gigabit Ethernet (xle) ports.

CAUTION: The Packet Forwarding Engine on the QFX3600 Node device is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the Node device.

The following message may be displayed in the system log file when the Packet Forwarding Engine is restarted. You can ignore this message.

Pipe write error: Broken pipe

flush operation failed

The following steps describe how to configure either a block of ports or an individual port to operate as 40-gigabit data plane uplink (fte) ports, as well as how to delete a 40-gigabit data plane uplink (fte) port configuration.

1. To configure a block of ports to operate as 40-gigabit data plane uplink (fte) ports, specify a port range:

   ```
   [edit chassis node-group name node-device name pic 1]
   root@qfabric# set fte port-range port-range-low port-range-high
   ```

   For example, to configure ports Q4 through Q7 to operate as 40-gigabit data plane uplink ports:

   ```
   [edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
   root@qfabric# set fte port-range 4 7
   ```

2. To configure an individual port to operate as a 40-gigabit data plane uplink (fte) port, specify a port number:

   ```
   [edit chassis node-group name node-device name pic 1]
   root@qfabric# set fte port port-number
   ```

For example, to configure port Q4 to operate as a 40-gigabit data plane uplink port:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# set fte port 4
```

3. Review your configuration and issue the **commit** command.

```
[edit]
root@qfabric# commit
commit complete
```

4. To delete the 40-gigabit data plane uplink (fte) port configuration for a block of ports, specify a port range:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# delete fte port-range port-range-low port-range-high
```

For example, to delete the 40-gigabit data plane uplink port configuration for ports Q4 through Q7:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# delete fte port-range 4 7
```

5. To delete the 40-gigabit data plane uplink (fte) port configuration for an individual port, specify a port number:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# delete fte port port-number
```

For example, to delete the 40-gigabit data plane uplink port configuration for port Q4:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# delete fte port 4
```

The following steps describe how to configure either a block of ports or an individual port to operate as 10-Gigabit Ethernet (xe) ports, as well as how to delete a 10-Gigabit Ethernet (xe) port configuration.

1. To configure a block of ports to operate as 10-Gigabit Ethernet (xe) ports, specify a port range:

```
[edit chassis node-group name node-device name pic 0]
```

```
root@qfabric# set xe port-range port-range-low port-range-high
```

For example, to configure ports Q4 through Q7 to operate as 10-Gigabit Ethernet ports:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 0]
root@qfabric# set xe port-range 4 7
```

2. To configure an individual port to operate as a 10-Gigabit Ethernet port, specify a port number:

```
[edit chassis node-group name node-device name pic 0]
root@qfabric# set xe port port-number
```

For example, to configure port Q4 to operate as a 10-Gigabit Ethernet port:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 0]
root@qfabric# set xe port 4
```

3. Review your configuration and issue the **commit** command.

```
[edit]
root@qfabric# commit
commit complete
```

4. To delete the 10-Gigabit Ethernet (xe) port configuration for a block of ports, specify a port range:

```
[edit chassis node-group name node-device name pic 0]
root@qfabric# delete xe port-range port-range-low port-range-high
```

For example, to delete the 10-Gigabit Ethernet port configuration for ports Q4 through Q7:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 0]
root@qfabric# delete xe port-range 4 7
```

5. To delete the 10-Gigabit Ethernet (xe) port configuration for an individual port, specify a port number:

```
[edit chassis node-group name node-device name pic 0]
root@qfabric# delete xe port port-number
```

For example, to delete the 10-Gigabit Ethernet port configuration for port Q4:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 0]
root@qfabric# delete xe port 4
```

The following steps describe how to configure either a block of ports or an individual port to operate as 40-Gigabit Ethernet (xle) ports, as well as how to delete a 40-Gigabit Ethernet (xle) port configuration.

1. To configure a block of ports to operate as 40-Gigabit Ethernet (xle) ports, specify a port range:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# set xle port-range port-range-low port-range-high
```

   For example, to configure ports Q4 through Q7 to operate as 40-Gigabit Ethernet ports:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# set xle port-range 4 7
```

2. To configure an individual port to operate as a 40-Gigabit Ethernet (xle) port, specify a port number:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# set xle port port-number
```

   For example, to configure port Q4 to operate as a 40-Gigabit Ethernet port:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# set xle port 4
```

3. Review your configuration and issue the **commit** command.

```
[edit]
root@qfabric# commit
commit complete
```

4. To delete the 40-Gigabit Ethernet (xle) port configuration for block of ports, specify a port range:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# delete xle port-range port-range-low port-range-high
```

For example, to delete the 40-Gigabit Ethernet port configuration for ports Q4 through Q7:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# delete xle port-range 4 7
```

5. To delete the 40-Gigabit Ethernet (xle) port configuration for an individual port, specify a port number:

```
[edit chassis node-group name node-device name pic 1]
root@qfabric# delete xle port port-number
```

For example, to delete the 40-Gigabit Ethernet port configuration for port Q4:

```
[edit chassis node-group BBAK8281 node-device BBAK8309 pic 1]
root@qfabric# delete xle port 4
```

RELATED DOCUMENTATION

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Configuring the QSFP+ Port Type on QFX5100 Devices

You can convert default 40-Gigabit Ethernet data plane uplink interfaces (fte) to 40-Gigabit Ethernet access interfaces (xle) ports, and default 40-Gigabit Ethernet interfaces (xle) to 40-Gigabit Ethernet data plane uplink interfaces (fte). Ports Q0 and Q1 are fixed fte ports and cannot be changed. Ports Q2 and Q3 are fte ports by default but can be changed to xle ports. Ports Q4 and Q5 are xle ports by default but can be changed to fte ports.

> **NOTE:** On QFX5100-24Q switches, ports Q1 through Q7 are fixed FTE ports and cannot be changed.

> **NOTE:** You must configure xle ports in pairs, not individually, otherwise functionality is not guaranteed.

> **CAUTION:** The Packet Forwarding Engine on a QFX5100 switch is restarted when you commit port type configuration changes (for example, configuring or deleting an **fte** or **xle** port). As a result, you might experience packet loss on the device.

The following steps describe how to configure either a block of ports or an individual port, as well as how to delete these configurations.

1. To configure a block of ports to operate as 40-Gigabit Ethernet interfaces (xle) , specify a port range:

   ```
   [edit chassis (QFX Series) node-group name node-device name pic 1]
   user@switch# set xle port-range port–range-low port-range-high
   ```

   For example, to configure ports Q4 through Q5 to operate as 40-Gigabit Ethernet interfaces (xle):

   ```
   [edit chassis node-group name node-device name pic 1]
   user@switch# set xle port-range 4 5
   ```

2. To configure a block of ports to operate as 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port range:

   ```
   [edit chassis (QFX Series) node-group name node-device name pic 1]
   ```

```
user@switch# set fte port-range port–range-low port-range-high
```

For example, to configure ports Q4 through Q5 to operate as 40-Gigabit Ethernet data plane uplink interfaces (fte):

```
[edit chassis node-group name node-device name pic 1]
user@switch# set fte port-range 4 5
```

3. To configure an individual port to operate as a 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port number:

```
[edit chassis node-group name node-device name pic 1]
user@switch# set fte port port-number
```

For example, to configure port Q4 to operate as a 40-Gigabit Ethernet data plane uplink interfaces (fte):

```
[edit chassis node-group name node-device name pic 1]
user@switch# set fte port 4
```

4. Review your configuration and issue the **commit** command.

```
[edit]
user@switch# commit
commit complete
```

5. To delete a block of ports configured as 40-Gigabit Ethernet (xle) ports, specify a port range:

```
[edit chassis node-group name node-device name pic 1]
user@switch# delete xle port-range port-range-low port-range-high
```

For example, to delete the 40-Gigabit Ethernet access interface (xle) port configuration for ports Q2 through Q3:

```
[edit chassis node-group name node-device name pic 1]
user@switch# delete xle port-range 2 3
```

6. To delete an individual port configured as a 40-Gigabit Ethernet (xle) interface:

```
[edit chassis node-group name node-device name pic 1]
user@switch# delete xle port port-number
```

For example, to delete the 40-Gigabit Ethernet interface (xle) for port Q2:

```
[edit chassis node-group name node-device name pic 1]
user@switch# delete xle port 2
```

7. To delete a block of ports configured as 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port range:

   ```
   [edit chassis node-group name node-device name pic 1]
   user@switch# delete fte port-range port-range-low port-range-high
   ```

   For example, to delete the block of ports configured as 40-Gigabit Ethernet data plane uplink interfaces (fte) for ports Q4 through Q5:

   ```
   [edit chassis node-group name node-device name pic 1]
   user@switch# delete fte port-range 4 5
   ```

8. To delete an individual port configured as a 40-Gigabit Ethernet data plane uplink interfaces (fte):

   ```
   [edit chassis node-group name node-device name pic 1]
   user@switch# delete fte port port-number
   ```

   For example, to delete the 40-Gigabit Ethernet data plane uplink interfaces (fte) for port Q4:

   ```
   [edit chassis node-group name node-device name pic 1]
   user@switch# delete fte port 4
   ```

9. Review your configuration and issue the **commit** command.

   ```
   [edit]
   user@switch# commit
   commit complete
   ```

RELATED DOCUMENTATION

pic

Configuring Node Groups for the QFabric System

This topic explains how to configure Node groups for Node devices within the QFabric system. Node groups provide redundancy for Node devices and make your QFabric system more resilient.

There are three types of Node groups in a QFabric system:

- **Automatically generated server Node groups**—By default, every Node device that joins the QFabric system is placed within an automatically generated server Node group that contains one Node device (the device itself). Server Node groups connect to servers and storage devices.
- **Network Node groups**—You can assign up to eight Node devices to a network Node group. When grouped together, the Node devices within a network Node group connect to other routers running routing protocols such as OSPF and BGP.
- **Redundant server Node groups**—You can assign two Node devices to a redundant server Node group. When grouped together, you can create link aggregation groups (LAGs) that span the interfaces on both Node devices to provide resiliency and redundancy.

Before you create Node groups in a QFabric system:

- Make sure your QFabric system is operational.
- Issue the **show fabric administration inventory node-devices** command to display the Node devices that are available to add to a Node group.
- Issue the **show fabric administration inventory node-groups** command to display the existing Node groups.

> **NOTE:** The following rules apply to QFabric Node group naming:
>
> - Node group names must use alphabetic (A through Z and a through z), numeric (0 through 9), or dash (-) characters.
> - The maximum length of a Node group name is 30 characters.
> - Node group names are case sensitive. For example, MY-NG-1 and my-ng-1 refer to different components.
> - You cannot use the reserved names **all**, **fabric**, or **director-group** as a Node group name.

NOTE: If you attempt to commit all configuration settings for a new Node group (such as the Node group itself, aliasing, and other features) at the same time, the commit operation might appear to succeed when it actually has failed. For this reason, we recommend configuring and verifying Node groups and aliases first, followed by configuring and verifying other features. Establishing the Node groups and aliases first enables the QFabric system to reject any potentially unsupported configuration. The resulting commit errors indicate where the configuration problem lies. To verify the establishment of Node groups and aliases before configuring other features, issue the **show fabric administration inventory** command.

To display an automatically generated server Node group:

- Issue the **show fabric administration inventory node-groups** command and look for Node groups containing a single Node device that has the same name or serial number as the server Node group.

  `root@qfabric>` **show fabric administration inventory node-groups**

```
Item                    Identifier              Connection      Configuration
Node group
  BBAK8281                                      Connected       Configured
    BBAK8281                                    Connected
  BBAK8835                                      Connected       Configured
    BBAK8835                                    Connected
  NW-NG-0                                       Connected       Configured
    Node0               BBAK8309                Connected
    Node1               BBAK8283                Connected
  S1                                            Connected       Configured
    Node2               BBAK8891                Connected
    Node3               BBAK8868                Connected
```

To create a network Node group:

1. Specify the Node devices you wish to add to the network Node group by including the **node-device** statement at the **[edit fabric resources node-group NW-NG-0]** hierarchy level.

   NOTE:
   - The network Node group must use the predefined name NW-NG-0. You must use this name when adding Node devices to the network Node group. You cannot specify a different name. Also, you can configure only one network Node group per partition.
   - When you configure routing protocols on the QFabric system, you must use interfaces from the Node devices assigned to the network Node group. If you try to configure routing protocols on interfaces from the Node devices assigned to server Node groups, the configuration commit operation fails.

   ```
   [edit]
   ```

   `root@qfabric#` **set fabric resources node-group NW-NG-0 node-device Node0**

   `root@qfabric#` **set fabric resources node-group NW-NG-0 node-device Node1**

2. To designate the Node group as a network Node group, include the **network-domain** statement at the **[edit fabric resources node-group NW-NG-0]** hierarchy level.

   ```
   [edit]
   ```

   `root@qfabric#` **set fabric resources node-group NW-NG-0 network-domain**

3. Review your configuration and issue the **commit** command.

   ```
   [edit]
   ```

   `root@qfabric#` **show fabric**

   ```
   resources {
       node-group NW-NG-0 {
           network-domain;
           node-device Node0;
           node-device Node1;
       }
   }
   ```

```
[edit]
```

root@qfabric# **commit**

```
commit complete
```

> **NOTE:** When you add or delete Node devices from a Node group configuration, the corresponding Node devices reboot when you commit the configuration change.

4. To determine if your network Node group is operational, issue the **show fabric administration inventory node-groups** command in operational mode.

   root@qfabric>**show fabric administration inventory node-groups NW-NG-0**

```
Item                    Identifier              Connection      Configuration
Node group
  NW-NG-0                                       Connected       Configured
    Node0               BBAK8309                Connected
    Node1               BBAK8283                Connected
```

To create a redundant server Node group:

1. Specify the two Node devices you wish to add to the redundant server Node group by including the **node-device** statement at the **[edit fabric resources node-group *node-group-name*]** hierarchy level.

   > **NOTE:** Ensure that the two Node devices are of the same type, either two QFX3500 Node devices, two QFX3600 Node devices, or two QFX5100 Node devices. You cannot add different Node device types to the same redundant server Node group.

```
[edit]
```

   root@qfabric# **set fabric resources node-group S1 node-device Node2**
   root@qfabric# **set fabric resources node-group S1 node-device Node3**

2. Review your configuration and issue the **commit** command.

```
[edit]
```

root@qfabric# **show fabric**

```
resources {
    node-group S1 {
        node-device Node2;
        node-device Node3;
    }
}
```

```
[edit]
```

root@qfabric# **commit**

```
commit complete
```

NOTE: When you add or delete Node devices from a Node group configuration, the corresponding Node devices reboot when you commit the configuration change.

3. To determine if your redundant server Node groups are operational, issue the **show fabric administration inventory node-groups *redundant-server-node-group-name*** command in operational mode.

   root@qfabric> **show fabric administration inventory node-groups S1**

```
Item                    Identifier              Connection      Configuration
Node group
  S1                                            Connected       Configured
    Node2               BBAK8891                Connected
    Node3               BBAK8868                Connected
```

RELATED DOCUMENTATION

show fabric administration inventory node-groups | 861
show fabric administration inventory node-devices | 859
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Example: Configuring SNMP

IN THIS SECTION

By default, SNMP is disabled on devices running Junos OS. This example describes the steps for configuring SNMP on the QFabric system.

Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.2
- Network management system (NMS) (running the SNMP manager)
- QFabric system (running the SNMP agent) with multiple Node devices

Overview

Because SNMP is disabled by default on devices running Junos OS, you must enable SNMP on your device by including configuration statements at the **[edit snmp]** hierarchy level. At a minimum, you must configure the **community public** statement. The community defined as public grants read-only access to MIB data to any client.

If no **clients** statement is configured, all clients are allowed. We recommend that you always include the **restrict** option to limit SNMP client access to the switch.

The network topology in this example includes an NMS, a QFabric system with four Node devices, and external SNMP servers that are configured for receiving traps.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set snmp name “snmp qfabric” description “qfabric0 switch”
set snmp location “Lab 4 Row 11” contact “qfabric-admin@qfabric0”
set snmp community public authorization read-only
set snmp client-list list0 192.168.0.0/24
set snmp community public client-list-name list0
set snmp community public clients 192.170.0.0/24 restrict
set snmp trap-group “qf-traps” destination-port 155 targets 192.168.0.100
```

Step-by-Step Procedure

The following example requires that you navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *Junos OS CLI User Guide*
.

To configure SNMP on the QFabric system:

> **NOTE:** If the name, description, location, contact, or community name contains spaces, enclose the text in quotation marks (" ").

1. Configure the SNMP system name:

   ```
   [edit snmp]
   user@switch# set name “snmp qfabric”
   ```

   > **NOTE:** The above configured SNMP system name can be accessed:
   >
   > - By doing a query with the SNMPGet on policy object identifier (OID) sysName.0.
   > - From the generic jnxSyslogTrap. To send the jnxSyslogTrap, configure the trap events at **[edit event-options policy]** hierarchy.

2. Specify a description.

   ```
   [edit snmp]
   user@switch# set description “qfabric0 system”
   ```

This string is placed into the MIB II sysDescription object.

3. Specify the physical location of the QFabric system.

```
[edit snmp]
user@switch# set location “Lab 4 Row 11”
```

This string is placed into the MIB II sysLocation object.

4. Specify an administrative contact for the SNMP system.

```
[edit snmp]
user@switch# set contact “qfabric-admin@qfabric0”
```

This name is placed into the MIB II sysContact object.

5. Specify a unique SNMP community name and the read-only authorization level.

> **NOTE:** The **read-write** option is not supported on the QFabric system.

```
[edit snmp]
user@switch# set community public authorization read-only
```

6. Create a client list with a set of IP addresses that can use the SNMP community.

```
[edit snmp]
user@switch# set client-list list0 192.168.0.0/24
user@switch# set community public client-list-name list0
```

7. Specify IP addresses of clients that are restricted from using the community.

```
[edit snmp]
user@switch# set community public clients 198.51.100.0/24 restrict
```

8. Configure a trap group, destination port, and a target to receive the SNMP traps in the trap group.

```
[edit snmp]
```

```
user@switch# set trap-group “qf-traps” destination-port 155 targets 192.168.0.100
```

NOTE: You do not need to include the **destination-port** statement if you use the default port 162.

The trap group qf-traps is configured to send traps to 192.168.0.100.

Results

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
[edit]
user@switch# show
  snmp {
    name "snmp qfabric";
    description "qfabric0 system";
    location "Lab 4 Row 11";
    contact "qfabric-admin@qfabric0";
    client-list list0 {
      192.168.0.0/24;
    }
    community public {
      authorization read-only;
      clients {
        198.51.100.0/24 restrict;
      }
    }
    trap-group qf-traps {
      destination-port 155;
      targets {
        192.168.0.100;
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

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snmp

Configuring Graceful Restart for QFabric Systems

IN THIS SECTION

When you configure graceful restart in the QFabric CLI, the QFabric system applies the configuration to the network Node group to participate in graceful restart operations with devices external to the QFabric system. Such configuration preserves routing table state and helps neighboring routing devices to resume routing operations more quickly after a system restart. This also enables the network Node group to resume routing operations rapidly if there is a restart in the QFabric system (such as a software upgrade). As a result, we recommend enabling graceful restart for routing protocols in the QFabric CLI.

> **NOTE:** The QFabric system also uses graceful restart internally within the fabric to facilitate interfabric resiliency and recovery. This internal feature is enabled by default with no configuration required.

Enabling Graceful Restart

By default, graceful restart is disabled. To enable graceful restart, include the **graceful-restart** statement at the **[edit routing-instance *instance-name* routing-options]** or **[edit routing-options]** hierarchy level.

For example:

```
routing-options {
   graceful-restart;
}
```

To configure the duration of the graceful restart period, include the **restart-duration** at the **[edit routing-options graceful-restart]** hierarchy level.

> **NOTE:** Helper mode (the ability to assist a neighboring router attempting a graceful restart) is enabled by default when you start the routing platform, even if graceful restart is not enabled. You can disable helper mode on a per-protocol basis.

```
[edit]
routing-options {
  graceful-restart {
    disable;
    restart-duration seconds;
  }
}
```

To disable graceful restart globally, include the **disable** statement at the **[edit routing-options graceful-restart]** hierarchy level.

When graceful restart is enabled for all routing protocols at the **[edit routing-options graceful-restart]** hierarchy level, you can disable graceful restart on a per-protocol basis.

> **NOTE:** If you configure graceful restart after a BGP or LDP session has been established, the BGP or LDP session restarts and the peers negotiate graceful restart capabilities. Also, the BGP peer routing statistics are reset to zero.

Configuring Graceful Restart Options for BGP

To configure the duration of the BGP graceful restart period, include the **restart-time** statement at the **[edit protocols bgp graceful-restart]** hierarchy level. To set the length of time the router waits to receive messages from restarting neighbors before declaring them down, include the **stale-routes-time** statement at the **[edit protocols bgp graceful-restart]** hierarchy level.

```
[edit]
protocols {
  bgp {
    graceful-restart {
      disable;
      restart-time seconds;
```

```
            stale-routes-time seconds;
        }
    }
}
routing-options {
    graceful-restart;
}
```

To disable BGP graceful restart capability for all BGP sessions, include the **disable** statement at the **[edit protocols bgp graceful-restart]** hierarchy level.

> **NOTE:** To set BGP graceful restart properties or disable them for a group, include the desired statements at the **[edit protocols bgp group *group-name* graceful-restart]** hierarchy level.
>
> To set BGP graceful restart properties or disable them for a specific neighbor in a group, include the desired statements at the **[edit protocols bgp group *group-name* neighbor *ip-address* graceful-restart]** hierarchy level.

> **NOTE:** Configuring graceful restart for BGP resets the BGP peer routing statistics to zero. Also, existing BGP sessions restart, and the peers negotiate graceful restart capabilities.

Configuring Graceful Restart Options for OSPF and OSPFv3

To configure the duration of the OSPF/OSPFv3 graceful restart period, include the **restart-duration** statement at the **[edit protocols (ospf | ospf3) graceful-restart]** hierarchy level. To specify the length of time for which the router notifies helper routers that it has completed graceful restart, include the **notify-duration** at the **[edit protocols (ospf | ospf3) graceful-restart]** hierarchy level. Strict OSPF link-state advertisement (LSA) checking results in the termination of graceful restart by a helping router. To disable strict LSA checking, include the **no-strict-lsa-checking** statement at the **[edit protocols (ospf | ospf3) graceful-restart]** hierarchy level.

```
[edit]
protocols {
    ospf | ospfv3{
        graceful-restart {
            disable;
            helper-disable
            no-strict-lsa-checking;
```

```
            notify-duration seconds;
            restart-duration seconds;
        }
    }
}
routing-options {
    graceful-restart;
}
```

To disable OSPF/OSPFv3 graceful restart, include the **disable** statement at the **[edit protocols (ospf | ospf3) graceful-restart]** hierarchy level.

Starting with Release 11.3, the Junos OS supports both the standard (based on RFC 3623, *Graceful OSPF Restart*) and the restart signaling-based (as specified in RFC 4811, RFC 4812, and RFC 4813) helper modes for OSPF version 2 graceful restart configurations. Both the standard and restart signaling-based helper modes are enabled by default. To disable the helper mode for OSPF version 2 graceful restart configurations, include the **helper-disable <both | restart-signaling | standard>** statement at the **[edit protocols ospf graceful-restart]** hierarchy level. Note that the last committed statement always takes precedence over the previous one.

```
[edit protocols ospf]
    graceful-restart {
        helper-disable <both | restart-signaling | standard>
    }
```

To reenable the helper mode, delete the **helper-disable** statement from the configuration by using the **delete protocols ospf graceful-restarthelper-disable <restart-signaling | standard | both>** command. In this case also, the last executed command takes precedence over the previous ones.

NOTE:

Restart signaling-based helper mode is not supported for OSPFv3 configurations. To disable helper mode for OSPFv3 configurations, include the ***helper-disable*** statement at the **[edit protocols ospfv3 graceful-restart]** hierarchy level.

TIP: You can also track graceful restart events with the **traceoptions** statement at the **[edit protocols (ospf | ospf3)]** hierarchy level. For more information, see "Tracking Graceful Restart Events" on page 489.

NOTE: If you configure BFD and graceful restart for OSPF, graceful restart might not work as expected.

Tracking Graceful Restart Events

To track the progress of a graceful restart event, you can configure graceful restart trace options flags for IS-IS and OSPF/OSPFv3. To configure graceful restart trace options, include the **graceful-restart** statement at the **[edit protocols *protocol* traceoptions flag]** hierarchy level:

```
[edit protocols]
isis {
    traceoptions {
        flag graceful-restart;
    }
}
(ospf | ospf3) {
    traceoptions {
        flag graceful-restart;
    }
}
```

RELATED DOCUMENTATION

Graceful Restart Concepts

Verifying Graceful Restart Operation

Optimizing the Number of Multicast Flows on QFabric Systems

Because of the distributed nature of QFabric systems, the default configuration does not allow the maximum number of supported Layer 3 multicast flows to be created. To allow a QFabric system to create the maximum number of supported flows, configure the following statement:

```
set fabric routing-options multicast fabric-optimized-distribution
```

After configuring this statement, you must reboot the QFabric Director group to make the change take effect.

RELATED DOCUMENTATION

Segregating QFabric Traffic Flows With Flow Groups

In a QFabric system, a hash function is used to select an Interconnect device to forward traffic between two ingress switches, which are called Node devices. Since this hash function is performed on all Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. Some operations, such as financial transactions, require redundant data flows to use different Interconnect devices to avoid point-of-failure data loss. To enforce this in a fabric, you can create a flow group for multicast or unicast traffic from a particular ingress switch. In a flow group, switches are forced to use different, specified Interconnect devices to forward redundant traffic.

> **NOTE:** An Interconnect device can belong to only one flow group but can serve as a backup to other flow groups.

To direct redundant QFabric system traffic flows to different Interconnect devices:

1. Create a flow group and indicate the Node device where the redundant data originates:

   ```
   [edit fabric flow-groups]
   set flow-group-name node-device node-device-name
   ```

2. Indicate at least one Interconnect device connected to the switch to be used for redundancy:

   ```
   [edit fabric flow-groups flow-group-name]
   set interconnect-device interconnect-device-name
   ```

   If all redundant data from the named switch will use the flow group, you are finished with the configuration.

3. You can alter a flow group's configuration by overriding the software's Node device preferences for Interconnect devices. Interconnect devices that reside in the default group (those that are not assigned to a user-configured flow group) have a link preference value set to **normal** in the software. When you create a flow group, the **flow-groups** configuration statement resets some Interconnect devices' preference to **high** (for those assigned to a flow group) and others to **never** (for those assigned to a different flow group) to create the flow.

- To add a Node device to multiple flow groups, set the link between the Node device in the original flow group and a different Interconnect device to **high**:

```
[edit fabric flow-groups flow-group-name]
set node-device node-device-name  interconnect-device new-IC-name preference
high
```

- To configure a Node device to use an Interconnect device from a different flow group if none in the same flow group are available, set the link between the Node device and the other group's Interconnect device to **normal**:

```
[edit fabric flow-groups flow-group-name]
set node-device node-device-name interconnect-device IC-name-from-other-flow-group
 preference normal
```

- To increase the priority of a switch for Interconnect devices, set the switch's Interconnect device link preference to **high**.

```
[edit fabric flow-groups flow-group-name]
set node-device node-device-name interconnect-device interconnect-device-name
preference high
```

- To prevent a flow group's switches from using an Interconnect device, set the Interconnect device link preference to **never**.

```
[edit fabric flow-groups flow-group-name]
set node-device node-device-name interconnect-device interconnect-device-name
preference never
```

For an example of flow group configuration, see "Example: Creating a QFabric Flow Group" on page 492.

TIP: To add a TOR to multiple flow groups:
set fabric resources node-device TOR-B interconnect-device IC-A preference HIGH
To configure a TOR to use an Interconnect device from a different flow group if none in the same flow group are available:
set fabric resources node-device TOR-B interconnect-device IC-A preference NORMAL
To increase the priority of default-flowgroup Interconnect devices for a specific TOR:
set fabric resources node-device TOR-A interconnect-device ALL_ICS preference HIGH
To configure default-flowgroup TORs to never use a particular Interconnect device:
set fabric resources node-device ALL_TORS interconnect-device IC-A preference NEVER

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Understanding QFabric Multicast Flow Groups | 53
Example: Creating a QFabric Flow Group | 492

Example: Creating a QFabric Flow Group

IN THIS SECTION

In a QFabric system, a hash function is used to select an Interconnect device to forward traffic between two Node devices. Since this hash function is performed on all Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. Some applications require that the redundant multicast streams flow through different Interconnect devices to prevent a single Interconnect device from potentially dropping both streams of multicast traffic during a failure. You can enforce this use of separate Interconnect devices by using the QFabric system flow groups feature. This example creates two flow groups.

TIP: A single point of failure can occur because the hash function can pick the same Interconnect device for two different sets of Node devices. For example, a set of Node devices (N1, N2) can be hashed to Interconnect device IC1 and another set of Node devices (N3, N4) are also hashed to IC1, so IC1 can then be a potential single point of failure.

Requirements

This example uses the following hardware and software components:

- QFX5100-F switches

- QFabric system
- Junos 14.1X53-D15

Before you create a flow group on your QFX Series switches, be sure you have installed and set up a QFabric system. See "QFX3000-G QFabric System Installation Overview" on page 105.

Overview

In this example, you configure two **flow-groups** flows on QFX5100-F switches in a QFabric system. Each flow will use its configured Interconnect device. You can optionally configure a backup option for one of the flows to use the Interconnect device in the other flow in case of failure.

Topology

This example creates two flow groups, flowA and flowB, in a QFabric system.

You always have a default flow group that contains any unassigned Interconnect devices and unassigned Node devices—in this case, the only member of the default flow group will be the Interconnect device IC3 after your configurations. The flow groups, Node devices (TORs—Top-of-Rack devices), and Interconnect devices that you configure are listed in Table 99 on page 493.

Table 99: Flow-group Example Devices

Flow Group Name	Node Devices	Interconnect Device Names
flowA	P2025-C P1360-C	IC-4892 IC-4
flowB	BBAK8822 P1523-C	IC-F4908
default flow-group		IC3

The software enforces flows by setting each Node device to one of three preferences for Interconnect devices:

- **high**—Use this Interconnect device in the hashing algorithm for the specified flow.
- **normal**—Use this Interconnect device for backup when no Interconnect devices with high settings are available.
- **never**—Do not use this Interconnect device in the hashing algorithm for the specified flow.

NOTE: Unassigned Interconnect devices in the default group are set to **normal**, meaning when no Interconnect device set to **high** is available in a flow group, the flow will look for unused Interconnect devices set to **normal** and use one that is available. This helps prevent loss of data in the event of an Interconnect device failure. The **high** and **never** settings for Interconnect devices are set by the software when you configure flow groups.

Configuration

IN THIS SECTION

In this example, you configure two flow groups: flowA and flowB. FlowA has two Interconnect devices set to **high**. If both Interconnect devices in flowA fail, there is one automatic backup because the default group contains an Interconnect device. You can also, optionally, provide a specific backup Interconnect device for flowA—in this example, we specifically configure the Interconnect device for flowB as backup for flowA. Therefore, if both Interconnect devices in flowA (IC-4892 and IC-4) fail, an Interconnect device with preference **normal** will take over. IC3 is available at this point.

CLI Quick Configuration

To quickly configure flow groups flowA and flowB with backup for the Interconnect device in flowA, copy and paste these commands into your CLI:

```
set fabric flow-groups flowA node-device P2025-C
set fabric flow-groups flowA node-device P1360-C
set fabric flow-groups flowA interconnect-device IC-4892
set fabric flow-groups flowA interconnect-device IC4

set fabric flow-groups flowB node-device BBAK8822
set fabric flow-groups flowB node-device P1523-C
set fabric flow-groups flowB interconnect-device IC-F4908
```

```
set fabric flow-groups node-device P2025-C interconnect-device IC-4908 preference
normal
```

Configure Flow Group flowA

Step-by-Step Procedure

1. Set up two Node devices for flowA:

```
set fabric flow-groups flowA node-device P2025-C
set fabric flow-groups flowA node-device P1360-C
```

2. Set up two Interconnect devices for flowA:

```
set fabric flow-groups flowA interconnect-device IC-4892
set fabric flow-groups flowA interconnect-device IC4
```

Results

At this point, the software's Node devices preference settings for flow A are P2025-C and P1360-C, with the following Inteconnect device preferences for flowA:

- IC-4892: **high** (assigned to flowA)
- IC4: **high** (assigned to flowA)
- IC-F4908: **normal** (not assigned to any specific flow group and is available for backup)
- IC3: **normal** (not assigned to any specific flow group and available for backup)

> **NOTE:** Neither IC-F4908 or IC3 have been assigned yet, so they are both set to **normal** in flowA and are available for automatic backup. That will change with the next configuration—when flowB is configured, the IC-F4908 preference for flowA will automatically change.

Configure Flow Group flowB

Step-by-Step Procedure

1. Set up two Node devices for flowB:

```
set fabric flow-groups flowB node-device BBAK8822
set fabric flow-groups flowB node-device P1523-C
```

2. Set up one Interconnect device for flowB:

```
set fabric flow-groups flowB interconnect-device IC-F4908
```

Results

At this point, the software's Node device preference settings for flowB are BBAK8822 and P1523-C, with the following Interconnect device preferences for flowB:

- IC-F4908: **high** (assigned to flowB)
- IC4: **never** (assigned to another flow group, flowA)
- IC-4892: **never** (assigned to another flow group, flowA)
- IC3: **normal** (not assigned to any specific flow group and available for backup)

Also, now the software's Interconnect device preference settings for flowA have changed automatically as a result of assigning Internconnect device IC-F4908 to another flow group, flowB. At this point, the Interconnect device preference settings for flowA are as follows:

- IC-4892: **high** (assigned to flowA)
- IC4: **high** (assigned to flowA)
- IC-F4908: **never** (assigned to another flow group, flowB)
- IC3: **normal** (not assigned to any specific flow group and is available for backup)

> **TIP:** After an Interconnect device is explicitly assigned to a flow group, all other flow groups mark its preference for their flow as **never**.

Configure a Backup Interconnect-Device For FlowA (Optional)

Step-by-Step Procedure

The software sets Interconnect device preferences automatically—however, you can override this setting using the **preference** option of the **flow-groups** CLI statement. You might want to do this for backup reasons.

In this example, the TOR switch P2025-C will always use either Interconnect device IC-F4908 or IC4 because these Interconnect devices are configured for flow group flowA. After adding the optional preference override setting described here, if both Interconnect devices IC4 and IC-F4908 subsequently fail, the TOR switches in flowA will start using an available Interconnect device that is set to preference **normal**, instead of dropping traffic. This step overrides the TOR switch P1523-C preference for the Interconnect device IC-4892, changing it from **never** to **normal**, resulting in two Interconnect devices with preference setting **normal**—IC-4892 in flowB and IC3 in the default group.

1. Override the TOR switch P2025-C preference for the Interconnect device IC-4908, changing it from **never** to **normal**:

   ```
   set fabric flow-groups node-device P2025-C interconnect-device IC-4908
   preference normal
   ```

Results

At this point, the Interconnect device preference settings for the Node device P2025-C are as follows:

- IC-4892: **high** (assigned to flowA)
- IC4: **high** (assigned to flowA)
- IC-F4908: **normal** (by explicit preference configuration for Node device P2025-C)
- IC3: **normal** (not assigned to any specific flow group and available for backup)

The preference settings for the Node devices in flowB are the same as they were before you configured the Interconnect device preference override for the Node device P2025-C in flowA:

- IC-F4908: **high** (assigned to flowB)
- IC4: **never** (assigned to flowA)
- IC-4892: **never** (assigned to flowA)
- IC3: **normal** not assigned to any specific flow group and available for backup)

TIP: To see more reasons you might want to alter the software’s preference settings, see “Segregating QFabric Traffic Flows With Flow Groups” on page 490.

Results

Type **show fabric flow-groups** in configuration mode to see your configuration.

`root@qfabric#` **show fabric flow-groups**

```
flowA {
  node-device {
    P2025-C;
    P1360-C;
  }
  interconnect-device {
    IC-F4892;
    IC-4;
  }
}
flowB {
  node-device {
    P1523-C;
    BBAK8822;
  }
  interconnect-device {
    IC-F4908;
  }
}
node-device P2025-C {
  interconnect-device IC-F4908 {
    preference normal;
  }
}
```

Verification

Verifying Flow Groups

Purpose

Check to see if the INEs in a QFabric system recognize the flow groups.

Action

After configuring the flow groups, you can see if the preference configuration has taken effect by running the following command on any of the INEs in a QFabric system:

```
root@P2025-C> show fabric multicast vccpdf-adjacency
```

```
Flags: S - Stale

Src       Src      Src         Dest                                         Src    Dest   link
Dev id    INE      Dev type    Dev id    Interface              Flags      Port   Port
Preference
2         260      TOR         256       n/a                                 -1     -1
NORMAL
2         260      TOR         768       n/a                                 -1     -1
NORMAL
3         262      TOR         256       n/a                                 -1     -1
NORMAL
3         262      TOR         774       n/a                                 -1     -1
NORMAL
5         265(s)   TOR         257       fte-0/1/2.32768                     2      9      HIGH

256       256      F1_F3       2         n/a                                 -1     -1
NORMAL
```

RELATED DOCUMENTATION

Understanding QFabric Multicast Flow Groups | 53

Segregating QFabric Traffic Flows With Flow Groups | 490

QFabric System Overview | 2

CHAPTER 18

QFabric System Fabric OAM Configuration

IN THIS CHAPTER

Overview of Internal Fabric Monitoring

Internal fabric monitoring is a feature of the Operation, Administration, and Maintenance (OAM) of the QFabric system. This feature enables you to validate the flow path of protocol data units (PDUs) across a given VLAN on the QFabric system using the unicast ping, multicast ping, and traceroute operations.

Internal fabric monitoring is useful for fault detection on the QFabric system. For example, if a PDU reaches a destination that is not part of the VLAN configuration, the operation (unicast ping, multicast ping, or traceroute) displays the exception on the console at runtime.

The unicast and multicast ping operations send PDUs from a source interface (called the source fabric maintenance endpoint [FMEP]) to a destination FMEP. The destination FMEP sends a response to the source FMEP when the PDUs are received.

The traceroute operation, also called a flow linktrace, traces the path taken by a specific, learned unicast flow from a source FMEP to a destination FMEP in a VLAN. The source and destination FMEPs may be on the same Node device, different Node devices connected to the same Interconnect device, or different Node devices connected to different Interconnect devices. The flow path is the sequence of Packet Forwarding Engine forwarding hops along which the PDU travels. The hop-by-hop sequence and number of hops are reported in terms of fabric maintenance intermediate points (FMIPs), which are interfaces on the Packet Forwarding Engine of the Interconnect device. An FMIP sends a response to the source FMEP when the traceroute PDU is received.

The following internal fabric monitoring commands are supported:

- **show oam fabric flow specification**
- **show oam fabric interfaces**

- **ping fabric unicast-flow**
- **ping fabric multicast-flow**
- **traceroute fabric unicast-flow**

The following are the main components of the internal fabric monitoring feature:

- FMEP—Represents the source or destination point (endpoint) in the monitoring operations. An FMEP is an interface through which PDUs are sent (source FMEP) or received (destination FMEP). Upon receipt of the PDUs, the destination FMEP sends a response to the source FMEP to validate the monitoring flow. FMEPs are associated with a VLAN in the fabric maintenance association (FMA) configuration, and the source and destination FMEP addresses are configured in the flow specification.
- FMA—Associates a set of FMEPs with a VLAN. The FMA defines the VLAN and FMEP parameters, including the VLAN name, FMEP identifiers, FMEP names, and the interface names of the FMEPs. The FMEPs defined in the FMA are the source and destination FMEPs used in the monitoring commands.

> **NOTE:** A default FMA is automatically created for each Node group in the QFabric system. The default FMA is used to send error response PDUs (for example, in the case of a VLAN leak) and responses to PDUs that are not mapped to a specific interface in the QFabric system.

- Flow specification—Configures the flow type and FMEP addressing parameters. Unicast flow types include an Ethernet type (other than IPv4) and Ethernet IPv4. Multicast flow types include the Ethernet IPv4 and VLAN flood type. The flow specification also defines parameters within each flow type, such as MAC or IPv4 addresses of the source and destination FMEPs. The names and identifiers of these FMEPs are configured in the FMA parameters.

To enable internal fabric monitoring, configure the **fabric-maintenance-associations** and **flow-specs** statements at the **[edit protocols oam fabric]** hierarchy level.

The **ping fabric unicast-flow**, **ping fabric multicast-flow**, and **traceroute fabric unicast-flow** commands require that you specify the flow specification and FMA names, as well as the source and destination FMEP names.

RELATED DOCUMENTATION

Configuring a Fabric Maintenance Association | 502
Configuring Flow Specifications | 503
fabric (OAM) | 531
ping fabric multicast-flow | 650
ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

Configuring a Fabric Maintenance Association

On a QFabric system, enabling internal fabric monitoring using the ping and traceroute operations requires that a fabric maintenance association (FMA) be configured in addition to a flow specification. The FMA associates a particular VLAN with a set of source and destination interfaces called fabric maintenance endpoints (FMEPs) that are used for tracing the flow path between the endpoints. Configuration of the VLAN name is mandatory.

Before configuring the FMA, configure a VLAN name (and not a VLAN ID) for the VLAN in which the internal fabric monitoring occurs. If you already configured a VLAN ID instead of a VLAN name, you must first delete the VLAN ID and then specify and VLAN name before you configure the FMA.

> **NOTE:** Because each FMA and VLAN have a one-to-one correspondence, an FMA in each QFabric system must be given a unique name.

To configure an FMA:

1. Configure an FMA name that is unique within the QFabric system:

   [edit protocols oam fabric]
   user@host# **set fabric-maintenance-associations *fma-name***

2. (Optional) Configure the FMA description:

   [edit protocols oam fabric]
   user@host# **set fabric-maintenance-associations *fma-name* description *string***

3. Configure the VLAN name:

   [edit protocols oam fabric]
   user@host# **set fabric-maintenance-associations *fma-name* vlan-name *vlan-name***

4. Configure an FMEP, including the identifier, name, description, and associated interface:

   [edit protocols oam fabric]

```
user@host# set fabric-maintenance-associations fma-name fabric-maintenance-end-points fmep-id fmep-name
  name description string fmep-interface interface-name
```

5. Repeat Step 4 to configure additional FMEPs.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Configuring Flow Specifications | 503

fabric (OAM) | 531

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

Configuring Flow Specifications

IN THIS SECTION

On a QFabric system, enabling internal fabric monitoring using the ping and traceroute operations requires that a flow specification be configured in addition to a fabric maintenance association (FMA). A flow specification is used to determine the contents of the packet that is used for a particular operation. For example, an Ethernet type flow specification describes the contents of a pure Layer 2 packet, whereas an Ethernet IPv4 type flow specification describes an Ethernet IPv4 packet.

> **NOTE:** In the flow specification configuration, some parameters are optional. If you do not configure the optional parameters, the system generates random values that are used as PDU contents.

In order to replicate actual traffic behavior, internal fabric monitoring requires that the following flow specification fields be filled with the same values as the traffic packets:

- Unicast Ethernet—Source MAC address, destination MAC address, Ethertype
- Unicast IPv4—Source IP address, destination IP address, source L4 port, destination L4 port, destination MAC address

The configuration for each flow specification type includes parameters specific to that particular type. Use one of the following procedures to configure the flow specification for your flow type:

Configuring a Unicast Ethernet Flow Specification

This procedure describes how to configure a flow specification for a unicast Ethernet flow type. This configuration is applicable for the unicast ping and traceroute operations.

> **NOTE:** Some parameters are optional. If you do not configure the optional parameters, the system generates random values that are used as PDU contents.
>
> In order to replicate actual traffic behavior, internal fabric monitoring requires that the following flow specification fields be filled with the same values as the traffic packets: source MAC address, destination MAC address, and Ethertype.

To configure a unicast Ethernet flow specification:

1. Configure a flow specification name:

```
[edit protocols oam fabric]
user@host# set flow-specs flow-specification-name
```

2. (Optional) Set the Ethernet frame size:

```
[edit protocols oam fabric]
user@host# set ethernet-frame-size ethernet-frame-size
```

3. Set the flow specification type as unicast Ethernet and specify the EtherType:

```
[edit protocols oam fabric flow-specs flow-specification-name]
user@host# set unicast-ethernet ethertype ethertype
```

4. (Optional) Set the MAC address and the MAC address range of the source FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet]
user@host# set source-mac source-mac-address source-mac-mask source-mac-mask
```

> **NOTE:** Configuration of the **source-mac** and **source-mac-mask** parameters is optional, but the **source-mac-mask** parameter can be specified only if the **source-mac** parameter is also configured.

5. (Optional) Set the MAC address or address range mask for the destination FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet]
user@host# set destination-mac destination-mac-address destination-mac-mask destination-mac-mask
```

> **NOTE:** Configuration of the **destination-mac** and **destinastion-mac-mask** parameters is optional, but the **destination-mac-mask** parameter can be specified only if the **destination-mac** parameter is also configured.

Configuring a Unicast Ethernet IPv4 Flow Specification

This procedure describes how to configure a flow specification for a unicast Ethernet IPv4 flow type. This configuration is applicable for the unicast ping and traceroute operations.

> **NOTE:** All parameters except the flow specification name are optional. If you do not configure the optional parameters, the system generates random values that are used as PDU contents.
>
> In order to replicate actual traffic behavior, internal fabric monitoring requires that the following flow specification fields be filled with the same values as the traffic packets: source IP address, destination IP address, source L4 port, destination L4 port, destination MAC address.

To configure a unicast Ethernet IPv4 flow specification:

1. Configure a flow specification name:

   ```
   [edit protocols oam fabric]
   user@host# set flow-specs flow-specification-name
   ```

2. (Optional) Set the Ethernet frame size:

   ```
   [edit protocols oam fabric flow-specs flow-specification-name]
   user@host# set ethernet-frame-size size
   ```

3. Set the flow specification type as unicast Ethernet IPv4:

   ```
   [edit protocols oam fabric flow-specs flow-specification-name]
   user@host# set unicast-ethernet-ipv4
   ```

4. (Optional) Set the IPv4 address or the address range of the source FMEP:

   ```
   [edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
   user@host# set source-ip source-ip-address
   ```

   or

   ```
   [edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
   user@host# set source-ip-mask source-ip-mask
   ```

5. (Optional) Set the IPv4 address or the address range of the destination FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
user@host# set destination-ip destination-ip-address
```

or

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
user@host# set destination-ip-mask destination-ip-mask
```

6. (Optional) Set the IPv4 protocol type:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
user@host# ip-proto protocol
```

7. (Optional) Set the L4 port (TCP or UDP port number) of the source FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
user@host# source-l4-port source-l4-port-number
```

8. (Optional) Set the L4 port of the destination FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name unicast-ethernet-ipv4]
user@host# destination-l4-port destination-l4-port-number
```

Configuring a Multicast IPv4 Flow Specification

This procedure describes how to configure a flow specification for a multicast IPv4 flow type.

> **NOTE:** Some parameters are optional. If you do not configure the optional parameters, the system generates random values that are used as PDU contents.

To configure a multicast IPv4 flow specification:

1. Configure a flow specification name:

```
[edit protocols oam fabric]
```

```
user@host# set flow-specs flow-specification-name
```

2. Set the flow specification type as multicast IPv4:

```
[edit protocols oam fabric flow-specs flow-specification-name]
user@host# set multicast-ipv4
```

3. (Optional) Set the IPv4 address of the source FMEP:

```
[edit protocols oam fabric flow-specs flow-specification-name multicast-ipv4]
user@host# set source-ip ipv4-address
```

4. Set the IPv4 multicast group address:

```
[edit protocols oam fabric flow-specs flow-specification-name multicast-ipv4]
user@host# set dest-ip-multicast-group ipv4-mcast-address
```

Configuring a Multicast VLAN Flood Flow Specification

This procedure describes how to configure a flow specification for a multicast VLAN flood flow type.

To configure a multicast VLAN flood flow specification:

1. Configure a flow specification name:

```
[edit protocols oam fabric]
user@host# set flow-specs flow-specification-name
```

2. Set the flow specification type as multicast VLAN flood:

```
[edit protocols oam fabric flow-specs flow-specification-name]
user@host# set multicast-vlan-flood
```

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Example: Configuring Internal Fabric OAM Monitoring

IN THIS SECTION

This example shows how to configure the internal fabric Operation, Administration, Maintenance (OAM) monitoring feature on the QFabric system, including the fabric maintenance association (FMA) and flow specifications for unicast Ethernet traffic.

Internal fabric monitoring enables you to validate the flow path of protocol data units (PDUs) across a given VLAN on the QFabric system using the ping operation.

Internal fabric monitoring is useful for fault detection on the QFabric system. For example, if a PDU reaches a destination that is not part of the VLAN configuration, the ping operation displays the exception on the console at runtime.

Requirements

This example uses the following hardware and software components:

- One QFabric system with the following components:
  - A Director group (two Director devices)
  - Two QFabric system Interconnect devices
  - Node devices, including:
    - One Node device (Node-81) configured in a default network Node group (NNW-NG-0)

- One Node device (Node-80) in an autogenerated server Node group (SNG-80)
- Two Node devices (Node-83 and Node-84) configured in a redundant server Node group (RSNG-8384)

- Junos OS Release 12.2 or later

Before you configure the FMA, first configure a VLAN in which the internal fabric OAM monitoring occurs. You can usually configure a VLAN by specifying a VLAN ID or VLAN name. However, in the case of the VLAN used for internal fabric OAM monitoring, you must specify a VLAN name (not a VLAN ID). The FMA configuration requires a VLAN name and not a VLAN ID.

If you have already configured a VLAN ID for the VLAN, you must delete the VLAN ID from the associated interfaces and then add a VLAN name.

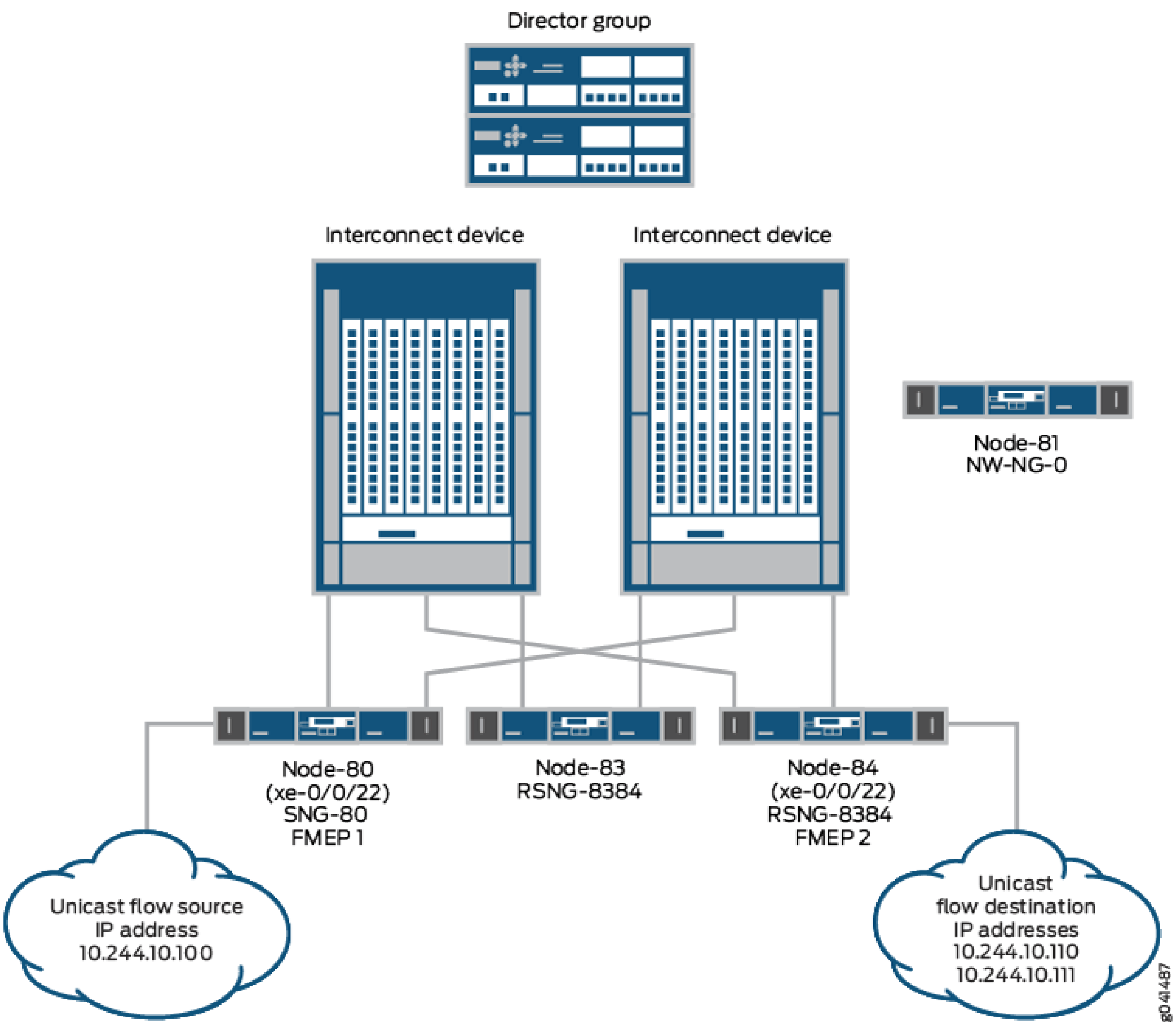
Overview

On a QFabric system, enabling internal fabric OAM monitoring requires that you configure an FMA and a flow specification.

- The *FMA* associates a particular VLAN with a set of source and destination interfaces called fabric maintenance endpoints (FMEPs) that are used for tracing the data path between the endpoints. Configuration of the VLAN name is mandatory when you configure an FMA.
- A *flow specification* is used to determine the contents of a packet that is used for a particular operation. For example, an Ethernet type flow specification describes the contents of a pure Layer 2 packet, whereas an Ethernet IPv4 type flow specification describes an Ethernet IPv4 packet.

Topology

This example uses the following topology:



- The QFabric system Node devices are connected to the Interconnect devices.
- Node device Node-80 is configured in the server Node group SNG-80.
- Node devices Node-83 and Node-84 are configured in a redundant server Node group RSNG-8384.
- The device with the unicast flow source IP address is connected to Node-80.
- The device with the unicast flow destination IP addresses is connected to Node-84.

Table 100 on page 512 maps the association of the fabric OAM elements configured in this example.

Table 100: Fabric OAM Configuration Elements

Interface	FMA	VLAN Name	FMEP ID	Flow Specifications
Node-80:xe-0/0/22	fma1	v10	1	• flowspec1 • flowspec2
Node-84:xe-0/0/22	fma1	v10	2	• flowspec1 • flowspec2

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set vlans v10 vlan-id 10
set interfaces Node-80:xe-0/0/22 unit 0 family ethernet-switching vlan members v10
set interfaces Node-84:xe-0/0/22 unit 0 family ethernet-switching vlan members v10
set protocols oam fabric fabric-maintenance-associations fma1 vlan-name v10
set protocols oam fabric fabric-maintenance-associations fma1 fabric-maintenance-end-points 1 fmep-interface
  Node-80:xe-0/0/22.0
set protocols oam fabric fabric-maintenance-associations fma1 fabric-maintenance-end-points 2 fmep-interface
  Node-84:xe-0/0/22.0
set protocols oam fabric flow-specs flowspec1 unicast-ethernet-ipv4 source-ip 10.244.10.100
set protocols oam fabric flow-specs flowspec1 unicast-ethernet-ipv4 destination-ip 10.244.10.110
set protocols oam fabric flow-specs flowspec1 unicast-ethernet-ipv4 destination-mac 00:00:80:8d:2d:15
set protocols oam fabric flow-specs flowspec1 unicast-ethernet-ipv4 source-l4-port 60
set protocols oam fabric flow-specs flowspec1 unicast-ethernet-ipv4 destination-l4-port 80
set protocols oam fabric flow-specs flowspec2 unicast-ethernet-ipv4 source-ip 10.244.10.100
set protocols oam fabric flow-specs flowspec2 unicast-ethernet-ipv4 destination-ip 10.244.10.111
set protocols oam fabric flow-specs flowspec2 unicast-ethernet-ipv4 destination-mac 00:00:80:8d:2d:17
set protocols oam fabric flow-specs flowspec2 unicast-ethernet-ipv4 source-l4-port 60
set protocols oam fabric flow-specs flowspec2 unicast-ethernet-ipv4 destination-l4-port 80
```

Step-by-Step Procedure

To configure internal fabric OAM monitoring:

1. Configure a name and ID for the VLAN.

   ```
   [edit]
   set vlans v10 vlan-id 10
   ```

2. Assign a set of interfaces to the VLAN.

```
[edit]
set interfaces Node-80:xe-0/0/22 unit 0 family ethernet-switching vlan members v10
set interfaces Node-84:xe-0/0/22 unit 0 family ethernet-switching vlan members v10
```

3. Define the FMA and associate it with a VLAN name.

```
[edit protocols oam fabric]
set fabric-maintenance-associations fma1 vlan-name v10
```

4. Configure FMEPs for the FMA.

```
[edit protocols oam fabric]
set fabric-maintenance-associations fma1 fabric-maintenance-end-points 1 fmep-interface
  Node-80:xe-0/0/22.0
set fabric-maintenance-associations fma1 fabric-maintenance-end-points 2 fmep-interface
  Node-84:xe-0/0/22.0
```

5. Configure two IPv4 flow specifications for unicast traffic from FMEP 1 to FMEP 2.

```
[edit protocols oam fabric]
set flow-specs flowspec1 unicast-ethernet-ipv4 source-ip 10.244.10.100
set flow-specs flowspec1 unicast-ethernet-ipv4 destination-ip 10.244.10.110
set flow-specs flowspec1 unicast-ethernet-ipv4 destination-mac 00:00:80:8d:2d:15
set flow-specs flowspec1 unicast-ethernet-ipv4 source-l4-port 60
set flow-specs flowspec1 unicast-ethernet-ipv4 destination-l4-port 80
set flow-specs flowspec2 unicast-ethernet-ipv4 source-ip 10.244.10.100
set flow-specs flowspec2 unicast-ethernet-ipv4 destination-ip 10.244.10.111
set flow-specs flowspec2 unicast-ethernet-ipv4 destination-mac 00:00:80:8d:2d:17
set flow-specs flowspec2 unicast-ethernet-ipv4 source-l4-port 60
set flow-specs flowspec2 unicast-ethernet-ipv4 destination-l4-port 80
```

Results

Display the results of the configuration.

`root@qfabric>` **show protocols oam fabric**

```
fabric-maintenance-associations {
    fma1 {
```

```
        vlan-name v10;
        fabric-maintenance-end-points {
            1 {
                fmep-interface Node-80:xe-0/0/22.0;
            }
            2 {
                fmep-interface Node-84:xe-0/0/22.0;
            }
        }
    }
}
flow-specs {
    flowspec1 {
        unicast-ethernet-ipv4 {
            source-ip 10.244.10.100;
            destination-ip 10.244.10.110;
            destination-mac 0:0:80:8d:2d:15;
            source-l4-port 60;
            destination-l4-port 80;
        }
    }
    flowspec2 {
        unicast-ethernet-ipv4 {
            source-ip 10.244.10.100;
            destination-ip 10.244.10.111;
            destination-mac 0:0:80:8d:2d:17;
            source-l4-port 60;
            destination-l4-port 80;
        }
    }
}
```

Verification

IN THIS SECTION

Confirm that the configuration is working properly.

Verifying Configuration of Fabric OAM Interfaces

Purpose

Verify that the interfaces are associated with the FMA.

Action

Display the fabric OAM interfaces.

`root@qfabric>` **show oam fabric interfaces**

```
Interface-name      Fabric-Maintenance     VLAN    Interface      MEP         MEP
                     Association                     state      Identifier    Name
NW-NG-0:NULL         fma-default           *         up           32790
fmep-default-BBAK8793
NW-NG-0:NULL         fma-default           *         up           32791
fmep-default-BBAK8798
RSNG-8384:NULL       fma-default           *         up           32794
fmep-default-BBAK8748
RSNG-8384:NULL       fma-default           *         up           32795
fmep-default-BBAK0465
Node-84:xe-0/0/22.0  fma1                  V10       up           2
SNG-60:NULL          fma-default           *         up           32793
fmep-default-BBAK9603
SNG-80:NULL          fma-default           *         up           32792
fmep-default-BBAK8728
Node-80:xe-0/0/22.0  fma1                  V10       up           1
```

Meaning

Interfaces Node-84:xe-0/0/22.0 and Node-80:xe-0/0/22.0 are associated with the FMA, FMEP, and VLAN as configured.

Interfaces that are not configured for fabric OAM monitoring (NW-NG-0:NULL, RSNG-8384:NULL, SNG-60:NULL, and SNG-80:NULL) display an asterisk (*) in the VLAN column, and the default FMA and FMEP names in the Fabric-Maintenance Association and MEP Name columns.

Verifying Configuration of the Fabric OAM Flow Specification

Purpose

Verify the configuration of the flow specifications.

Action

Display the fabric OAM flow specification configuration.

`root@qfabric>` **show oam fabric flow-specification**

```
Flow specification name  : flowspec1 Type : Ethernet Unicast IPV4
     Ethernet frame size  : Unspecified
     Source-IP  : 10.244.10.100
     Source-IP Mask : Unspecified
     Destination-IP  : 10.244.10.110
     Destination-IP Mask : Unspecified
     Destination-mac : 0:0:80:8d:2d:15
     IP-protocol : Unspecified
     Source-L4-port : 60
     Destination-L4-port : 80
 Flow specification name  : flowspec2 Type : Ethernet Unicast IPV4
     Ethernet frame size  : Unspecified
     Source-IP  : 10.244.10.100
     Source-IP Mask : Unspecified
     Destination-IP  : 10.244.10.111
     Destination-IP Mask : Unspecified
     Destination-mac : 0:0:80:8d:2d:17
     IP-protocol : Unspecified
     Source-L4-port : 60
     Destination-L4-port : 80
```

Meaning

The output shows that flow specifications were configured as the user intended.

Verifying Operation of the Unicast ping Command

Purpose

Verify that the fabric OAM unicast **ping** command works.

Action

Issue the **ping fabric unicast-flow** command.

`root@qfabric>` **ping fabric unicast-flow source-fmep-id 1 dest-fmep-id 2 flow-spec-name flowspec1 fma-name fma1 count 3**

```
Fabric flow ping between source Node-80 destination Node-84
received response from fmep-id 2...
received response from fmep-id 2...
received response from fmep-id 2...
```

```
sent 3 requests, received 3 responses

root@qfabric> ping fabric unicast-flow source-fmep-id 1 dest-fmep-id 2 fma-name
fma1 flow-spec-name flowspec2
Fabric flow ping between source Node-80 destination Node-84
received response from fmep-id 2...
sent 1 requests, received 1 responses
```

Meaning

The fabric OAM unicast ping request from the source Node device (Node-80) to the destination Node device (Node-84) has been successful.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

fabric-maintenance-associations | 534

fabric-maintenance-end-points | 536

flow-specs | 547

show oam fabric flow-specification | 880

show oam fabric interfaces | 884

CHAPTER 19

Configuration Statements

IN THIS CHAPTER

aliases

Syntax

```
aliases {
  director-device director-device-name {
    assigned-director-device-name;
  }
  interconnect-device interconnect-device-name {
    assigned-interconnect-device-name;
  }
  node-device node-device-name {
    assigned-node-device-name;
  }
```

Hierarchy Level

```
[edit fabric]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.
Options **director-group** and **interconnect-device** introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Specify the mapping of user defined names to QFabric system components. You can reassign names for Director devices, Interconnect devices, and Node devices.

The remaining statements are explained separately. See CLI Explorer.

NOTE: The following rules apply to QFabric component alias naming:

- Alias names must use alphabetic (A through Z and a through z), numeric (0 through 9), or dash (-) characters.
- The maximum length of an alias name is 30 characters.
- Alias names are case sensitive. For example, MY-NG-1 and my-ng-1 refer to different components.
- You cannot use the reserved names **all**, **fabric**, or **director-group** as an alias name.

Required Privilege Level

admin—To view this statement in the configuration.

admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Aliases for the QFabric System | 452
Understanding Node Devices | 31

archive (QFabric System)

Syntax

```
archive {
    size size;
}
```

Hierarchy Level

```
[edit system syslog file filename]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure the archiving properties for the system message log file.

Options

size *size*—Maximum amount of system log message data that the QFabric system stores in the log file.

Syntax: *x*k to specify the number of kilobytes, *x*m for the number of megabytes, or *x*g for the number of gigabytes

Range: 65 KB through 1 GB

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

syslog | 581

chassis (QFabric System)

Syntax

```
chassis {
  interconnect-device {
    alarm {
      (ethernet (Alarm) | management-ethernet) {
        link-down (red | yellow | ignore);
      }
    }
    container-devices {
      device-count number;
    }
    craft-lockout {
      alarm {
        interface-type {
          link-down (red | yellow | ignore);
        }
      }
      container-devices {
        device-count number;
      }
      fpc slot {
        power (on | off);
      }
      routing-engine {
        on-disk-failure {
          disk-failure-action (halt | reboot);
        }
      }
    }
    fpc slot {
      power (on | off);
    }
    routing-engine {
      on-disk-failure {
        disk-failure-action (halt | reboot);
      }
    }
  }
  node-group name {
    aggregated-devices {
      ethernet {
        device-count number;
```

```
            }
        }
        alarm {
            interface-type {
                link-down (ignore | red | yellow);
            }
        }
        container-devices {
            device-count number;
        }
        node-device name {
            fibre-channel {
                port-range {
                    port-range-low port-range-high;
                }
            }
            pic pic-number {
                fte {
                    port port-number;
                    port-range port-range-low port-range-high;
                }
                xe {
                    port port-number;
                    port-range port-range-low port-range-high;
                }
                xle {
                    port port-number;
                    port-range port-range-low port-range-high;
                }
            }
        }
        routing-engine {
            on-disk-failure {
                disk-failure-action (halt | reboot);
            }
        }
    }
}
```

Hierarchy Level

```
[edit]
```

Release Information

Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description

Configure chassis-specific properties for the switch.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

device-authentication

Syntax

```
device-authentication {
    (encrypted-password "password" | plain-text-password);
}
```

Hierarchy Level

```
[edit system]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the authentication password used when accessing individual QFabric system components with the **request component login** command.

> **NOTE:** Configuring this statement overrides the password for individual QFabric system components that was set during the initial QFabric system setup procedure.

Options

encrypted-password "*password*"— Specify the MD5 or other encrypted authentication password. You can specify only one encrypted password.

You cannot configure a blank password for the **encrypted-password** option using blank quotation marks (" "). You must configure a password of 1 through 128 characters and enclose the password in quotation marks.

plain-text-password—Plain-text password. The CLI prompts you for the password and then encrypts it. The CLI displays the encrypted version, and the software places the encrypted version in its user database. You can specify only one plain-text password.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

director-device (Aliases)

Syntax

```
director-device director-device-name {
    assigned-director-device-name;
}
```

Hierarchy Level

```
[edit fabric aliases]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Specify the mapping of user-defined names to QFabric system Director devices.

> **NOTE:** The following rules apply to QFabric component alias naming:
>
> - Alias names must use alphabetic (**A** through **Z** and **a** through **z**), numeric (**0** through **9**), or dash (**-**) characters.
> - The maximum length of an alias name is 30 characters.
> - Alias names are case sensitive. For example, **MY-NG-1** and **my-ng-1** refer to different components.
> - You cannot use the reserved names **all**, **fabric**, or **director-group** as an alias name.

Options

director-device-name—Specify a user-defined name for a QFabric system Director device.

assigned-director-device-name—Specify the Director device identifier or name that has been provided. Identifiers are usually auto-generated by the Director software, and names are usually provided by the administrator of the default partition.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

ethernet-frame-size

Syntax

```
ethernet-frame-size ethernet-frame-size;
```

Hierarchy Level

```
[edit protocols oam fabric flow-specs flow-specification-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the Ethernet frame size in the flow specification parameters for internal fabric monitoring.

Options

ethernet-frame-size—Integer defining the size (in bytes) of the Ethernet frame.

Range: 256 to 9116 bytes

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

fabric

Syntax

```
fabric
  aliases {
    director-device director-device-name {
      assigned-director-device-name;
    }
    interconnect-device interconnect-device-name {
      assigned-interconnect-device-name;
    }
    node-device node-device-name {
      assigned-node-device-name;
    }
  }
  flow-groups {
    flow-group-name {
      node-device (node-device-name | serial-ID | alias);
      interconnect-device interconnect-device-name;
    }
    node-device (node-device-name | serial-ID | alias) {
      interconnect-device interconnect-device- name {
        preference (high | normal | never);
      }
    }
  }
  protocols {
    fabric-control {
      graceful-restart {
        restart-timeseconds;
        stale-routes-time seconds;
      }
    }
  }
  resources {
    node-group node-group-name {
      node-device node-device-name;
      network-domain;
    }
  }
}
```

Hierarchy Level

```
[edit]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Define resources, routing options, fabric control protocol settings, and the mapping of user-defined names to QFabric system components.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

show fabric administration inventory | 839
Understanding QFabric System Administration Tasks and Utilities | 435

fabric (OAM)

Syntax

```
fabric {
    fabric-maintenance-associations {
        fma-name {
            description string;
            fabric-maintenance-end-points {
                fmep-id {
                    description string;
                    fmep-interface interface-name;
                    fmep-name name;
                }
            }
            vlan-name vlan-name;
        }
    }
    flow-specs {
        flow-specification-name {
            ethernet-frame-size size;
            multicast-ipv4 {
                dest-ip-multicast-group ipv4-mcast-address;
                source-ip ipv4-address;
            }
            multicast-vlan-flood;
            unicast-ethernet {
                destination-mac destination-mac-address destination-mac-mask destination-mac-mask;
                ethertype ethertype;
                source-mac mac-address source-mac-mask source-mac-mask;
            }
            unicast-ethernet-ipv4 {
                destination-ip destination-ip-address destination-ip-mask destination-ip-mask;
                destination-l4-port destination-l4-port-number;
                destination-mac destination-mac-address;
                ip-proto protocol;
                source-ip source-ip-address source-ip-mask source-ip-mask;
                source-l4-port source-l4-port-number;
            }
        }
    }
    faboam-trace-options {
        file filename{
            files number;
            no-stamp;
```

```
        no-world-readable;
        replace;
        size size;
        world-readable;
      }
      flag {
        all;
        debug-all;
        ffping;
        generic;
        netio;
        packets;
        trace-route;
      }
    }
  }
```

Hierarchy Level

```
[edit protocols oam]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the fabric maintenance association (FMA) and flow specification parameters for internal fabric monitoring.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Configuring a Fabric Maintenance Association | 502

Configuring Flow Specifications | 503

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

fabric-control

Syntax

```
fabric-control {
  graceful-restart {
    restart-timeseconds;
    stale-routes-time seconds;
  }
}
```

Hierarchy Level

```
[edit fabric protocols]
```

Release Information

Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description

Specify attributes for the fabric control protocol.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Routing Engines in the QFabric System | 25

fabric-maintenance-associations

Syntax

```
fabric-maintenance-associations {
    fma-name {
        description string;
        fabric-maintenance-end-points {
            fmep-id {
                description string;
                fmep-interface interface-name;
                fmep-name name;
            }
        }
        vlan-name vlan-name;
    }
}
```

Hierarchy Level

```
[edit protocols oam fabric]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the fabric maintenance association (FMA) parameters for internal fabric monitoring. The FMA defines a set of QFabric system interfaces (fabric maintenance endpoints [FMEPs]) that are members of a given VLAN which are used in internal fabric monitoring operations. The FMA associates the set of FMEPs with a VLAN. Configuration of the VLAN is mandatory.

The remaining statements under this hierarchy level are explained separately.

Options

description *string*—Description of the FMA.

Syntax: 1 to 128 alphanumeric characters

fma-name—Name of the FMA.

Syntax: 1 to 20 alphanumeric characters

vlan-name *vlan-name*—Name of the VLAN for which the FMA is defined.

NOTE: Configuring the VLAN option is mandatory.

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Configuring a Fabric Maintenance Association | 502

Configuring Flow Specifications | 503

fabric (OAM) | 531

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

fabric-maintenance-end-points

Syntax

```
fabric-maintenance-end-points {
    fmep-id {
        description string;
        fmep-interface interface-name;
        fmep-name name;
    }
}
```

Hierarchy Level

```
[edit protocols oam fabric fabric-maintenance-associations fma-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the fabric maintenance association endpoint (FMEP) parameters within a fabric maintenance association (FMA). The FMA associates the FMEP with a VLAN for purposes of internal fabric monitoring.

Options

description *string*—Description of the FMEP.

Syntax: 1 to 128 alphanumeric characters

fmep-id—32-bit integer that is used to identify an FMEP.

Range: 1 to 64,000

fmep-name *name*—Name of the fabric maintenance association endpoint.

Syntax: 1 to 20 alphanumeric characters

fmep-interface *interface-name*—Interface on a QFabric system Node device.

Syntax: *node-device-name*:*interface-type-fpc/pic/slot.unit*

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

file (QFabric System)

Syntax

```
file filename {
    archive {
        size maximum-file-size;
    }
    explicit-priority;
    facility severity;
    match "regular-expression";
    structured-data {
        brief;
    }
}
```

Hierarchy Level

```
[edit system syslog]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure the logging of system messages to a file.

Options

facility—Class of messages to log. To specify multiple classes, include multiple ***facility severity*** statements.

filename—Filename that you specify with the **show log** command.

Default: Filename **messages**

severity—Severity of the messages that belong to the facility specified by the paired *facility* name. Messages with severities at the specified level and higher are logged.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

flow-groups

Syntax

```
flow-groups {
    flow-group-name {
        node-device (node-device-name | serial-ID | alias);
        interconnect-device interconnect-device-name;
    }
    node-device (node-device-name | serial-ID | alias) {
        interconnect-device interconnect-device- name {
            preference (high | normal | never);
        }
    }
}
```

Hierarchy Level

```
[edit fabric]
```

Release Information

Statement introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In a QFabric system, a hash function is used to select an Interconnect device to forward traffic between two ingress switches, which are called Node devices. Since this hash function is performed on all Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. Some operations, such as financial transactions, require redundant data flows to use different Interconnect devices to avoid point-of-failure data loss. To enforce this in a fabric, you can create a flow group for multicast or unicast traffic from a particular ingress switch. In a flow group, switches are forced to use different, specified Interconnect devices to forward redundant traffic.

NOTE: The following rules apply to QFabric system flow control:

- A Node device can belong to only one flow group.
- A fabric can contain up to four flow groups.
- Node devices in flow groups can only use the defined Interconnect devices in their flow groups unless all defined Interconnect devices fail. In case of failure, the flow group checks for Interconnect devices with preference set to **normal**—this includes all Interconnect devices in the default group and any Interconnect devices you specifically set to preference **normal**.

The following example creates a flow group. The name of the flow group, test1, is configured first. Next, the Node device TA3713480203 is configured, and the Interconnect device IC-P6603-C is configured last.

```
[edit fabric]
root@qfabric#  set flow-groups ?
Possible completions:
<flow group name>                  Flow Group name
+ apply-groups                     Groups from which to inherit configuration data
+ apply-groups-except             Don't inherit configuration data from these groups

> node-device                      Override the link preference for Node device(s)

root@qfabric#  set flow-groups test1 ?
Possible completions:
+ apply-groups                      Groups from which to inherit configuration data
+ apply-groups-except              Don't inherit configuration data from these groups
> interconnect-device               Interconnect device(s) associated with this flow
group
> node-device                       Node device(s) associated with this flow group

root@qfabric#  set flow-groups test1 node-device ?

Possible completions:
<node-device-name> Serial ID or alias of node-device
P3686-C                       Node device
TA3713480203                  Node device
TA3713500165                  Node device
TA3713500185                  Node device
TA3713500307                  Node device

root@qfabric# set flow-groups test1 node-device TA3713480203 ?
Possible completions:
<Enter>                           Execute this command
+ apply-group                     Groups from which to inherit configuration data
+ apply-groups-except             Don't inherit configuration data from these groups
|                                 Pipe through a command

root@qfabric# set fabric flow-groups test1 node-device TA3713480203

root@qfabric# set flow-groups test1 interconnect-device ?
Possible completions:
<interconnect-device-name>  Serial ID or alias of interconnect-device
IC-P6601-C                  Interconnect device
IC-P6603-C                  Interconnect device
```

```
root@qfabric# set flow-groups test1 interconnect-device IC-P6603-C
root@qfabric# show flow-groups
test1 {
    node-device {
        TA3713480203;
    }
    interconnect-device {
        IC-P6603-C;
    }
}
```

The following example overrides the software settings the flow group test1 Node device TA3713500307 was assigned by the software for Interconnect device IC-P6601-C. Node device TA3713500307 has its preference for Interconnect device IC-P6601-C set to **never** by the software, meaning that Node device TA3713500307 can never use Interconnect device IC-P6601-C. You can change this preference so that Interconnect device IC-P6601-C can be used by Node device TA3713500307 if the specifically-configured Interconnect devices all fail. You use the preference option of the **flow-groups** configuration statement to set Interconnect device IC-P6601-C preference to **normal** for Node device TA3713500307.

To configure the preference setting for a Node device to use a particular Interconnnect device, you first select the Node device, then specify the Interconnect device, and finally specify the preference option:

```
[edit fabric]
root@qfabric# set flow-groups ?

Possible completions:
<flow-group name>          Flow Group name
+ apply-groups             Groups from which to inherit configuration data
+ apply-groups-except      Don't inherit configuration data from these groups >
node-device            Override the link preference for Node device(s)
test1                      Flow Group name

root@qfabric# set flow-groups node-device ?

Possible completions:
<name> serial ID or alias of node-device
P3686-C                     Node device
TA3713480203                Node device
TA3713500185                Node device
TA3713500307                Node device

root@qfabric# set fabric flow-groups node-device TA3713500307 ?
Possible completions:
+ apply-groups            Groups from which to inherit configuration data
+ apply-groups-except     Don't inherit configuration data from these groups
interconnect device

root@qfabric# set fabric flow-groups node-device TA3713500307 interconnect-device ?
Possible completions:
<name>                   Serial ID or alias of interconnect-device
 IC-P6601-C               Interconnect device
 IC-P6603-C               Interconnect device

root@qfabric# set fabric flow-groups node-device TA3713500307 interconnect-device
IC-P6601-C
preference ?
Possible completions:
  high                         High link preference
  never                        Never use this link
  normal                       Normal link reference

root@qfabric# set fabric flow-groups node-device TA3713500307 interconnect-device
IC-P6601-C preference never

root@qfabric# show fabric flow-groups
test1 {
```

```
    node-device {
        TA3713480203;
    }
    interconnect-device {
        IC-P6603-C;
    }
}
node-device TA3713500307 {
    interconnect-device IC-P6601-C {
        preference never;
    }
}
```

TIP: To add a TOR to multiple flow groups:
set fabric resources node-device TOR-B interconnect-device IC-A preference HIGH
To configure a TOR to use an Interconnect device from a different flow group if none in the same flow group are available:
set fabric resources node-device TOR-B interconnect-device IC-A preference NORMAL
To increase the priority of default-flowgroup Interconnect devices for a specific TOR:
set fabric resources node-device TOR-A interconnect-device ALL_ICS preference HIGH
To configure default-flowgroup TORs to never use a particular Interconnect device:
Set fabric resources node-device ALL_TORS interconnect-device IC-A preference NEVER

Options

node-device *node-device-name* —Specify a QFabric system ingress Node switch by device name or alias in the QFabric system.

interconnect-device *interconnect-device-name*—Specify a QFabric system Interconnect device name.

preference *preference*—Overrides the algorithm results that assign preference to Node devices to use particular Interconnect devices. You can set preference values for these devices to **normal**, **high**, or **never**. (See "Example: Creating a QFabric Flow Group" on page 492 for more details on setting **preference** values and their meanings.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Example: Creating a QFabric Flow Group | 492

Understanding QFabric Multicast Flow Groups | 53

Segregating QFabric Traffic Flows With Flow Groups | 490

flow-specs

Syntax

```
flow-specs {
    flow-specification-name {
        ethernet-frame-size ethernet-frame-size;
        multicast-ipv4 {
            dest-ip-multicast-group ipv4-mcast-address;
            source-ip ipv4-address;
        }
        multicast-vlan-flood;
        unicast-ethernet {
            destination-mac destination-mac-address destination-mac-mask destination-mac-mask;
            ethertype ethertype;
            source-mac mac-address source-mac-mask source-mac-mask;
        }
        unicast-ethernet-ipv4 {
            destination-ip destination-ip-address destination-ip-mask destination-ip-mask;
            destination-l4-port destination-l4-port-number;
            destination-mac destination-mac-address;
            ip-proto protocol;
            source-ip source-ip-address source-ip-mask source-ip-mask;
            source-l4-port source-l4-port-number;
        }
    }
}
```

Hierarchy Level

```
[edit protocols oam fabric]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the fabric flow specification parameters for internal fabric monitoring. The following conditions apply:

- You must specify a protocol type for each flow specification: **unicast-ethernet**, **unicast-ethernet-ipv4**, **multicast-ipv4**, or **multicast-vlan-flood**.
- You can specify only one type for each flow specification.
- All other parameters are optional.

The remaining statements under this hierarchy level are explained separately.

Options

flow-specification-name—Name of the flow specification.

Syntax: 1 to 20 alphanumeric characters

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | **500**
Configuring a Fabric Maintenance Association | **502**
Configuring Flow Specifications | **503**
fabric (OAM) | **531**
ping fabric multicast-flow | **650**
ping fabric unicast-flow | **652**
traceroute fabric unicast-flow | **888**

graceful-restart (Enabling Globally)

Syntax

```
graceful-restart {
    disable;
    helper-disable;
    maximum-helper-recovery-time seconds;
    maximum-helper-restart-time seconds;
    notify-duration seconds;
    recovery-time seconds;
    restart-duration seconds;
    stale-routes-time seconds;
}
```

Hierarchy Level

```
[edit logical-systems logical-system-name routing-options],
[edit logical-systems logical-system-name routing-instances routing-instance-name routing-options],
[edit routing-options],
[edit routing-instances routing-instance-name routing-options]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 12.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

You configure the graceful restart routing option globally to enable the feature, but not to enable graceful restart for all routing protocols in a routing instance. To enable graceful restart globally, include the graceful-restart statement under the **[edit routing options]** hierarchy level. This enables graceful restart globally for all routing protocols. You can, optionally, modify the global settings at the individual protocol level.

NOTE:

- For VPNs, the **graceful-restart** statement allows a router whose VPN control plane is undergoing a restart to continue to forward traffic while recovering its state from neighboring routers.
- For BGP, if you configure graceful restart after a BGP session has been established, the BGP session restarts and the peers negotiate graceful restart capabilities.
- LDP sessions flap when **graceful-restart** configurations change.

Default

Graceful restart is disabled by default.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Enabling Graceful Restart

Configuring Routing Protocols Graceful Restart

Configuring Graceful Restart for MPLS-Related Protocols

Configuring VPN Graceful Restart

Configuring Logical System Graceful Restart

Configuring Graceful Restart for QFabric Systems | 485

graceful-restart (Fabric Control)

Syntax

```
graceful-restart {
    restart-timeseconds;
    stale-routes-time seconds;
}
```

Hierarchy Level

```
[edit fabric protocols fabric-control]
```

Release Information

Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description

Configure graceful restart parameters for the fabric control in a QFabric system.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Routing Engines in the QFabric System | 25

graceful-restart (Protocols BGP)

Syntax

```
graceful-restart {
    disable;
    restart-time seconds;
    stale-routes-time seconds;
}
```

Hierarchy Level

```
[edit logical-systems logical-system-name protocols bgp],
[edit logical-systems logical-system-name protocols bgp group group-name],
[edit logical-systems logical-system-name protocols bgp group group-name neighbor address],
[edit protocols bgp],
[edit protocols bgp group group-name],
[edit protocols bgp group group-name neighbor address]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 12.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure graceful restart for BGP. Graceful restart allows a routing device undergoing a restart to inform its adjacent neighbors and peers of its condition. Graceful restart is disabled by default. However, helper mode, the ability to assist a neighboring router attempting a graceful restart, is enabled by default.

To configure the duration of the BGP graceful restart period, include the **restart-time** statement at the **[edit protocols bgp graceful-restart]** hierarchy level. To set the length of time the router waits to receive messages from restarting neighbors before declaring them down, include the **stale-routes-time** statement at the **[edit protocols bgp graceful-restart]** hierarchy level.

> **NOTE:** If you configure graceful restart after a BGP session has been established, the BGP session restarts and the peers negotiate graceful restart capabilities.

Enable graceful restart mode for BGP (and other protocols) by configuring graceful-restart at the routing-options level. Note that you cannot enable graceful restart for specific protocols unless graceful restart is also enabled globally.

For example, this configuration is required to enable graceful restart:

```
routing-options {
    graceful-restart
}
```

If you want to disable graceful restart for some protocols, you can do this at the protocol's graceful-restart command. The following configuration along with the configuration above will keep graceful restart for all protocols but BGP.

```
protocols{
    bgp{
    graceful-restart; {
    disable;
}
```

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Graceful Restart Options for BGP

Configuring Graceful Restart for QFabric Systems | **485**

High Availability User Guide

graceful-restart (Protocols OSPF)

Syntax

```
graceful-restart {
    disable;
    helper-disable (standard | restart-signaling | both);
    no-strict-lsa-checking;
    notify-duration seconds;
    restart-duration seconds;
}
```

Hierarchy Level

```
[edit logical-systems logical-system-name protocols (ospf | ospf3)],
[edit logical-systems logical-system-name routing-instances routing-instance-name protocols (ospf | ospf3)],
[edit protocols (ospf | ospf3)],
[edit routing-instances routing-instance-name protocols ospf]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Support for the **no-strict-lsa-checking** statement introduced in Junos OS Release 8.5.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Support for the helper mode **standard**, **restart-signaling**, and **both** options introduced in Junos OS Release 11.4.
Statement introduced in Junos OS Release 12.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure graceful restart for OSPF.

Graceful restart allows a routing device to restart with minimal effects to the network, and is enabled for all routing protocols at the **[edit routing-options]** hierarchy level.

Options

disable—Disable graceful restart for OSPF.

helper-disable (standard | restart-signaling| both)—Disable helper mode for graceful restart. When helper mode is disabled, a device cannot help a neighboring device that is attempting to restart. Beginning with Junos OS Release 11.4, you can configure restart signaling-based helper mode for OSPFv2 graceful restart configurations. The **standard**, **restart-signaling**, and **both** options are only supported for OSPFv2. Specify **standard** to disable helper mode for standard graceful restart (based on RFC 3623). Specify **restart-signaling** to disable helper mode for restart signaling-based graceful restart (based on RFC 4811, RFC 4812, and

RFC 4813). Specify **both** to disable helper mode for both standard and restart signaling-based graceful restart. The last committed statement takes precedence over the previously configured statement.

Default: Helper mode is enabled by default. For OSPFv2, both standard and restart-signaling based helper modes are enabled by default.

no-strict-lsa-checking—Disable strict OSPF link-state advertisement (LSA) checking to prevent the termination of graceful restart by a helping router. LSA checking is enabled by default.

> **NOTE:** The **helper-disable** statement and the **no-strict-lsa-checking** statement cannot be configured at the same time. If you attempt to configure both statements at the same time, the routing device displays a warning message when you enter the **show protocols (ospf | ospf3)** command.

notify-duration ***seconds***—Estimated time needed to send out purged grace LSAs over all the interfaces.

Range: 1 through 3600 seconds

Default: 30 seconds

restart-duration ***seconds***—Estimated time needed to reacquire a full OSPF neighbor from each area.

Range: 1 through 3600 seconds

Default: 180 seconds

Required Privilege Level

routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Example: Configuring Graceful Restart for OSPF

Example: Configuring the Helper Capability Mode for OSPFv2 Graceful Restart

Example: Configuring the Helper Capability Mode for OSPFv3 Graceful Restart

Example: Disabling Strict LSA Checking for OSPF Graceful Restart

interconnect-device (Chassis)

Syntax

```
interconnect-device {
    alarm {
        (ethernet (Alarm) | management-ethernet) {
            link-down (red | yellow | ignore);
        }
    }
    container-devices {
        device-count number;
    }
    craft-lockout {
        alarm {
            interface-type {
                link-down (red | yellow | ignore);
            }
        }
        container-devices {
            device-count number;
        }
        fpc slot {
            power (on | off);
        }
        routing-engine {
            on-disk-failure {
                disk-failure-action (halt | reboot);
            }
        }
    }
    fpc slot {
        power (on | off);
    }
    routing-engine {
        on-disk-failure {
            disk-failure-action (halt | reboot);
        }
    }
}
```

Hierarchy Level

```
[edit chassis]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure properties specific to a QFabric system Interconnect device.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Interconnect Devices | 27

interconnect-device (Aliases)

Syntax

```
interconnect-device interconnect-device-name {
    assigned-interconnect-device-name;
}
```

Hierarchy Level

```
[edit fabric aliases]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Specify the mapping of user-defined names to QFabric system Interconnect devices.

> **NOTE:** The following rules apply to QFabric component alias naming:
>
> - Alias names must use alphabetic (**A** through **Z** and **a** through **z**), numeric (**0** through **9**), or dash (**-**) characters.
> - The maximum length of an alias name is 30 characters.
> - Alias names are case sensitive. For example, **MY-NG-1** and **my-ng-1** refer to different components.
> - You cannot use the reserved names **all**, **fabric**, or **director-group** as an alias name.

Options

interconnect-device-name—Specify a user-defined name for a QFabric system Interconnect device.

assigned-interconnect-device-name—Specify the Interconnect device identifier or name that has been provided. Identifiers are usually auto-generated by the Interconnect software, and names are usually provided by the administrator of the default partition.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Aliases for the QFabric System | 452
Understanding Interconnect Devices | 27

interconnect-device (Flow Groups)

Syntax

```
interconnect-device interconnect-device-name;
```

Hierarchy Level

```
[edit fabric flow-groups flow-group-name]
```

Release Information

Statement introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In a QFabric system, a hash function is used to select an interconnect device to forward traffic between two Node devices. Since this hash function is performed on all available Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. You can enforce the use of specific Interconnect devices by using the QFabric system **flow-groups** statement.

```
[edit fabric]
root@qfabric# set flow-groups test1 interconnect-device ?
Possible completions:
  <interconnect-device-name> Serial ID or alias of interconnect-device
  IC-P6601-C  Interconnect-device
  IC-P6602-C  Interconnect device
  IC-P6603-C  Interconnect device
```

Options

interconnect-device-name—assigns Interconnect devices to the named flow group

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

flow-groups | 540
Example: Creating a QFabric Flow Group | 492

multicast (QFabric Routing Options)

Syntax

```
multicast {
    fabric-optimized-distribution
    no-make-before-break;
}
```

Hierarchy Level

```
[edit fabric routing-options]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Set multicast routing options in a QFabric system, such as **no-make-before-break**.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding the QFabric System Data Plane | 51

multicast-ipv4

Syntax

```
multicast-ipv4 {
    source-ip source-ip-address;
    dest-ip-multicast-group ipv4-mcast-address;
}
```

Hierarchy Level

```
[edit protocols oam fabric flow-specs flow-specification-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure multicast parameters for the IPv4 Ethernet protocol type in the internal fabric monitoring flow specifications.

Options

dest-ip-multicast-group *ipv4-mcast-address*—IPv4 multicast group address of the destination fabric maintenance endpoint (FMEP) that is configured in the flow specification. Configuration of this parameter is mandatory.

Syntax: Dotted decimal notation without the prefix

source-ip *source-ip-address*—(Optional) IPv4 multicast address of the source fabric maintenance endpoint (FMEP) that is configured in the flow specification.

Syntax: Dotted decimal notation without the prefix

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500
Configuring a Fabric Maintenance Association | 502
Configuring Flow Specifications | 503
fabric (OAM) | 531

multicast-vlan-flood

Syntax

```
multicast-vlan-flood
```

Hierarchy Level

```
[edit protocols oam fabric flow-specs flow-specification-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure parameters of the multicast VLAN flood protocol type in the internal fabric monitoring flow specification.

Options

There are no configuration options.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

network-domain

Syntax

```
network-domain;
```

Hierarchy Level

[edit fabric resources node-group *node-group-name*]

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Designate a Node group to become a *network Node group*, which is used to route traffic between a QFabric system and external networks. The absence of the **network-domain** configuration statement implies that the Node group is a *server Node group*, which is used to group sets of Node devices that are connected to servers or storage devices.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476
Understanding Node Groups | 36

no-make-before-break

Syntax

```
no-make-before-break;
```

Hierarchy Level

```
[edit fabric routing-options multicast]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Disable the default *make-before-break* multicast feature on QFabric systems to prevent the duplication of system traffic. This feature increases the speed of data plane traffic, but carries the risk of minor traffic losses when compared with the default make-before-break method of creating new multicast fabric paths before tearing down the old paths. The absence of the **no-make-before-break** configuration statement implies that the make-before-break default system behavior is in effect.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding the QFabric System Data Plane | 51

node-device (Aliases)

Syntax

```
node-device node-device-name {
    assigned-node-device-name;
}
```

Hierarchy Level

```
[edit fabric aliases]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Specify the mapping of user-defined names to QFabric system Node devices.

> **NOTE:** The following rules apply to QFabric component alias naming:
>
> - Alias names must use alphabetic (A through Z and a through z), numeric (0 through 9), or dash (-) characters.
> - The maximum length of an alias name is 30 characters.
> - Alias names are case sensitive. For example, MY-NG-1 and my-ng-1 refer to different components.
> - You cannot use the reserved names **all**, **fabric**, or **director-group** as an alias name.

Options

node-device-name—Specify a user-defined name for a QFabric system Node device.

assigned-node-device-name—Specify the Node device identifier or name that has been provided. Identifiers are usually autogenerated by the Director software, and names are usually provided by the administrator of the default partition.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Aliases for the QFabric System | 452

Understanding Node Devices | 31

node-device (Chassis)

Syntax

```
node-device name {
    fibre-channel {
        port-range {
            port-range-low port-range-high;
        }
    }
    pic pic-number {
        fte {
            port port-number;
            port-range port-range-low port-range-high;
        }
        xe {
            port port-number;
            port-range port-range-low port-range-high;
        }
    }
}
```

Hierarchy Level

```
[edit chassis node-group]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure properties specific to a Node device in a QFabric system.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Link Aggregation

node-device (Flow Groups)

Syntax

node-device (*node-device-name* | *serial-ID* | *alias*);

Hierarchy Level

[edit **fabric flow-groups** *flow-group-name*]

Release Information

Statement introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In a QFabric system, a hash function is used to select an Interconnect device to forward traffic between two Node devices. Since this hash function is performed on all available Interconnect devices, it is possible for redundant multicast streams to flow through one Interconnect device, making that Interconnect device a potential single point of failure for the redundant flows. You can enforce the use of specific Interconnect devices by using the QFabric system **flow-groups** statement.

NOTE: A Node device can belong to only one flow group.

```
root@qfabric# set fabric flow-groups test1 node-device ?
Possible completions:
 <node-device-name> Serial ID or alias of node-device
P3686-C      Node device
TA3713480203   Node device
TA3713500165  Node device
TA3713500185  Node device
TA3713500307  Node device
```

Options

***node-device-name* (or *serial-ID* or *alias*)**—selects the indicated ingress Node device switch for a flow group

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

flow-groups | 540
Segregating QFabric Traffic Flows With Flow Groups | 490
Example: Creating a QFabric Flow Group | 492
Understanding QFabric Multicast Flow Groups | 53

node-device (Resources)

Syntax

```
node-device node-device-name;
```

Hierarchy Level

```
[edit fabric resources node-group node-group-name]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Assign Node devices to Node groups within a QFabric system.

> **NOTE:** Ensure that the Node devices you assign to a redundant server Node group are of the same type, either two QFX3500 Node devices, two QFX3600 Node devices, or two QFX5100 Node devices. You cannot mix and match different Node device types in the same redundant server Node group.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476
Understanding Node Groups | 36

node-group (Chassis)

Syntax

```
node-group name {
    aggregated-devices {
        ethernet {
            device-count number;
        }
    }
    alarm {
        interface-type {
            link-down (ignore | red | yellow);
        }
    }
    container-devices {
        device-count number;
    }
    node-device name {
        fibre-channel {
            port-range {
                port-range-low port-range-high;
            }
        }
    }
    pic pic-number {
        fte {
            port port-number;
            port-range port-range-low port-range-high;
        }
        xe {
            port port-number;
            port-range port-range-low port-range-high;
        }
    }
    routing-engine {
        on-disk-failure {
            disk-failure-action (halt | reboot);
        }
    }
}
```

Hierarchy Level

```
[edit chassis]
```

Release Information
Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure properties specific to a Node group.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Link Aggregation

node-group (Resources)

Syntax

```
node-group node-group-name {
    network-domain;
    node-device node-device-name;
}
```

Hierarchy Level

```
[edit fabric resources]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Define Node groups within a QFabric system.

> **NOTE:** The following rules apply to QFabric Node group naming:
>
> - The network Node group must use the predefined name *NW-NG-0*. You must use this name when adding Node devices to the network Node group. You cannot specify a different name. Also, you can configure only one network Node group per partition.
> - Node group names must use alphabetic (A through Z and a through z), numeric (0 through 9), or dash (-) characters.
> - The maximum length of a Node group name is 30 characters.
> - Node group names are case sensitive. For example, MY-NG-1 and my-ng-1 refer to different components.
> - You cannot use the reserved names **all**, **fabric**, or **director-group** as a Node group name.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476

Understanding Node Groups | 36

pic (Port)

Syntax

```
pic pic-number {
    fte {
        (port port-number | port-range port-range-low port-range-high);
    }
    xe {
        (port port-number | port-range port-range-low port-range-high);
    }
}
```

Hierarchy Level

```
[edit chassis interconnect-device name fpc slot]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFX3600 Node device only) Configure port types on QFX3600 Node devices.

CAUTION: The Packet Forwarding Engine on the QFX3600 Node device is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the Node device.

Options

pic *pic-number*—Number of the physical interface card (PIC) on which you want to configure port types. Specify **0** to configure *xe* (10-Gigabit Ethernet) type ports. Specify **1** to configure *fte* (40-gigabit data plane uplink) type ports.

fte—Configure a specific port or a range of ports to operate as 40-gigabit data plane uplink ports.

xe—Configure a specific port or a range of ports to operate as four 10-Gigabit Ethernet ports.

port-number—Port number on which you want to configure the port type. Valid values are 0 through 7 if the port type is **fte**, and 2 through 15 if the port type is **xe**.

port-range-low—Lowest-numbered port in the range of ports. The lowest possible value is 0 if the port type is **fte**. The lowest possible value is 2 if the port type is **xe**.

port-range-high—Highest-numbered port in the range of ports. The highest possible value is 7 if the port type is **fte**. The highest possible value is 15 if the port type is **xe**.

NOTE:

- By default, ports Q0 through Q3 operate as fte type ports, and ports Q4 through Q15 operate as xe type ports.
- Only ports Q0 through Q7 can be configured as fte type ports.
- Only ports Q2 through Q15 can be configured as xe type ports.

NOTE: When you delete the port type configuration for an individual port or a block of ports, the ports return to operating in their default port type.

Required Privilege Level

routing—To view this statement in the configuration.

routing-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring the Port Type on QFX3600 Node Devices | **467**

protocols (Fabric)

Syntax

```
protocols {
    fabric-control {
        graceful-restart {
            restart-timeseconds;
            stale-routes-time seconds;
        }
    }
}
```

Hierarchy Level

```
[edit fabric]
```

Release Information

Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description

Specify attributes for the fabric control protocol.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Routing Engines in the QFabric System | 25

resources

Syntax

```
resources {
  node-group node-group-name {
    network-domain;
    node-device node-device-name;
  }
}
```

Hierarchy Level

```
[edit fabric]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Define resources within a QFabric system and handle a variety of component assignments.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476
Understanding Node Groups | 36

restart-time (Fabric Control)

Syntax

```
restart-time seconds;
```

Hierarchy Level

```
[edit fabric protocols fabric-control graceful-restart]
```

Release Information

Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description

Configure the duration of the graceful restart period for the fabric control Routing Engine.

The graceful restart resynchronization process takes longer when the QFabric system contains node groups that have a large number of VLANs. The graceful-restart duration should, therefore, be set higher when the QFabric system contains at least one node group with a large number of VLANs.

Configure a restart time of 600 seconds if the number of VLAN members (vmembers) exceeds 32k.

CAUTION: Configuring the restart time restarts the session between the fabric control Routing Engine and the Node groups. Traffic is dropped as a result of this restart. Normal QFabric system operations should resume once the session has restarted without any further user actions.

Options

seconds—Duration of the graceful restart period.

Default: 300 seconds

Range: 300 to 900 seconds

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Bridging and VLANs on Switches

Understanding Routing Engines in the QFabric System | 25

routing-options (QFabric System)

Syntax

```
routing-options {
    multicast {
        no-make-before-break;
    }
}
```

Hierarchy Level

```
[edit fabric]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Set routing options in a QFabric system.

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding the QFabric System Data Plane | 51

syslog (QFabric System)

Syntax

```
syslog {
    file filename {
        archive {
            size maximum-file-size;
        }
        explicit-priority;
        facility severity;
        match "regular-expression";
        structured-data;
    }
    filter all {
        facility severity;
        match "regular-expression";
    }
    host hostname {
        explicit-priority;
        facility severity;
        facility-override facility;
        log-prefix string;
        match "regular-expression";
        structured-data;
    }
}
```

Hierarchy Level

```
[edit system]
```

Release Information

Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description

Configure system log messages for the QFabric system.

The remaining statements are explained separately.

Required Privilege Level

system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding the Implementation of System Log Messages on the QFabric System | 69

Directing System Log Messages to a Remote Machine

stale-routes-time (Fabric Control)

Syntax

```
stale-routes-time seconds;
```

Hierarchy Level

```
[edit fabric protocols fabric-control graceful-restart]
```

Release Information

Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description

Set the length of time that the fabric control Routing Engine waits to receive messages from devices before declaring them down. Configure a stale routes time of 1800 seconds if the number of VLAN members (vmembers) exceeds 32k.

Options

seconds—Amount of time that the fabric control Routing Engine waits to receive messages from other devices before declaring them down.

Default: 900 seconds

Range: 900 to 1800 seconds

Required Privilege Level

admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Understanding Bridging and VLANs on Switches

Understanding Routing Engines in the QFabric System | 25

unicast-ethernet

Syntax

```
unicast-ethernet {
    destination-mac destination-mac-address destination-mac-mask destination-mac-mask;
    ethertype ethertype;
    source-mac source-mac-address source-mac-mask source-mac-mask;
}
```

Hierarchy Level

```
[edit protocols oam fabric flow-specs flow-specification-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure unicast Ethernet parameters for a flow specification used in internal fabric monitoring.

Options

destination-mac *destination-mac-address*—(Optional) MAC address of the destination fabric maintenance endpoint (FMEP) that is configured in the flow specification.

destination-mac-mask *destination-mac-mask*—(Optional) MAC address range mask for the destination FMEP that is configured in the flow specification. You cannot configure the **destination-mac-mask** parameter unless you also configure the **destination-mac** parameter.

The masked bits denote the range that needs to be generated. The other bits obtain their values from the corresponding source or destination MAC address parameter. The mask must be contiguous.

Values: Maximum of 6 contiguous masked bits, or a mask range of 64

ethertype *ethertype*—Valid Ethernet type other than the IPv4 Ethertype.

Values: 2 bytes in decimal or hexadecimal notation

source-mac *source-mac-address*—(Optional) MAC address of the source FMEP or interface that is configured in the flow specification.

source-mac-mask *source-mac-mask*—(Optional) MAC address range mask for the source FMEP that is configured in the flow specification. You cannot configure the **source-mac-mask** parameter unless you also configure the **source-mac** parameter.

The masked bits denote the range that needs to be generated. The other bits obtain their values from the corresponding source or destination MAC address parameter. The mask must be contiguous.

Values: Maximum of 6 contiguous masked bits, or a mask range of 64

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | **500**

Configuring a Fabric Maintenance Association | **502**

Configuring Flow Specifications | **503**

fabric (OAM) | **531**

ping fabric multicast-flow | **650**

ping fabric unicast-flow | **652**

traceroute fabric unicast-flow | **888**

unicast-ethernet-ipv4

Syntax

```
unicast-ethernet-ipv4 {
    source-ip source-ip-address source-ip-mask source-ip-mask;
    destination-ip destination-ip-address destination-ip-mask destination-ip-mask;
    ip-proto protocol;
    source-l4-port source-l4-port-number;
    destination-l4-port destination-l4-port-number;
}
```

Hierarchy Level

```
[edit protocols oam fabric flow-specs flow-specification-name]
```

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure unicast parameters for the Ethernet IPv4 protocol type in the internal fabric monitoring flow specifications.

Options

destination-ip *destination-ip-address*—Unicast IPv4 address of the destination fabric maintenance endpoint (FMEP) that is configured in the fabric maintenance association (FMA).

Syntax: Dotted decimal notation without the prefix

destination-l4-port *destination-l4-port-number*—L4 TCP or UDP port for the destination fabric maintenance endpoint (FMEP).

Values: 2-byte decimal or hexadecimal notation

ip-proto *protocol*—IPv4 protocol type.

Values: 1-byte value in decimal or hexadecimal notation

destination-ip-mask *destination-ip-mask*—IPv4 address range mask for the destination FMEP that is configured in the flow specification.

The masked bits denote the range that needs to be generated. The other bits obtain their values from the corresponding source or destination IPv4 address parameter. The mask must be contiguous.

Syntax: Dotted decimal notation without the prefix

Values: Maximum of 6 contiguous masked bits, or a mask range of 64

source-ip *source-ip-address*—Unicast IPv4 address of the source fabric maintenance endpoint (FMEP) that is configured in the fabric maintenance association (FMA).

Syntax: Dotted decimal notation without the prefix

source-l4-port *source-l4-port-number*—TCP or UDP port for the source fabric maintenance endpoint (FMEP).

Values: 2-byte decimal or hexadecimal notation

source-ip-mask *source-ip-mask*—IPv4 address range mask for the source FMEP that is configured in the flow specification.

The masked bits denote the range that needs to be generated. The other bits obtain their values from the corresponding source or destination IPv4 address parameter. The mask must be contiguous.

Syntax: Dotted decimal notation without the prefix

Values: Maximum of 6 contiguous masked bits, or a mask range of 64

Required Privilege Level

interface—To view this statement in the configuration.

interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Configuring a Fabric Maintenance Association | 502

Configuring Flow Specifications | 503

fabric (OAM) | 531

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

4

PART

Administration

CHAPTER 20

Software Upgrade, Downgrade, and Recovery

IN THIS CHAPTER

Nonstop Software Upgrade Checklist for QFabric Systems

IN THIS SECTION

This topic lists the precautions that must be taken before you begin a nonstop software upgrade (NSSU) on QFabric systems. This topic includes:

Preparing for an NSSU

> **NOTE:** Before you perform a nonstop software upgrade, contact JTAC to perform a pre-upgrade health check on the QFabric system.

In preparation for an NSSU, ensure the following:

- The NSSU is being done during a maintenance window.
- Console connectivity is available for both Director groups.
- The existing configuration has been backed up.

Next, complete the following steps:

1. Collect the output of the **lsvm** and **dns.dump** commands. **lsvm** command provides the universal unique identifiers (UUIDs) of all the virtual machines, and the **dns.dump** provides the IP addresses of all the components that can be used in case of failure.

2. Run the following commands from the Director device shell to perform sanity checks of the entire QFabric system:

```
/opt/dcf/scripts/director_upgrade_sanity_check.pl
/opt/dcf/scripts/fabric_upgrade_sanity_check.pl
/opt/dcf/scripts/nodegroup_upgrade_sanity_check.pl
```

   NOTE: In case of any errors, contact Juniper Networks Technical Assistance Center (JTAC).

3. Enter the **request component login DRE-0** command to connect to DRE-0. Check the available storage using the **show system storage** command. There should be about 500 MB of space available in the /var partition. If not, delete the files under /var/log. Also, check the /var/log/kdm and /var/tmp directories for any large files that can be deleted. Issue the **clear log *filename-with-path*** command to clear the large files in the /var/log/ and in /var/tmp/ directories.

4. Modify the multicast discovery advertisements (MDA) timer on all Fibre Channel (FC) and Fibre Channel over Ethernet (FCoE) gateways connected to QFabric, if applicable. We recommend this step to prevent FC session drops during NSSU. Enter the following command on FC and FCoE gateways: **set fc-fabrics *fabric-name* protocols fip fka-adv-period 45000**.

5. Enter the following CLI commands to update the system log configuration. This will reduce the amount of system log messages added to the database during upgrade. Logging to an external server does not have any impact during upgrade.

   - **set system syslog host *syslog server address***
   - For remote servers:

     set system syslog file cli_commands interactive-commands any

     set system syslog file *for all files configured* any critical

set system syslog file messages any critical

Upgrading Director Groups

The NSSU process individually upgrades members of a Director group, so that one device in the group is always operational. It switches the mastership of the Routing Engine processes to the backup Director device, before upgrading the master Director device.

Before starting the NSSU for the Director group:

- Run the sanity check scripts from the Director device shell to ensure that the Director device is ready to be upgraded.

```
root@dg0 ~]# /opt/dcf/scripts/director_upgrade_sanity_check.pl
Checking if director-device upgrade is currently in progress.
Checking VM status.
Checking for communication between director devices.
Checking inventory status of VMs.
Checking VM versions.
Checking VM passwords.
Checking chassis alarms.
```

- Verify whether both the Director devices are online.

`root@Qfabric_device>` **show fabric administration inventory director-group status**

Enter the following CLI commands to clean the storage and system log.

```
request system storage cleanup director-group
request system storage cleanup infrastructure FM-0
request system storage cleanup qfabric component all
clear log messages
```

After these processes are complete, you can run the NSSU on the master Director group. After the upgrade is complete, verify the process using the following CLI commands:

```
show version component director-group
show version component DRE-0
show fabric admin inventory
show fabric admin inventory infrastructure
show fabric admin inventory director-group status
```

Restore the system log configuration that you updated in step 5.

Upgrading QFabric

Before starting the NSSU on QFabric:

- Run the sanity check scripts from the Director device shell to ensure that the Director device is ready to be upgraded.

```
root@dg0 ~]# /opt/dcf/scripts/fabric_upgrade_sanity_check.pl
Checking if director-device upgrade is currently in progress.
Checking VM status.
Checking for communication between director devices.
Checking inventory status of ICs/FCs.
Checking FC passwords.
Checking IC passwords.
Checking chassis alarms.
The system is not ready for upgrade, please check the following:
Check password for P8959-C/RE0 cannot complete. Node P8959-C/RE0 not reachable.
```

Enter the following CLI commands to clean the storage.

```
request system storage cleanup infrastructure FC-0
request system storage cleanup infrastructure FC-1
request system storage cleanup interconnect-device ic-name
```

After these processes are complete, you can run the NSSU on QFabric. After the upgrade is complete, verify the process using the following CLI commands:

```
show version component fabric
show fabric admin inventory
show fabric admin inventory infrastructure
show chassis fabric connectivity
```

Upgrading Network Node Groups

Before starting the NSSU on the network Node groups:

- Run the sanity check scripts from the Director device shell to ensure that the Node groups are ready to be upgraded.

```
root@dg0 ~]# /opt/dcf/scripts/nodegroup_upgrade_sanity_check.pl
Checking if director-device upgrade is currently in progress.
Checking VM status.
Checking for communication between director devices.
```

```
Checking inventory status of NINEs/SINEs/RNGs.
Checking Server INE passwords.
Checking NW-NG-0 passwords.
Checking chassis alarms.
```

Enter the following CLI commands to clean the storage.

```
request system storage cleanup node-group NW-NG-0
```

After these processes are complete, you can run the NSSU on the network Node groups. After the upgrade is complete, verify the process using the following CLI commands:

```
show version component NW-NG-0
show fabric admin inventory NW-NG-0
show fabric admin inventory infrastructure
show chassis fabric connectivity
```

NOTE: Follow the same procedure for redundant server Node groups (RSNGs) and server Node groups (SNGs).

RELATED DOCUMENTATION

Understanding Nonstop Software Upgrade for QFabric Systems | 58
Performing a Nonstop Software Upgrade on the QFabric System | 592

Performing a Nonstop Software Upgrade on the QFabric System

NOTE: Before you perform a nonstop software upgrade, contact JTAC to perform a pre-upgrade health check on the QFabric system.

NOTE: Before you can perform a nonstop software upgrade to Junos OS Release 13.1X50-D10, you must have Junos OS Release 12.2X50-D42 or later installed. You cannot perform a nonstop software upgrade with Junos OS Release 12.2X50-D41 or earlier. Contact the Juniper Technical Assistance Center for information on how to download Junos OS Release 12.2X50-D42. Performing a standard software upgrade (that is, issuing the **request system software add component all** command) does not require that you that you upgrade to an intermediate Junos OS software release.

To perform a nonstop software upgrade to Junos OS Release 13.1X50-D10:

1. First perform a nonstop software upgrade to Junos OS Release 12.2X50-D42.

2. Then perform a nonstop software upgrade to Junos OS Release 13.1X50-D10.

Nonstop software upgrade enables you to upgrade a QFabric system with minimal packet loss and maximum uptime. This feature introduces several high availability improvements to the QFabric system software upgrade process, including:

- Upgrading members of a Director group or Node group one at a time so that one device in the group is always operational
- Switching mastership of Routing Engine processes to the backup Director device before upgrading the master Director device
- Rebooting Interconnect devices and fabric control Routing Engines one at a time, so that one Interconnect device or one fabric control Routing Engine is always operational
- Switching mastership of a Node group to the backup Node device before upgrading the master Node device
- Specifying an upgrade group if you want all Node devices in a Node group to be upgraded in parallel (which shortens the time of the upgrade)
- Rebooting devices automatically as part of the nonstop upgrade process

When performing a nonstop upgrade, start with the Director group upgrade, then issue the fabric upgrade, and end with the Node group upgrades.

NOTE: Because there is no redundancy for Node groups containing a single Node device, traffic loss occurs when the device reboots during the upgrade. For node-groups defined with two node-devices, both must be online in order for upgrade to succeed.

NOTE: Before you install the software, we recommend that you back up your current configuration files by issuing the **request system software configuration-backup** command.

NOTE: Before you can perform a nonstop software upgrade in your QFabric system, you must first upgrade your system to Junos OS Release 12.2 by using a conventional upgrade method such as issuing the **request system software add component all** command.

This topic describes the following tasks:

Backing Up the Current Configuration Files

To back up your current configuration files:

`user@qfabric>` **request system software configuration-backup** ***path***

Back up the configuration files to a local directory, remote server, or removable drive (for example, an external USB flash drive).

For example:

`user@qfabric>` **request system software configuration-backup/media/USB/**

Downloading Software Files Using a Browser

> **NOTE:** To access the download site, you must have a service contract with Juniper Networks and an access account. If you need help obtaining an account, complete the registration form at the Juniper Networks website https://www.juniper.net/registration/Register.jsp .

1. Using a Web browser, navigate to the https://www.juniper.net/support .
2. Click **Download Software**.
3. In the **Switching** box, click **Junos OS Platforms**.
4. In the **QFX Series** section, click the name of the platform for which you want to download software.
5. Click the **Software** tab and select the release number from the **Release** drop-down list.
6. Select the complete install package you want to download in the **QFabric System Install Package** section:
   - If you want to upgrade the entire QFabric system, select **QFabric System - Complete Install Package**.
   - If you want to upgrade either a single Node or Interconnect device for recovery purposes, select **Node and Interconnect Device Install Package**. For information on how to perform a recovery installation on either a Node or Interconnect device, see "Performing a Recovery Installation" on page 904.

   A login screen appears.
7. Enter your user ID and password and press **Enter**.
8. Read the End User License Agreement, select the **I agree** option button, and then click **Proceed**.
9. Save the **jinstall-qfabric-*version*.rpm** file on your computer.

Retrieving Software Files for Download

Retrieve the software from the location in which you downloaded it. To do this, issue the **request system software download** command. The software package is copied from where you downloaded it and is placed locally on the QFabric system.

- To retrieve the software:

  `user@qfabric>` **request system software download /*path*/*package-name***

  For example:

  `user@qfabric>` **request system software download ftp://server/files/jinstall-qfabric-12.2X50-D10.3.rpm**

Performing a Nonstop Software Upgrade for Director Devices in a Director Group

NOTE: If you reboot any Node groups or Interconnect devices after you perform a nonstop upgrade on the Director group, these devices are upgraded to the same version of software that is running on the Director group.

To upgrade the software on the Director devices in a Director group:

- Issue the **request system software nonstop-upgrade director-group *package-name*** command.

  For example:

  `user@qfabric>` **request system software nonstop-upgrade director-group jinstall-qfabric-12.2X50-D10.3.rpm**

When the Director group is rebooting the first Director device during the upgrade and transferring mastership to the peer director device, you might not be able to log in and access the QFabric system CLI for several minutes while user interface services come back online.

Performing a Nonstop Software Upgrade for Interconnect Devices and Other Fabric-Related Components

Before you perform a nonstop upgrade on the Interconnect devices and other fabric-related components, verify that both Director devices in the Director group are online. Both Director devices must be online before you attempt to perform a nonstop upgrade. To do verify that both Director devices are online, issue the **show fabric administration inventory director-group status** command.

To install the software on the Interconnect device and other components in the fabric:

- Issue the **request system software nonstop-upgrade fabric *package-name*** command.

  For example:

  `user@qfabric>` **request system software nonstop-upgrade fabric jinstall-qfabric-12.2X50-D10.3.rpm**

(Optional) Creating Upgrade Groups for Node Groups

Upgrade groups enable two or more Node devices in a Node group, or an entire Node group, to be rebooted at the same time. If you do not create an upgrade group, the Node devices are upgraded one at a time. Before performing a nonstop upgrade on a Node group, create an upgrade group and include the devices you want to reboot at the same time.

> **NOTE:** If you add Node devices that have links to the same link aggregation group (LAG), there might be traffic loss.

- Create the upgrade group by issuing the **set chassis node-group *node-group-name* nssu upgrade-group *upgrade-group-name* node-devices** command at the **[edit chassis]** hierarchy.

  For example:

  `user@qfabric#` **set chassis node-group nodegroup1 nssu upgrade-group upgrade1 node-devices [node1 node2]**

Performing a Nonstop Software Upgrade on a Node Group

When you perform a nonstop software upgrade on a network Node group, the Node devices in the network Node group are upgraded in a serial fashion except when upgrade groups are configured. If you perform a nonstop upgrade on a redundant server Node group, both Node devices must be online for a successful upgrade. If one of the Node devices is no longer available, remove it from the configuration before you perform the nonstop software upgrade. If you perform a nonstop upgrade on a Node group with only one Node device, traffic loss occurs while the Node device is rebooting.

> **NOTE:** You can upgrade multiple Node groups with this command. However, if more than one Node group is specified, there may be traffic loss depending on the topology of the network.

To install software on a Node group:

- Issue the **request system software nonstop-upgrade node-group *node-group-name package-name*** command.

  To perform a nonstop upgrade on one Node group:

  `user@qfabric>` **request system software nonstop-upgrade node-group nodegroup1 jinstall-qfabric-12.2X50-D10.3.rpm**

  To perform a nonstop upgrade on more than one Node group:

  `user@qfabric>` **request system software nonstop-upgrade node-group [nodegroup1 nodegroup2 nodegroup3] jinstall-qfabric-12.2X50-D10.3.rpm**

RELATED DOCUMENTATION

Nonstop Software Upgrade Checklist for QFabric Systems | 588
Configuring Graceful Restart for QFabric Systems | 485
Understanding Nonstop Software Upgrade for QFabric Systems | 58

Verifying Nonstop Software Upgrade for QFabric Systems

IN THIS SECTION

NOTE: Before you perform a nonstop software upgrade, contact JTAC to perform a pre-upgrade health check on the QFabric system.

This topic discusses how you can monitor the progress of each of the three steps in a nonstop software upgrade. By identifying the key actions and events that define this process, you can track the status of the upgrade with confidence.

TIP: When performing a nonstop software upgrade, open two SSH sessions to the QFabric CLI. Use one session to monitor the upgrade itself and use a second session to verify that the QFabric system components respond to operational mode commands as expected.

Verifying a Director Group Nonstop Software Upgrade

Purpose

During the Director group portion of a nonstop software upgrade, you should expect to see the Director device that hosts the CLI session selected as the master device. When mastership of all processes moves to the master, the QFabric system upgrades the backup Director device and this Director device reboots. After the backup Director device comes back online, the master Director device suspends CLI operations for 15 minutes, upgrades itself, and reboots. At this point, the backup becomes the new master Director device and you can issue CLI operational commands. Finally, the former master comes back online as a backup and both devices are operational once again. In addition to the steps below, you can issue the **show system software upgrade status** command to view the progress of the upgrade.

Action

1. In one SSH session to the QFabric CLI, verify the current status of the QFabric system by issuing the **show fabric administration inventory**, **show fabric administration inventory director-group status**, and **show fabric session-host** commands. In this case, Director device DG0 is the master device but DG1 hosts the CLI session.

   session1@qfabric> show fabric administration inventory

```
Item                    Identifier              Connection      Configuration
Node group
  NW-NG-0                                       Connected       Configured
    P1507-C                                     Connected
  RSNG                                          Connected       Configured
    P1550-C                                     Connected
    P1571-C                                     Connected
Interconnect device
  IC-F4912                                      Connected       Configured
    F4912/RE0                                   Connected
Fabric manager
  FM-0                                          Connected       Configured
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
Diagnostic routing engine
  DRE-0                                         Connected       Configured
```

   session1@qfabric> show fabric administration inventory director-group status

```
Director Group Status Tue Jun  5 15:11:26 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.49.215.38    8%  17363152k   4   3 days, 20:55 hrs
 dg1    online backup   10.49.215.39    6%  20157440k   3   3 days, 20:55 hrs

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    0281052011000001 online  master

  Master Services
  ---------------
  Database Server               online
  Load Balancer Director        online
  QFabric Partition Address     online

  Director Group Managed Services
```

```
-------------------------------
Shared File System              online
Network File System             online
Virtual Machine Server          online
Load Balancer/DHCP              online

Hard Drive Status
----------------
Volume ID:4                     optimal
Physical ID:1                   online
Physical ID:0                   online
SCSI ID:1                       100%
SCSI ID:0                       100%


Size  Used Avail Used% Mounted on
----  ---- ----- ----- ----------
423G 5.4G 395G  2%   /
99M  16M  79M   17%  /boot
93G  7.3G 86G   8%   /pbdata

Director Group Processes
------------------------
Director Group Manager          online
Partition Manager               online
Software Mirroring              online
Shared File System master       online
Secure Shell Process            online
Network File System             online
DHCP Server master              online     master
FTP Server                      online
Syslog                          online
Distributed Management          online
SNMP Trap Forwarder             online
SNMP Process                    online
Platform Management             online

Interface Link Status
---------------------
Management Interface            up
Control Plane Bridge            up
Control Plane LAG               up
CP Link [0/2]                   up
CP Link [0/1]                   up
```

```
 CP Link [0/0]                  up
 CP Link [1/2]                  down
 CP Link [1/1]                  down
 CP Link [1/0]                  down
 Crossover LAG                  up
 CP Link [0/3]                  up
 CP Link [1/3]                  up

Member Device Id/Alias  Status  Role
------ ---------------- ------- ---------
dg1    0281052011000032 online  backup

 Director Group Managed Services
 -------------------------------
 Shared File System             online
 Network File System            online
 Virtual Machine Server         online
 Load Balancer/DHCP             online

 Hard Drive Status
 ----------------
 Volume ID:8                    optimal
 Physical ID:1                  online
 Physical ID:0                  online
 SCSI ID:1                      100%
 SCSI ID:0                      100%


 Size  Used Avail Used% Mounted on
 ----  ---- ----- ----- ----------
 423G 5.5G 395G  2%   /
 99M  16M  79M   17%  /boot
 93G  7.3G 86G   8%   /pbdata

 Director Group Processes
 ------------------------
 Director Group Manager         online
 Partition Manager              online
 Software Mirroring             online
 Shared File System master      online
 Secure Shell Process           online
 Network File System            online
 DHCP Server master             online     backup
 FTP Server                     online
```

```
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

session1@qfabric> show fabric session-host

```
Identifier: 0281052011000032
```

2. In a second SSH session to the QFabric CLI, issue the request for the Director group nonstop software upgrade.

   root@qfabric> request system software nonstop-upgrade director-group jinstall-qfabric-12.2X50-D10.3.rpm

3. If the CLI session is being hosted by the master Director device, skip to step 4. However, if the CLI session is hosted by the backup Director device, the Director group mastership switches to the backup device after you issue the nonstop software upgrade command. In this example, mastership switches to Director device DG1.

   session1@qfabric> show fabric administration inventory director-group status

```
Director Group Status Tue Jun  5 15:12:20 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online backup   10.49.215.38    8%  31905924k   0   3 days, 21:16 hrs
```

```
dg1    online master   10.49.215.39    6%  18010368k   3   3 days, 21:16 hrs

Member Device Id/Alias  Status  Role
------ ---------------- ------- ---------
dg0    0281052011000001 online  backup

 Director Group Managed Services
 -------------------------------
 Shared File System             offline
 Network File System            offline
 Virtual Machine Server         offline
 Load Balancer/DHCP             offline

 Hard Drive Status
 ----------------
 Volume ID:4                    optimal
 Physical ID:1                  online
 Physical ID:0                  online
 SCSI ID:1                      100%
 SCSI ID:0                      100%


 Size  Used Avail Used% Mounted on
 ----  ---- ----- ----- ----------
 423G 5.4G 395G  2%   /
 99M  16M  79M   17%  /boot

 Director Group Processes
 ------------------------
 Director Group Manager         online
 Partition Manager              online
 Software Mirroring             online
 Shared File System master      online
 Secure Shell Process           online
 Network File System            offline
 DHCP Server master             offline    backup
 FTP Server                     online
 Syslog                         online
 Distributed Management         offline
 SNMP Trap Forwarder            offline
 SNMP Process                   offline
 Platform Management            online

 Interface Link Status
```

```
  ---------------------
  Management Interface          up
  Control Plane Bridge          up
  Control Plane LAG             up
  CP Link [0/2]                 up
  CP Link [0/1]                 up
  CP Link [0/0]                 up
  CP Link [1/2]                 down
  CP Link [1/1]                 down
  CP Link [1/0]                 down
  Crossover LAG                 up
  CP Link [0/3]                 up
  CP Link [1/3]                 up

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg1    0281052011000032 online  master

  Master Services
  ---------------
  Database Server               online
  Load Balancer Director        online
  QFabric Partition Address     online

  Director Group Managed Services
  -------------------------------
  Shared File System            online
  Network File System           online
  Virtual Machine Server        online
  Load Balancer/DHCP            online

  Hard Drive Status
  ----------------
  Volume ID:8                   optimal
  Physical ID:1                 online
  Physical ID:0                 online
  SCSI ID:1                     100%
  SCSI ID:0                     100%


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 6.0G 395G  2%   /
  99M  16M  79M   17%  /boot
```

```
93G  7.3G 86G   8%   /pbdata

Director Group Processes
------------------------
Director Group Manager         online
Partition Manager              online
Software Mirroring             online
Shared File System master      online
Secure Shell Process           online
Network File System            online
DHCP Server master             online     master
FTP Server                     online
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

session1@qfabric> show fabric session-host

```
Identifier: 0281052011000032
```

4. The Director group nonstop software upgrade process continues by downloading and installing software for the fabric manager Routing Engines and the Director devices.

root@qfabric>

```
Validating update package jinstall-qfabric-12.2X50-D10.3.rpm
Installing update package jinstall-qfabric-12.2X50-D10.3.rpm
```

```
Installing fabric images version 12.2X50-D10.3
Performing cleanup
Package install complete
Installing update package jinstall-qfabric-12.2X50-D10.3.rpm on peer
Triggering Initial Stage of Fabric Manager Upgrade
Updating CCIF default image to 12.2X50-D10.3
Updating FM-0 to Junos version 12.2X50-D10.3
[Status   2012-06-05 15:25:29]: Fabric Manager: Upgrade Initial Stage started
[FM-0     2012-06-05 15:25:38]: FM-0 Master already running on LOCAL DG
[NW-NG-0  2012-06-05 15:25:45]: NW-NG-0 Master already running on LOCAL DG
[FM-0     2012-06-05 15:26:12]: Retrieving package
[FM-0     2012-06-05 15:27:11]: Pushing bundle to re0
[Status   2012-06-05 15:29:06]: Load completed with 0 errors...
[Status   2012-06-05 15:29:06]: Reboot is required to complete upgrade ...
[Status   2012-06-05 15:29:07]: Trying to Connect to Node: FM-0
[Status   2012-06-05 15:29:13]: Rebooting FM-0
[FM-0     2012-06-05 15:29:13]: Waiting for FM-0 to terminate ...
Starting Peer upgrade

Initiating rolling upgrade of Director peer:  version 12.2X50-D10.3

Inform CCIF regarding rolling upgrade
[Peer Update Status]: Validating install package
jinstall-qfabric-12.2X50-D10.3.rpm
[Peer Update Status]: Cleaning up node for rolling phase one upgrade
[Peer Update Status]: Director group upgrade complete
[Peer Update Status]: COMPLETED
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
```

```
 upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
 upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase
one of rolling upgrade
[Peer Update Status]: Waiting for peer to complete phase one of rolling upgrade
[Peer Update Status]: Peer completed phase one of rolling upgrade
```

5. When the system upgrades and reboots the backup Director device DG0, notice how this device is not displayed in the output of the **show fabric administration inventory director-group status** command. Because Director device DG1 appears, this means that the DG1 is operational and acts as the master device.

> **NOTE:** If your second SSH session is being hosted by the rebooting Director device, your session terminates and you need to log back in to establish a new session running on the active Director device.

session1@qfabric> show fabric administration inventory director-group status

```
Director Group Status Tue Jun  5 15:41:14 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg1    online master   10.49.215.39    6%  8372272k    4   3 days, 21:25 hrs
```

```
Member Device Id/Alias  Status  Role
------ ---------------- ------- ---------
dg1    0281052011000032 online  master

 Master Services
 ---------------
 Database Server                online
 Load Balancer Director         online
 QFabric Partition Address      online

 Director Group Managed Services
 -------------------------------
 Shared File System             online
 Network File System            online
 Virtual Machine Server         online
 Load Balancer/DHCP             online

 Hard Drive Status
 ----------------
 Volume ID:8                    optimal
 Physical ID:1                  online
 Physical ID:0                  online
 SCSI ID:1                      100%
 SCSI ID:0                      100%


 Size  Used Avail Used% Mounted on
 ----  ---- ----- ----- ----------
 423G 6.0G 395G  2%   /
 99M  16M  79M   17%  /boot
 93G  7.3G 86G   8%   /pbdata

 Director Group Processes
 ------------------------
 Director Group Manager         online
 Partition Manager              online
 Software Mirroring             online
 Shared File System master      online
 Secure Shell Process           online
 Network File System            online
 DHCP Server master             online     master
 FTP Server                     online
 Syslog                         online
 Distributed Management         online
```

```
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

6. The upgrade continues with master Director device DG1 suspending CLI services for 15 minutes, transferring mastership to Director device DG0, and then rebooting Director device DG1 (which terminates the CLI session).

   root@qfabric>

```
[Peer Update Status]: Setting peer DG node as the master SFC

Delaying start of local upgrade to allow peer services time to initialize [15
minutes]
Delaying start of local upgrade to allow peer services time to initialize [15
minutes]
Delaying start of local upgrade to allow peer services time to initialize [12
minutes]
Delaying start of local upgrade to allow peer services time to initialize [9
minutes]
Delaying start of local upgrade to allow peer services time to initialize [6
minutes]
Delaying start of local upgrade to allow peer services time to initialize [3
minutes]
[Peer Update Status]: Check for VMs on dg0
Triggering Final Stage of Fabric Manager Upgrade:
Updating FM-0 to Junos version 12.2X50-D10.3
[Status   2012-06-05 16:10:12]: Fabric Manager: Upgrade Final Stage started
[NW-NG-0  2012-06-05 16:10:22]: Transferring NW-NG-0 Mastership to REMOTE DG
```

```
[NW-NG-0  2012-06-05 16:11:44]: Finished NW-NG-0 Mastership switch
[Status   2012-06-05 16:11:45]: Upgrading FM-0 VM on worker DG to 12.2X50-D10.3
[DRE-0    2012-06-05 16:12:43]: Retrieving package
[DRE-0    2012-06-05 16:13:46]: ------- re0: -------
[Status   2012-06-05 16:15:17]: Load completed with 0 errors...
[Status   2012-06-05 16:15:17]: Reboot is required to complete upgrade ...
[DRE-0    2012-06-05 16:15:22]: Waiting for DRE-0 to terminate ...
[DRE-0    2012-06-05 16:15:34]: Waiting for DRE-0 to come back ...
[DRE-0    2012-06-05 16:18:44]: Running Uptime Test for DRE-0
[DRE-0    2012-06-05 16:18:51]: Uptime Test for DRE-0 Passed ...
[Status   2012-06-05 16:18:51]: DRE-0 booted successfully ...
Performing post install shutdown and cleanup

Broadcast message from root (Tue Jun  5 16:18:51 2012):

The system is going down for reboot NOW!
Director group upgrade complete

root@qfabric> Read from remote host qfabric-partition0: Connection reset by peer
Connection to qfabric-partition0 closed.
```

7. Upon reopening the SSH session, notice that Director device DG0 is now the master device hosting the session and Director device DG1 does not appear in the QFabric system inventory while it is rebooting.

session1@qfabric> show fabric session-host

```
Identifier: 0281052011000001
```

session1@qfabric> show fabric administration inventory director-group status

```
Director Group Status Tue Jun  5 16:21:23 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.49.215.38    13% 20739560k   3   36:29 mins

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    0281052011000001 online  master

  Master Services
  ---------------
```

```
Database Server                 online
Load Balancer Director          online
QFabric Partition Address       online

Director Group Managed Services
-------------------------------
Shared File System              online
Network File System             online
Virtual Machine Server          online
Load Balancer/DHCP              online

Hard Drive Status
----------------
Volume ID:4                     optimal
Physical ID:1                   online
Physical ID:0                   online
SCSI ID:1                       100%
SCSI ID:0                       100%


Size  Used Avail Used% Mounted on
----  ---- ----- ----- ----------
423G 5.3G 396G  2%   /
99M  16M  79M   17%  /boot
93G  7.4G 86G   8%   /pbdata

Director Group Processes
------------------------
Director Group Manager          online
Partition Manager               online
Software Mirroring              online
Shared File System master       online
Secure Shell Process            online
Network File System             online
DHCP Server master              online     master
FTP Server                      online
Syslog                          online
Distributed Management          online
SNMP Trap Forwarder             online
SNMP Process                    online
Platform Management             online

Interface Link Status
---------------------
```

```
  Management Interface            up
  Control Plane Bridge            up
  Control Plane LAG               up
  CP Link [0/2]                   up
  CP Link [0/1]                   up
  CP Link [0/0]                   up
  CP Link [1/2]                   down
  CP Link [1/1]                   down
  CP Link [1/0]                   down
  Crossover LAG                   up
  CP Link [0/3]                   up
  CP Link [1/3]                   up
```

8. When Director device DG1 comes back online, it returns to the QFabric system inventory as a backup Director device and hosts some of the Routing Engine processes (which should appear load balanced between the master and backup Director devices).

   session1@qfabric> show fabric administration inventory director-group status

```
root@qfabric> show fabric administration inventory director-group status
Director Group Status Tue Jun  5 16:41:02 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.49.215.38    15% 14759920k   6   56:09 mins
 dg1    online backup   10.49.215.39    8%  31486680k   0   07:51 mins

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    0281052011000001 online  master

  Master Services
  ---------------
  Database Server                 online
  Load Balancer Director          online
  QFabric Partition Address       online

  Director Group Managed Services
  -------------------------------
  Shared File System              online
  Network File System             online
  Virtual Machine Server          online
  Load Balancer/DHCP              online
```

```
Hard Drive Status
----------------
Volume ID:4                    optimal
Physical ID:1                  online
Physical ID:0                  online
SCSI ID:1                      100%
SCSI ID:0                      100%


Size  Used Avail Used% Mounted on
----  ---- ----- ----- ----------
423G 5.3G 396G  2%   /
99M  16M  79M   17%  /boot
93G  7.4G 86G   8%   /pbdata

Director Group Processes
------------------------
Director Group Manager         online
Partition Manager              online
Software Mirroring             online
Shared File System master      online
Secure Shell Process           online
Network File System            online
DHCP Server master             online     master
FTP Server                     online
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
```

```
  CP Link [0/3]                  up
  CP Link [1/3]                  up

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg1    0281052011000032 online  backup

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
  Volume ID:8                    optimal
  Physical ID:1                  online
  Physical ID:0                  online
  SCSI ID:1                      100%
  SCSI ID:0                      100%


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 5.3G 396G  2%   /
  99M  16M  79M   17%  /boot
  93G  7.4G 86G   8%   /pbdata

  Director Group Processes
  ------------------------
  Director Group Manager         online
  Partition Manager              online
  Software Mirroring             online
  Shared File System master      online
  Secure Shell Process           online
  Network File System            online
  DHCP Server master             online     backup
  FTP Server                     online
  Syslog                         online
  Distributed Management         online
  SNMP Trap Forwarder            online
  SNMP Process                   online
  Platform Management            online
```

```
Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up
CP Link [0/1]                  up
CP Link [0/0]                  up
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

session1@qfabric> show fabric administration inventory infrastructure

```
dg0:
   Routing Engine Type                 Hostname             PID      CPU-Use(%)
------------------------- -------------------------------- ----------
-------------
 Fabric control             QFabric_default_FC-1_RE0         27906       2.5

 Network Node group         QFabric_default_NW-NG-1_RE1      20421       1.8

 Fabric manager             FM-0                             4211        1.8

 Debug Routing Engine       QFabric_DRE                      1575        3.3

dg1:
   Routing Engine Type                 Hostname             PID      CPU-Use(%)
------------------------- -------------------------------- ----------
-------------
 Fabric control             QFabric_default_FC-0_RE0         5686        2.3

 Network Node group         QFabric_default_NW-NG-0_RE0      5866        1.9

 Fabric manager             FM-1                             572         1.6
```

Verifying a Fabric Nonstop Software Upgrade

Purpose

During the fabric portion of a nonstop software upgrade, you should expect to see both fabric control Routing Engines upgrade first, followed by the upgrade of each Interconnect device one at a time. In addition to the steps below, you can issue the **show system software upgrade status** command to view the progress of the upgrade.

Action

1. In an SSH session to the QFabric CLI, issue the request for the fabric nonstop software upgrade.

   root@qfabric> request system software nonstop-upgrade fabric jinstall-qfabric-12.2X50-D10.3.rpm

```
[FC-0     2012-06-05 16:48:53]: Retrieving package
[FC-1     2012-06-05 16:48:53]: Retrieving package
[IC-F4912 2012-06-05 16:48:59]: Retrieving package
[FC-0     2012-06-05 16:49:51]: ------- re0: -------
[FC-1     2012-06-05 16:49:52]: ------- re0: -------
[IC-F4912 2012-06-05 16:49:54]: ------- re0: -------
[IC-F4912 2012-06-05 16:50:42]: Step 1 of 20 Creating temporary file system
[IC-F4912 2012-06-05 16:50:42]: Step 2 of 20 Determining installation source
[IC-F4912 2012-06-05 16:50:43]: Step 3 of 20 Processing format options
[IC-F4912 2012-06-05 16:50:43]: Step 4 of 20 Determining installation slice
[IC-F4912 2012-06-05 16:50:43]: Step 5 of 20 Creating and labeling new slices
[IC-F4912 2012-06-05 16:50:44]: Step 6 of 20 Create and mount new file system
[IC-F4912 2012-06-05 16:50:53]: Step 7 of 20 Getting OS bundles
[IC-F4912 2012-06-05 16:50:53]: Step 8 of 20 Updating recovery media
[IC-F4912 2012-06-05 16:51:17]: Step 9 of 20 Extracting incoming image
[IC-F4912 2012-06-05 16:52:56]: Step 10 of 20 Unpacking OS packages
[IC-F4912 2012-06-05 16:52:59]: Step 11 of 20 Mounting jbase package
[IC-F4912 2012-06-05 16:53:28]: Step 12 of 20 Creating base OS symbolic links
[IC-F4912 2012-06-05 16:54:45]: Step 13 of 20 Creating fstab
[IC-F4912 2012-06-05 16:54:45]: Step 14 of 20 Creating new system files
[IC-F4912 2012-06-05 16:54:46]: Step 15 of 20 Adding jbundle package
[IC-F4912 2012-06-05 16:58:15]: Step 16 of 20 Backing up system data
[IC-F4912 2012-06-05 16:58:18]: Step 17 of 20 Setting up shared partition data
[IC-F4912 2012-06-05 16:58:18]: Step 18 of 20 Checking package sanity in
installation
[IC-F4912 2012-06-05 16:58:18]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[IC-F4912 2012-06-05 16:58:22]: Step 20 of 20 Setting da0s1 as new active
partition
[Status   2012-06-05 16:58:34]: Load completed with 0 errors...
[Status   2012-06-05 16:58:34]: Reboot is required to complete upgrade ...
[Status   2012-06-05 16:58:34]: Trying to Connect to Node: FC-0
```

```
[Status   2012-06-05 16:58:39]: Rebooting FC-0
[Status   2012-06-05 16:58:39]: Trying to Connect to Node: FC-1
[Status   2012-06-05 16:58:44]: Rebooting FC-1
[Status   2012-06-05 16:58:44]: Trying to Connect to Node: IC-F4912
[Status   2012-06-05 16:58:50]: Rebooting IC-F4912
Success
```

2. When the fabric components reboot, they appear as **Disconnected** in the output of the **show fabric administration inventory infrastructure fabric-controls** and **show fabric administration inventory interconnect-devices** commands.

session1@qfabric> show fabric administration inventory infrastructure fabric-controls

```
Item                    Identifier              Connection      Configuration
Fabric control
  FC-0                                          Disconnected
  FC-1                                          Disconnected
```

session1@qfabric> show fabric administration inventory interconnect-devices IC-F4912

```
Item                    Identifier              Connection      Configuration
Interconnect device
  IC-F4912                                      Disconnected
    F4912/RE0                                   Disconnected
```

3. When the fabric components return to full service, they appear as **Connected** in the output of the **show fabric administration inventory** command.

session1@qfabric> show fabric administration inventory

```
Item                    Identifier              Connection      Configuration
Node group
  NW-NG-0                                       Connected       Configured
    P1507-C                                     Connected
  RSNG                                          Connected       Configured
    P1550-C                                     Connected
    P1571-C                                     Connected
Interconnect device
  IC-F4912                                      Connected       Configured
    F4912/RE0                                   Connected
Fabric manager
  FM-0                                          Connected       Configured
Fabric control
```

```
  FC-0                                            Connected       Configured
  FC-1                                            Connected       Configured
Diagnostic routing engine
  DRE-0                                           Connected       Configured
```

Verifying a Redundant Server Node Group Nonstop Software Upgrade

Purpose

During the redundant server Node group portion of a nonstop software upgrade, you should expect to see the backup Node device upgrade first, followed by the upgrade of the master Node device. Server Node groups with a single device upgrade the device in the same way as a standalone switch. In addition to the steps below, you can issue the **show system software upgrade status** command to view the progress of the upgrade.

Action

1. In an SSH session to the QFabric CLI, issue the request for the redundant server Node group nonstop software upgrade.

   root@qfabric> request system software nonstop-upgrade node-group RSNG jinstall-qfabric-12.2X50-D10.3.rpm

```
Upgrading target(s): RSNG

[RSNG     2012-06-05 17:26:44]: Starting with package
ftp://169.254.0.3/pub/images/12.2X50-D10.3/jinstall-qfx.tgz
[RSNG     2012-06-05 17:26:44]: Retrieving package
[RSNG     2012-06-05 17:28:56]: Pushing bundle to fpc1
[RSNG     2012-06-05 17:29:26]: fpc1: Validate package...
[RSNG     2012-06-05 17:35:22]: fpc0: Validate package...
[RSNG     2012-06-05 17:35:49]: ------- fpc1 -------
[RSNG     2012-06-05 17:36:25]: Step 1 of 20 Creating temporary file system
[RSNG     2012-06-05 17:36:26]: Step 2 of 20 Determining installation source
[RSNG     2012-06-05 17:36:26]: Step 3 of 20 Processing format options
[RSNG     2012-06-05 17:36:26]: Step 4 of 20 Determining installation slice
[RSNG     2012-06-05 17:36:27]: Step 5 of 20 Creating and labeling new slices
[RSNG     2012-06-05 17:36:27]: Step 6 of 20 Create and mount new file system
[RSNG     2012-06-05 17:36:35]: Step 7 of 20 Getting OS bundles
[RSNG     2012-06-05 17:36:35]: Step 8 of 20 Updating recovery media
[RSNG     2012-06-05 17:36:56]: Step 9 of 20 Extracting incoming image
[RSNG     2012-06-05 17:38:07]: Step 10 of 20 Unpacking OS packages
[RSNG     2012-06-05 17:38:16]: Step 11 of 20 Mounting jbase package
[RSNG     2012-06-05 17:38:41]: Step 12 of 20 Creating base OS symbolic links
```

```
[RSNG     2012-06-05 17:39:41]: Step 13 of 20 Creating fstab
[RSNG     2012-06-05 17:39:42]: Step 14 of 20 Creating new system files
[RSNG     2012-06-05 17:39:42]: Step 15 of 20 Adding jbundle package
[RSNG     2012-06-05 17:42:16]: Step 16 of 20 Backing up system data
[RSNG     2012-06-05 17:42:32]: Step 17 of 20 Setting up shared partition data
[RSNG     2012-06-05 17:42:33]: Step 18 of 20 Checking package sanity in
installation
[RSNG    2012-06-05 17:42:33]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[RSNG     2012-06-05 17:42:36]: Step 20 of 20 Setting da0s2 as new active
partition
[RSNG     2012-06-05 17:42:51]: ------- fpc0 - master -------
[RSNG     2012-06-05 17:42:51]: Step 1 of 20 Creating temporary file system
[RSNG     2012-06-05 17:42:51]: Step 2 of 20 Determining installation source
[RSNG     2012-06-05 17:42:51]: Step 3 of 20 Processing format options
[RSNG     2012-06-05 17:42:51]: Step 4 of 20 Determining installation slice
[RSNG     2012-06-05 17:42:51]: Step 5 of 20 Creating and labeling new slices
[RSNG     2012-06-05 17:42:51]: Step 6 of 20 Create and mount new file system
[RSNG     2012-06-05 17:42:51]: Step 7 of 20 Getting OS bundles
[RSNG     2012-06-05 17:42:51]: Step 8 of 20 Updating recovery media
[RSNG     2012-06-05 17:42:51]: Step 9 of 20 Extracting incoming image
[RSNG     2012-06-05 17:42:51]: Step 10 of 20 Unpacking OS packages
[RSNG     2012-06-05 17:42:51]: Step 11 of 20 Mounting jbase package
[RSNG     2012-06-05 17:42:51]: Step 12 of 20 Creating base OS symbolic links
[RSNG     2012-06-05 17:42:51]: Step 13 of 20 Creating fstab
[RSNG     2012-06-05 17:42:51]: Step 14 of 20 Creating new system files
[RSNG     2012-06-05 17:42:51]: Step 15 of 20 Adding jbundle package
[RSNG     2012-06-05 17:42:51]: Step 16 of 20 Backing up system data
[RSNG     2012-06-05 17:42:51]: Step 17 of 20 Setting up shared partition data
[RSNG     2012-06-05 17:42:51]: Step 18 of 20 Checking package sanity in
installation
[RSNG    2012-06-05 17:42:51]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[RSNG     2012-06-05 17:42:51]: Step 20 of 20 Setting da0s2 as new active
partition
[RSNG     2012-06-05 17:43:36]: Rebooting Backup RE
[RSNG     2012-06-05 17:43:36]: ------- Rebooting fpc1 -------
[RSNG     2012-06-05 17:50:12]: Initiating Chassis In-Service-Upgrade
[RSNG     2012-06-05 17:50:33]: Upgrading group: 0 fpc: 0
[RSNG     2012-06-05 17:52:38]: Upgrade complete for group:0
[RSNG     2012-06-05 17:52:38]: Upgrading group: 1 fpc: 1
[RSNG     2012-06-05 17:54:42]: Upgrade complete for group:1
[RSNG     2012-06-05 17:54:42]: Finished processing all upgrade groups, last
group :1
```

```
[RSNG     2012-06-05 17:54:48]: Preparing for Switchover
[RSNG     2012-06-05 17:55:38]: Switchover Completed
[Status   2012-06-05 17:55:41]: Upgrade completed with 0 errors
Success
```

2. Issue the **show system software upgrade status** command to view the status of the upgrade.

   root@qfabric> show system software upgrade status

```
Wed Jan 16 22:06:02 2013 Software nonstop upgrade on:
                         RSNG in progress
```

3. During the redundant server Node group upgrade, the backup Node device (in this case, P1571-C) is upgraded first and appears in the **Disconnected** state in the output of the **show fabric administration inventory** command.

   session1@qfabric> show fabric administration inventory

```
Item                    Identifier              Connection      Configuration
Node group
  NW-NG-0                                       Connected       Configured
    P1507-C                                     Connected
  RSNG                                          Connected       Configured
    P1550-C                                     Connected
    P1571-C                                     Disconnected
Interconnect device
  IC-F4912                                      Connected       Configured
    F4912/RE0                                   Connected
Fabric manager
  FM-0                                          Connected       Configured
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
Diagnostic routing engine
  DRE-0                                         Connected       Configured
```

4. After the backup Node device comes back online, the master Node device (in this case, P1550-C) appears in the **Disconnected** state in the output of the **show fabric administration inventory** command while the master Node device upgrades its software.

   session1@qfabric> show fabric administration inventory

```
Item                        Identifier                  Connection      Configuration
Node group
  NW-NG-0                                               Connected       Configured
    P1507-C                                             Connected
  RSNG                                                  Connected       Configured
    P1550-C                                             Disconnected
    P1571-C                                             Connected
Interconnect device
  IC-F4912                                              Connected       Configured
    F4912/RE0                                           Connected
Fabric manager
  FM-0                                                  Connected       Configured
Fabric control
  FC-0                                                  Connected       Configured
  FC-1                                                  Connected       Configured
Diagnostic routing engine
  DRE-0                                                 Connected       Configured
```

5. After both Node devices in the redundant server Node group come back online, both Node devices appear as **Connected** to indicate the successful completion of the Node group nonstop software upgrade step.

session1@qfabric> show fabric administration inventory

```
Item                        Identifier                  Connection      Configuration
Node group
  NW-NG-0                                               Connected       Configured
    P1507-C                                             Connected
  RSNG                                                  Connected       Configured
    P1550-C                                             Connected
    P1571-C                                             Connected
Interconnect device
  IC-F4912                                              Connected       Configured
    F4912/RE0                                           Connected
Fabric manager
  FM-0                                                  Connected       Configured
Fabric control
  FC-0                                                  Connected       Configured
  FC-1                                                  Connected       Configured
Diagnostic routing engine
  DRE-0                                                 Connected       Configured
```

Verifying a Network Node Group Nonstop Software Upgrade

Purpose

During the network Node group portion of a nonstop software upgrade, you should expect to see the backup network Node group Routing Engine upgrade first, followed by the Node devices within the network Node group upgrading one at a time, and ending with the upgrade of the master network Node group Routing Engine. In addition to the steps below, you can issue the **show system software upgrade status** command to view the progress of the upgrade.

> **NOTE:** If you configure an upgrade group for Node groups containing 2 or more Node devices, all Node devices within the upgrade group reboot at the same time.

Action

1. In an SSH session to the QFabric CLI, issue the request for the network Node group nonstop software upgrade.

   root@qfabric> request system software nonstop-upgrade node-group NW-NG-0 jinstall-qfabric-12.2X50-D10.3.rpm

```
Upgrading target(s): NW-NG-0

[NW-NG-0  2012-06-01 09:45:06]: Starting with package
ftp://169.254.0.3/pub/images/12.2X50-D10.3/jinstall-qfx.tgz
[NW-NG-0  2012-06-01 09:45:06]: Retrieving package
[NW-NG-0  2012-06-01 09:46:18]: Pushing bundle to fpc0
[NW-NG-0  2012-06-01 09:46:52]: fpc0: Validate package...
[NW-NG-0  2012-06-01 09:53:26]: ------- fpc0 -------
[NW-NG-0  2012-06-01 09:54:01]: Step 1 of 20 Creating temporary file system
[NW-NG-0  2012-06-01 09:54:01]: Step 2 of 20 Determining installation source
[NW-NG-0  2012-06-01 09:54:02]: Step 3 of 20 Processing format options
[NW-NG-0  2012-06-01 09:54:02]: Step 4 of 20 Determining installation slice
[NW-NG-0  2012-06-01 09:54:02]: Step 5 of 20 Creating and labeling new slices
[NW-NG-0  2012-06-01 09:54:03]: Step 6 of 20 Create and mount new file system
[NW-NG-0  2012-06-01 09:54:10]: Step 7 of 20 Getting OS bundles
[NW-NG-0  2012-06-01 09:54:10]: Step 8 of 20 Updating recovery media
[NW-NG-0  2012-06-01 09:54:31]: Step 9 of 20 Extracting incoming image
[NW-NG-0  2012-06-01 09:55:43]: Step 10 of 20 Unpacking OS packages
[NW-NG-0  2012-06-01 09:55:46]: Step 11 of 20 Mounting jbase package
[NW-NG-0  2012-06-01 09:56:09]: Step 12 of 20 Creating base OS symbolic links
[NW-NG-0  2012-06-01 09:57:05]: Step 13 of 20 Creating fstab
[NW-NG-0  2012-06-01 09:57:05]: Step 14 of 20 Creating new system files
[NW-NG-0  2012-06-01 09:57:05]: Step 15 of 20 Adding jbundle package
```

```
[NW-NG-0  2012-06-01 09:59:30]: Step 16 of 20 Backing up system data
[NW-NG-0  2012-06-01 09:59:44]: Step 17 of 20 Setting up shared partition data
[NW-NG-0  2012-06-01 09:59:44]: Step 18 of 20 Checking package sanity in
installation
[NW-NG-0  2012-06-01 09:59:44]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[NW-NG-0  2012-06-01 09:59:47]: Step 20 of 20 Setting da0s1 as new active
partition
[NW-NG-0  2012-06-01 09:59:55]: Starting with package
ftp://169.254.0.3/pub/images/12.2X50-D10.3/jinstall-dc-re.tgz
[NW-NG-0  2012-06-01 09:59:55]: Retrieving package
[NW-NG-0  2012-06-01 10:01:04]: Pushing bundle to re1
[NW-NG-0  2012-06-01 10:01:35]: re1: Validate package...
[NW-NG-0  2012-06-01 10:02:56]: re0: Validate package...
[NW-NG-0  2012-06-01 10:04:45]: Rebooting Backup RE
[NW-NG-0  2012-06-01 10:08:31]: Initiating Chassis In-Service-Upgrade
[NW-NG-0  2012-06-01 10:08:52]: Upgrading group: 0 fpc: 0
[NW-NG-0  2012-06-01 10:18:33]: Upgrade complete for group:0
[NW-NG-0  2012-06-01 10:18:33]: Finished processing all upgrade groups, last
group :0
[NW-NG-0  2012-06-01 10:18:37]: Preparing for Switchover
[NW-NG-0  2012-06-01 10:18:55]: Switchover Completed
[Status   2012-06-01 10:18:58]: Upgrade completed with 0 errors
Success
```

2. Issue the **show system software upgrade status** command to view the status of the upgrade.

   root@qfabric> show system software upgrade status

```
Wed Jan 16 22:06:02 2013 Software nonstop upgrade on:
                         NW-NG-0 in progress
```

3. Verify the progress of the upgrade by issuing the **show chassis nonstop-upgrade node-group**, **show fabric administration inventory**, **show fabric administration inventory infrastructure**, and **show fabric administration inventory node-groups NW-NG-0** commands. You should see the backup network Node group Routing Engine reboot first, followed by each Node device within the network Node group, and ending with the reboot of master network Node group Routing Engine. Restarting devices appear as **Disconnected** in the output of the **show fabric administration inventory** command and restarting Routing Engines do not appear in output of the **show fabric administration inventory infrastructure** command until they return to service.

RELATED DOCUMENTATION

Upgrading Software on a QFabric System

The QFabric system software package contains software for all of the different components in the QFabric system, such as the Director group, Interconnect devices, Node devices, and other QFabric system components. You can upgrade the software on all of the QFabric components at the same time using the **request system software add *package-name* component all reboot** command.

> **NOTE:** Downgrading software on a QFabric system is not supported.

This topic describes the following tasks:

Backing Up the Current Configuration Files

To back up your current configuration files:

`user@switch>` **request system software configuration-backup *path***

Back up the configuration files to a local directory, remote server, or removable drive (for example, an external USB flash drive).

For example:

```
user@switch> request system software configuration-backup /media/USB/
```

Downloading Software Files Using a Browser

> **NOTE:** To access the download site, you must have a service contract with Juniper Networks and an access account. If you need help obtaining an account, complete the registration form at the Juniper Networks website https://www.juniper.net/registration/Register.jsp .

1. Using a Web browser, navigate to the https://www.juniper.net/support .

2. Click **Download Software**.

3. In the **Switching** box, click **Junos OS Platforms**.

4. In the **QFX Series** section, click the name of the platform for which you want to download software.

5. Click the **Software** tab and select the release number from the **Release** drop-down list.

6. Select the complete install package you want to download in the **QFabric System Install Package** section:

   - If you want to upgrade the entire QFabric system, select **QFabric System - Complete Install Package**.
   - If you want to upgrade either a single Node or Interconnect device for recovery purposes, select **Node and Interconnect Device Install Package**. For information on how to perform a recovery installation on either a Node or Interconnect device, see "Performing a Recovery Installation" on page 904.

   A login screen appears.

7. Enter your user ID and password and click **Login**.

8. Read the End User License Agreement, select the **I agree** option button, and then click **Proceed**.

9. Save the **jinstall-qfabric-*version*.rpm** file on your computer.

Retrieving Software Files for Download

Retrieve the software from the location in which you downloaded it. To do this, issue the **request system software download** command. The software package is copied from where you downloaded it and is placed locally on the QFabric system.

- To retrieve the software:

  `user@switch>` **request system software download** ***/path/package-name***

  For example:

  `user@switch>` **request system software download ftp://server/files/jinstall-qfabric-11.3X30.6.rpm**

Installing the Software Package on the Entire QFabric System

> **NOTE:** On a QFabric system, a QFX3500 Node device or QFX3600 Node device might not be able to participate as a Node device in the QFabric system if the Node device is running a different version of software from that of the Director group. This mismatch of software versions between the Node device and the Director group can occur when the Node device is introduced into the setup, and both Director devices go offline before the Node device completes its auto-upgrade process to upgrade its software version to the same software version running on the Director group. The workaround is to reboot the QFX3500 or QFX3600 Node device once the Director group comes back online. The QFX3500 or QFX3600 Node device will initiate auto-upgrade and upgrade its software version from the Director group.

1. Issue the **request system software add** ***package-name*** **component all reboot** command.

   For example:

   `user@switch>` **request system software add jinstall-qfabric-11.3X30.6.rpm component all reboot**

   > **NOTE:** If you receive an error message after issuing the **request system software add** ***package-name*** **component all reboot** command that says that the configuration file cannot be loaded as is, you will need to enter configuration mode, make any necessary changes to the configuration file, and then commit the changes.

NOTE: The default value for a QFabric system software upgrade is **validate**. The validation step adds up to 10 minutes to the overall software upgrade. If the validation fails, the upgrade does not proceed and the QFabric system automatically issues the **request system software rollback** command to restore the current software image. If you upgrade more than one component (for example, by issuing the **component all** option), validation failure on one device stops the upgrade process for the other devices. If you do not want to validate the software package against the current configuration, issue the **no-validate** option.

2. After the reboot has finished, verify that the new version of software has been properly installed by issuing the **show version component all** command.

   `user@switch>` **show version component all**

```
dg1:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]

dg0:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]

NW-NG-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-0:
-
Hostname: qfabric
Model: qfx-jvre
```

```
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-1:
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

DRE-0:
-
Hostname: dre-0
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FM-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
```

```
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

nodedevice1:
-
Hostname: qfabric
Model: QFX3500
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

interconnectdevice1:
-
Hostname: qfabric
Model: QFX3108
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]
```

RELATED DOCUMENTATION

Software Installation and Upgrade Overview

Performing a QFabric System Recovery Installation on the Director Group | **894**

Upgrading Jloader Software on QFX Series Devices

request system software add

Software Installation and Upgrade Guide

Downgrading Software on a QFabric System

IN THIS SECTION

Starting in Junos OS Release 14.1, if a software upgrade or configuration changes has made the QFabric system unstable or inoperable, you can rollback or downgrade to a previous version of software and configuration. The software and configuration that you rollback to is called a restore-point. The restore-point is stored in a dedicated partition. You can create a checksum (MD5 hash) for the partition in which the restore-partition is stored and verify the integrity of the restore-point partition.

> **NOTE:** The ability to downgrade the software does not replace the existing back up and restore functionality.

If possible, perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device (for example, an external USB flash drive) for each of your Director devices to use during the recovery installation.

   You can either use the external USB flash drive containing the software supplied by Juniper Networks, or you can use an external USB flash drive supplied by Juniper Networks on which you install the QFabric system install media.

2. Because the recovery installation process completely overwrites the entire contents of the Director device, make sure you back up any configuration files and initial setup information on a different external USB flash drive before you begin a recovery installation. You will need to restore this information as part of recovery process.

   Use the **request system software configuration-backup** command to back up your configuration files and initial setup information:

   `user@switch>` **request system software configuration-backup *path***

NOTE: To recover the Director group, you must upgrade both Director devices in parallel. If you are recovering only one Director device in a Director group, and the software version will remain the same between the two Director devices, make sure that the other Director device is powered on and operational. If the software version of the Director device you are recovering will be different, make sure that the other Director device is powered off and is not operational.

(Optional) Creating an Emergency Boot Device Using a Juniper Networks External Blank USB Flash Drive

If you do not have an external USB flash drive preloaded with the software from Juniper Networks to use as an emergency boot device, you can create your own, using a blank external USB flash drive provided by Juniper Networks. Download the install media from the Juniper Networks Support website onto your UNIX workstation, uncompress and untar the software, and then burn the software image onto your Juniper Networks external USB (4-gigabyte) flash drive. Make sure you create two emergency boot devices, one for each Director device, so you can perform a recovery installation in parallel.

1. Using a Web browser, navigate to the https://www.juniper.net/support .

2. Click **Download Software**.

3. In the *Switching*box, click *Junos OS Platforms*.

4. In the *QFX Series* section, click the name of the platform for which you want to download software.

5. Click the *Software* tab and select the release number from the *Release* drop-down list.

6. Select the complete install media you want to download in the *QFabric System Install Media* section.

   A login screen appears.

7. Enter your name and password and press **Enter**.

8. Read the End User License Agreement, click the **I agree** radio button, and then click **Proceed**.

9. Log in and save the install media file to your UNIX workstation.

10. Use FTP to access the UNIX workstation where the install media resides.

    ftp ftp://*hostname/pathname install-media-qfabric-<version>*.img.tgz

11. When prompted, enter your username and password.

12. Make sure you are in binary mode by entering **binary** at the prompt.

    binary

13. Use the **get** command to transfer the installation package from the FTP host to your UNIX workstation.

    get *install-media-qfabric-<version>*.img.tgz

14. Close the FTP session:

    bye

15. Untar the *install-media-qfabric-<version>* .img.tgz file on your UNIX workstation.

    ```
    tar -xvzf install-media-qfabric-11.3X30.6.img.tgz
    ```

16. Insert a blank external USB (4-gigabyte) flash drive supplied by Juniper Networks into your UNIX workstation.

17. Burn the software image you just downloaded to your UNIX workstation onto your external USB flash drive using the **dd** command:

    dd if=install-media-qfabric-11.3X30.6.img of=/dev/sdb bs=16k

    ```
    250880+0 records in
    250880+0 records out
    4110417920 bytes (4.1 GB) copied, 5.10768 seconds, 805 MB/s
    ```

18. Perform the steps in "Performing a Recovery Installation Using a Juniper Networks External USB Flash Drive with Preloaded Software" on page 634 to continue with the recovery installation.

Performing a Recovery Installation Using a Juniper Networks External USB Flash Drive with Preloaded Software

This procedure describes how to perform a recovery installation using an external USB flash drive that contains Junos OS software.

> **NOTE:** Since the recovery installation process completely overwrites the entire contents of the Director device, you will need to restore the required configuration files and initial setup information. The following procedure assumes you previously saved these backup files with the **request system software configuration-backup** command. Ensure that you have these backup files available on an external USB flash drive before you perform the following steps.

1. Insert the external USB flash drive into the Director device.

2. Perform one of the following tasks:

   - If you have access to the default partition, reboot the Director device by issuing the **request system reboot director-group** command.
   - If you do not have access to the default partition, power cycle the Director device.

   The following menu appears on the Director device console when the Director device boots up:

   ```
   Juniper Networks QFabric Director Install/Recovery Media
   -  To boot from the local disk, wait 10 seconds or press the Enter key.
   -  To reinstall the QFabric software on this Director device, type: install
   ```

3. Type **install** and then press **Enter** to install the software on the Director device.

   Once the installation process is complete, the Director device reboots, and the following menu appears on the Director device console:

   ```
   Juniper Networks QFabric Director Install/Recovery Media
   -  To boot from the local disk, wait 10 seconds or press the Enter key.
   -  To reinstall the QFabric software on this Director device, type: install
   ```

4. Press **Enter**.

   The Director device reboots from the local disk on which the software was just installed.

5. Log in as root on the Director device.

   The following menu appears on the Director device console:

```
Before you can access the QFabric system, you must complete the initial setup
of the Director group by using the steps that follow.
If the initial setup procedure does not complete successfully, log out of the
Director device and then log back in to restart
 this setup menu.

Continue?[y/n]
```

6. Enter **n** to bypass the initial setup script and enter the Director device root directory, where you can mount the external USB flash drive containing the configuration files and initial setup information.

7. Issue the **ls /mnt** command to list the *mount* directory.

   `root@dg0 ~]#` **ls /mnt**

8. Issue the **mkdir** command to create a directory within the mount directory.

   `root@dg0 ~]#` **mkdir /mnt/myusb**

9. Issue the **mount /dev/sdb2 /mnt/myusb/** command to mount the external USB flash drive to the local drive of the Director device.

   `root@dg0 ~]#` **mount /dev/sdb2 /mnt/myusb/**

10. Issue the **ls -la /mnt/myusb/** command to verify the contents of your mounted external USB flashdrive.

   `root@dg0 ~]#` **ls -la /mnt/myusb/**

```
total 1770884
drwxr-xr-x 2 root root       4096 Sep  7 05:16 .
drwxr-xr-x 3 root root       4096 Sep  7 10:15 ..
-rw-r--r-- 1 root root       4249 Sep  7 03:52 mybackup-20110907
```

11. Exit the Director device and log back in as root on the Director device.

   The following menu appears:

```
Before you can access the QFabric system, you must complete the initial setup
of the Director group by using the steps that follow.
If the initial setup procedure does not complete successfully, log out of the
Director device and then log back in to restart
 this setup menu.
```

```
Continue?[y/n] y
Initial Configuration

You may enter the configuration manually or restore from a backup.

Specify a backup file? [y/n] : y
Please specify the full path of the configuration backup file. :
/mnt/myusb/mybackup-20110907
```

12. Enter **y** to continue.

13. Enter **y** and specify the path to the backup configuration file located on the external USB flash drive.

    `/mnt/myusb/mybackup-20110907`

    The following messages appear:

```
Saving temporary configuration...
Configuring peer...
connect error for 1.1.1.2:9001
Configuring local interfaces...
Configuring interface eth0 with [10.49.213.163/24:10.49.213.254]
Configured interface eth0 with [10.49.213.163/24:10.49.213.254]
Configuring QFabric software with initial pool of 4000 MAC addresses
[00:10:00:00:00:00 - 00:10:00:00:0f:3b]
Configuring QFabric address [10.49.213.50]
Reconfiguring QFabric software static configuration
Applying the new Director Device password
Applying the QFabric component password
First install initial configuration, generating and sharing SSH keys.
First install initial configuration, generating SSH keys.
connect error for 1.1.1.2:9001
Shared SSH keys.
Configuration complete. Director Group services will auto start within 30 seconds.
```

    The Director device reboots from the local disk on which the software was just installed. Exit the Director device session and log in to the QFabric default partition CLI.

14. Issue the **request system software configuration-restore** command and specify the path to the backup configuration file located on the external USB flash drive to load the previously saved QFabric system configuration.

15. From the default partition, issue the **request system reboot node-group all** command to reboot all of the Node groups in the QFabric system to ensure that all Node devices are running the same version of software as the Director-group.

    `user@switch>` **request system reboot node-group all**

16. From the default partition, issue the **request system reboot fabric** command to reboot the Interconnect devices and the other components in the fabric in the QFabric system to ensure that Interconnect devices are running the same version of software as the Director group.

    `user@switch>` **request system reboot fabric**

17. Log in to the default partition and issue the **show version component all** command to verify that all components are running the same version of software.

    `user@switch>` **show version component all**

```
dg1:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]

dg0:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]

NW-NG-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-0:
-
Hostname: qfabric
```

```
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-1:
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

DRE-0:
-
Hostname: dre-0
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FM-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
```

```
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

nodedevice1:
-
Hostname: qfabric
Model: QFX3500
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

interconnectdevice1:
-
Hostname: qfabric
Model: QFX3108
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]
warning:  from interconnectdevice0: Disconnected
```

Release History Table

Release	Description
14.1	Starting in Junos OS Release 14.1, if a software upgrade or configuration changes has made the QFabric system unstable or inoperable, you can rollback or downgrade to a previous version of software and configuration.

Performing System Backup and Recovery for a QFabric System

Many routers and switches require an administrator to recover the software package and the configuration file for the device separately. In the case of a device failure, this means the administrator might need to perform two separate tasks (if neither the software package nor the configuration file can be recovered).

In contrast, the QFabric system uses a unique mechanism that saves the backup and recovery files for both the Junos OS software and the system configuration into a single collection. The following QFabric system backup and recovery mechanism simplifies and streamlines the recovery process so you can return to normal operations as quickly as possible.

To backup and recover your QFabric system:

1. (First time only) Implement the following one-time procedure to prepare your QFabric system to use the system backup and recovery feature:

   - Insert a Juniper Networks software installation USB flash drive into the master Director device. (This drive was provided to you as one of the components of your QFabric system shipment.)

   - Issue the **request system software format-qfabric-backup** command. The contents and format of the USB flash drive are copied to the Director group shared directory and are used as the basis for all future backup and recovery operations.

     `user@qfabric>` **request system software format-qfabric-backup**

     ```
     Copying QFabric USB template image from /dev/sdb(Unigen,PQS4000,4009 MB)......
     ```

   - Remove the Juniper Networks software installation USB drive from the master Director device.

2. Issue the **request system software system-backup** command to backup the software package and configuration file. This command saves the current files necessary to recover the QFabric system. The files are saved to a shared memory directory in the Director group.

   > **NOTE:** As you upgrade your system with new software and change the system configuration over time, remember to reissue this command periodically to save the newest files for recovery purposes.

   `user@qfabric>` **request system software system-backup**

   ```
   user@qfabric>
   ```

3. Insert a 4 GB or larger USB flash drive into the master Director device for your Director group, and issue the **request system software system-backup usb-create** command. This command copies the recovery files that have been backed up in the Director group and transfers them to the USB flash drive to create a recovery USB drive.

   > **NOTE:** Issuing this command overwrites the contents of the USB flash drive with the QFabric system recovery files.

   ```
   user@qfabric> request system software system-backup usb-create /dev/sdb
   ```

   ```
   Issuing this command will overwrite the contents of the USB drive.
   Continue? [yes,no] (no) yes

   This operation will access the USB drive on 0281042010000013.
   Are you sure you want to continue? [yes,no] (no) yes

   Copying QFabric recovery media to /dev/sdb...
   Successfully copied QFabric recovery media to /dev/sdb
   ```

4. Remove the recovery USB drive from the Director device, and store it securely in a known location that you will remember when you need to use the recovery USB drive.

5. If the QFabric system fails, power off the Director group, insert the recovery USB drive into the master Director device of your Director group, turn on power to the Director device, and follow the prompts to recover your system. This step restores the software package and the configuration file for your QFabric system.

RELATED DOCUMENTATION

request system software format-qfabric-backup | 697
request system software system-backup | 706

CHAPTER 21

QFabric System Administration and Maintenance

IN THIS CHAPTER

Overview of Internal Fabric Monitoring

Internal fabric monitoring is a feature of the Operation, Administration, and Maintenance (OAM) of the QFabric system. This feature enables you to validate the flow path of protocol data units (PDUs) across a given VLAN on the QFabric system using the unicast ping, multicast ping, and traceroute operations.

Internal fabric monitoring is useful for fault detection on the QFabric system. For example, if a PDU reaches a destination that is not part of the VLAN configuration, the operation (unicast ping, multicast ping, or traceroute) displays the exception on the console at runtime.

The unicast and multicast ping operations send PDUs from a source interface (called the source fabric maintenance endpoint [FMEP]) to a destination FMEP. The destination FMEP sends a response to the source FMEP when the PDUs are received.

The traceroute operation, also called a flow linktrace, traces the path taken by a specific, learned unicast flow from a source FMEP to a destination FMEP in a VLAN. The source and destination FMEPs may be on the same Node device, different Node devices connected to the same Interconnect device, or different Node devices connected to different Interconnect devices. The flow path is the sequence of Packet Forwarding Engine forwarding hops along which the PDU travels. The hop-by-hop sequence and number of hops are reported in terms of fabric maintenance intermediate points (FMIPs), which are interfaces on the Packet Forwarding Engine of the Interconnect device. An FMIP sends a response to the source FMEP when the traceroute PDU is received.

The following internal fabric monitoring commands are supported:

- **show oam fabric flow specification**
- **show oam fabric interfaces**
- **ping fabric unicast-flow**

- **ping fabric multicast-flow**
- **traceroute fabric unicast-flow**

The following are the main components of the internal fabric monitoring feature:

- FMEP—Represents the source or destination point (endpoint) in the monitoring operations. An FMEP is an interface through which PDUs are sent (source FMEP) or received (destination FMEP). Upon receipt of the PDUs, the destination FMEP sends a response to the source FMEP to validate the monitoring flow. FMEPs are associated with a VLAN in the fabric maintenance association (FMA) configuration, and the source and destination FMEP addresses are configured in the flow specification.
- FMA—Associates a set of FMEPs with a VLAN. The FMA defines the VLAN and FMEP parameters, including the VLAN name, FMEP identifiers, FMEP names, and the interface names of the FMEPs. The FMEPs defined in the FMA are the source and destination FMEPs used in the monitoring commands.

> **NOTE:** A default FMA is automatically created for each Node group in the QFabric system. The default FMA is used to send error response PDUs (for example, in the case of a VLAN leak) and responses to PDUs that are not mapped to a specific interface in the QFabric system.

- Flow specification—Configures the flow type and FMEP addressing parameters. Unicast flow types include an Ethernet type (other than IPv4) and Ethernet IPv4. Multicast flow types include the Ethernet IPv4 and VLAN flood type. The flow specification also defines parameters within each flow type, such as MAC or IPv4 addresses of the source and destination FMEPs. The names and identifiers of these FMEPs are configured in the FMA parameters.

To enable internal fabric monitoring, configure the **fabric-maintenance-associations** and **flow-specs** statements at the **[edit protocols oam fabric]** hierarchy level.

The **ping fabric unicast-flow**, **ping fabric multicast-flow**, and **traceroute fabric unicast-flow** commands require that you specify the flow specification and FMA names, as well as the source and destination FMEP names.

RELATED DOCUMENTATION

Configuring a Fabric Maintenance Association | 502

Configuring Flow Specifications | 503

fabric (OAM) | 531

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

QFabric System Operational Mode Commands

Table 101 on page 644 summarizes the command line interface (CLI) commands that you can use to monitor and troubleshoot the QFabric system operations.

Table 101: QFabric System Operational Mode Commands

Task	Command
Bring an Interconnect device Control Board offline or online.	**request chassis cb**
Select the operating mode for the device.	**request chassis device-mode**
Set the Interconnect device Flexible PIC Concentrator (FPC) offline or online for the QFabric system.	**request chassis fabric fpc**
Log in to individual QFabric system components for device level troubleshooting.	**request component login**
Select a Director device to become the new primary device within a Director group.	**request fabric administration director-group change-master**
Power off an Interconnect device in a QFX3000-G QFabric system (take the device offline and gracefully shut it down).	**request fabric administration power-off interconnect-device**
Power off an Interconnect device FPC card in a QFX3000-G QFabric system.	**request fabric administration power-off interconnect-device fpc**
Power off node devices in server Node groups, redundant server Node groups, and network Node groups In a QFX3000-G Qfabric system, or power off an Interconnect device in a QFX3000-M QFabric system.	**request fabric administration power-off node-device**
Remove a disconnected component from the QFabric system inventory.	**request fabric administration remove**
Add a MAC range to the MAC pool assigned to the QFabric system.	**request fabric administration system mac-pool add**
Delete a MAC range from the MAC block assigned to the QFabric system.	**request fabric administration system mac-pool delete**
Halt a Director device.	**request system halt director-device**
Reboot QFabric system components.	**request system reboot**

Table 101: QFabric System Operational Mode Commands *(continued)*

Task	Command
Upgrade the software version of the QFabric system by using the nonstop software upgrade method (which preserves forwarding functionality during the upgrade and enables components to upgrade on a rotating basis).	request system software nonstop-upgrade
Save the software package and system configuration files to be able to recover the QFabric system in the case of a system failure.	request system software system-backup
Specify information to be displayed on the LCD panel of a QFabric system device.	set chassis display message
Display information about the operating mode of the device.	show chassis device-mode
Display information about the Control Board of an Interconnect device.	show chassis environment cb
Display the status of Ethernet switching in the Control Board of an Interconnect device.	show chassis ethernet-switch interconnect-device cb
Display the status of Ethernet switching in the Flexible PIC Controller (FPC) of an Interconnect device.	show chassis ethernet-switch interconnect-device fpc
Display the status of the data plane connections in the QFabric system.	show chassis fabric connectivity
Display the fabric management status of devices in your QFabric system.	show chassis fabric device
Display information shown on the LCD screen of a QFabric system device.	show chassis lcd
Display the status of a nonstop software upgrade for a Node group.	show chassis nonstop-upgrade node-group
Display all devices that belong to the QFabric system.	show fabric administration inventory
Display the Director devices that belong to a QFabric system Director group.	show fabric administration inventory director-group status
Display the services running on the Director group for the QFabric system.	show fabric administration inventory infrastructure
Display the Interconnect devices that belong to a QFabric system.	show fabric administration inventory interconnect-devices
Display the Node devices that belong to the QFabric system.	show fabric administration inventory node-devices

Table 101: QFabric System Operational Mode Commands *(continued)*

Task	Command
Display the Node groups and the corresponding Node devices that belong to the QFabric system.	show fabric administration inventory node-groups
Display all devices that belong to the QFabric system.	show fabric inventory
Display the MAC addresses that belong to a QFabric system Director group.	show fabric administration system mac-pool
Display the Director device that hosts the QFabric CLI session.	show fabric session-host
Display the system log messages in the specified file.	show log
Display the status of a QFabric system software upgrade.	show system software upgrade status

Filtering Operational Mode Command Output in a QFabric System

When you issue an operational mode command in a QFabric system, the output generated can be fairly extensive because of the number of components contained within the system. To make the output more accessible, you can filter the output by appending the **| filter** option to the end of most Junos OS commands.

1. To filter operational mode command output and limit it to a Node group, include the **| filter node-group *node-group-name*** option at the end of your Junos OS operational mode command.

   root@qfabric> show interfaces terse | filter node-group NW-NG-0

```
Interface               Admin Link Proto    Local                 Remote
NW-NG-0:dsc             up    up
NW-NG-0:em0             up    up
NW-NG-0:em1             up    up
NW-NG-0:gre             up    up
NW-NG-0:ipip            up    up
NW-NG-0:lo0             up    up
NW-NG-0:lo0.16384       up    up   inet     127.0.0.1           --> 0/0
NW-NG-0:lo0.16385       up    up   inet
NW-NG-0:lsi             up    up
NW-NG-0:mtun            up    up
NW-NG-0:pimd            up    up
```

```
NW-NG-0:pime              up    up
NW-NG-0:tap               up    up
Node01:ge-0/0/10          up    up
Node01:ge-0/0/40          up    up
Node01:ge-0/0/41          up    up
vlan                      up    up
```

2. To filter operational mode command output and limit it to a set of Node groups, include the **| filter node-group** option at the end of your Junos OS operational mode command and specify the list of Node group names in brackets.

   root@qfabric> show ethernet-switching interfaces | filter node-group [NW-NG-0 RSNG-1]

```
Interface     State  VLAN members        Tag   Tagging  Blocking
NW-NG-0:ae0.0 up     v200                200   tagged   unblocked
                     v50                 50    tagged   unblocked
                     v51                 51    tagged   unblocked
                     v52                 52    tagged   unblocked
                     v53                 53    tagged   unblocked
RSNG-1:ae0.0  up     v200                200   untagged unblocked
RSNG-1:ae47.0 up     v50                 50    tagged   unblocked
                     v51                 51    tagged   unblocked
                     v52                 52    tagged   unblocked
                     v53                 53    tagged   unblocked
```

CHAPTER 22

Operational Mode Commands

IN THIS CHAPTER

ping fabric multicast-flow

Syntax

```
ping fabric multicast-flow source-fmep-id source-fmep-id fma-name fma-name flow-spec-name flow-specification-name
<verbose>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Send a fabric multicast ping command to the multicast group destination fabric maintenance endpoints (FMEPs) configured in the flow specification. Send a single PDU with a timeout after 1 second.

Options

flow-spec-name *flow-specification-name*—Name of the flow specification that defines the protocol parameters (unicast or multicast) for the fabric ping operation.

fma-name *fma-name*—Name of the FMA.

source-fmep-id *source-fmep-id*—FMEP ID that is the source of the fabric ping operation.

verbose—(Optional) Detailed version of the output display.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500
Configuring a Fabric Maintenance Association | 502
Configuring Flow Specifications | 503
fabric (OAM) | 531
ping fabric unicast-flow | 652
traceroute fabric unicast-flow | 888

List of Sample Output

ping fabric multicast-flow on page 651

Output Fields

Table 102 on page 651 lists the output fields for the **ping fabric-multicast-flow** command. Output fields are listed in the approximate order in which they appear.

Table 102: ping fabric multicast-flow Output Fields

Field Name	Field Description
Using fabric flow-specification	Name of the flow specification.
Ethernet frame-size	Ethernet frame size in bytes.
Source-IP	MAC address of the source FMEP interface.
Destination-IP	MAC address of the destination FMEP interface.
Protocol	IP protocol.
received response from fmep-id	FMEP ID from which responses are received.

Sample Output

ping fabric multicast-flow

`user@host>` **ping fabric multicast-flow source-fmep-id 3 fma-name fma1 flow-spec-name fspec2 verbose**

```
Using fabric flow-specification: fspec2
 Ethernet frame-size: 256
 Source-IP: 87.238.205.21
 Destination-IP: 225.0.0.1 IP
 Protocol: 17
 received response from fmep-id 32775...
 received response from fmep-id 32794...
 received response from fmep-id 32795...
 sent 1 requests, received 3 responses
```

ping fabric unicast-flow

Syntax

```
ping fabric unicast-flow fma-name fma-name source-fmep-id source-fmep-id dest-fmep-id dest-fmep-id
   flow-spec-name flow-specification-name
<count count>
<forced-fte-interface fte-interface>
<verbose>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Send a unicast fabric ping command to the destination fabric maintenance endpoints (FMEPs) specified.

Options

count *count*—(Optional) Number of fabric ping PDUs to send.

The maximum PDU count is 5. The default PDU count is 1.

dest-fmep-id *destination-fmep-id*—ID of the destination FMEP of the fabric ping operation.

flow-spec-name *flow-specification-name*—Name of the flow specification that defines the protocol parameters (unicast or multicast) for the fabric ping operation.

fma-name *fma-name*—Name of the FMA.

forced-fte-interface *fte-interface*—(Optional) Forces the fabric ping operation to use the specified FTE interface to inject the PDU into the fabric instead of using the internal forwarding path lookup table to determine the FTE interface.

source-fmep-id *source-fmep-id*—ID of the FMEP that is the source of the fabric ping operation.

verbose—(Optional) Detailed version of the output display.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500
Configuring a Fabric Maintenance Association | 502

List of Sample Output

Output Fields

Table 103 on page 653 lists the output fields for the **ping fabric-unicast-flow** command. Output fields are listed in the approximate order in which they appear.

Table 103: ping fabric unicast-flow Output Fields

Field Name	Field Description
Fabric flow ping between source *source-fmep-name* destination *destination-fmep-name*	Path of the unicast-flow ping between the source and detination FMEPs.
Using fabric flow-specification	Name of the flow specification.
Ethernet frame-size	Ethernet frame size in bytes.
Source-MAC	MAC address of the source FMEP interface.
Destination-MAC	MAC address of the destination FMEP interface.
Ethertype	EtherType protocol.
received response from fmep-id	ID of the FMEP sending the response.

Sample Output

ping fabric unicast-flow

`user@host>` **ping fabric unicast-flow fma-name fma1 source-fmep-id 1 dest-fmep-id 2 flow-spec-name fspec1 verbose**

```
Fabric flow ping between source ED1494 destination ED1497
Using fabric flow-specification: fspec1
```

```
Ethernet frame-size: 256
Source-MAC: 0:2:B1:61:3B:96
Destination-MAC: 0:26:78:90:70:21
Ethertype: 8295
received response from fmep-id 2...
sent 1 requests, received 1 responses
```

ping fabric unicast-flow (With Masking Enabled on the Flow Specification)

`user@host>` **ping fabric unicast-flow fma-name fma1 source-fmep-id 1 dest-fmep-id 2 flow-spec-name fspec1 verbose**

```

Fabric flow ping between source ED1494 destination ED1497
Using fabric flow-specification: fspec1
Ethernet frame-size: 256
Source-MAC: 0:1:20:A0:0:1
Destination-MAC: 0:8A:3A:B3:7D:67
Source-MAC Mask: FF:F8:FF:FF:FF:FF
Ethertype: 26785
Current Source-MAC value: 0:1:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:2:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:3:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:4:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:5:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:6:20:a0:0:1
received response from fmep-id 2...
Current Source-MAC value: 0:7:20:a0:0:1
received response from fmep-id 2...
sent 7 requests, received 7 responses
```

request chassis cb

List of Syntax

Syntax

```
request chassis cb (offline | online) slot slot-number
```

Syntax (TX Matrix Router)

```
request chassis cb (offline | online) <slot slot-number | lcc number slot cb-slot-number | scc number slot cb-slot-number>
```

Syntax (TX Matrix Plus Router)

```
request chassis cb (offline | online) <slot slot-number | lcc number slot cb-slot-number | sfc number slot cb-slot-number>
```

Syntax (QFabric System)

```
request chassis cb (offline | online) interconnect-device name slot slot-number
<interconnect-device name slot slot-number (offline | online)>
```

Syntax (EX9253 Switches)

```
request chassis cb (offline | online) name slot slot-number
```

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS 9.4 for EX Series switches.
sfc option introduced for the TX Matrix Plus router in Junos OS Release 9.6.
Command introduced in Junos OS 11.3 for QFX Series.
Command introduced in Junos OS Release 12.3 for MX2010 and MX2020 Universal Routing Platforms.
Command introduced in Junos OS Release 17.2 for MX2008 Universal Routing Platforms.
Command introduced in Junos OS Release 17.3 for MX10003 Universal Routing Platforms.
Command introduced in Junos OS Release 18.2 for EX9253 Series Switches.

Description

(M120, M320, and MX Series routers and T Series routers, QFabric systems, and EX8200 switches only) Control the operation of the Control Board (CB).

Options

offline—Take the Control Board offline.

> **NOTE:** On a QFabric system, to bring the backup Control Board on a QFX3008-I Interconnect device offline, issue the **request chassis cb slot *backup-slot-number* offline** command.

> **NOTE:** Only backup Control Board can be turned offline or online. To turn a Control Board offline or to bring it back online, the Routing Engine should be turned offline first.

online—Bring the Control Board online.

interconnect-device *name*—(QFabric systems only) (Optional) Bring the QFX3008-I Interconnect device Control Board either offline or online:

slot *slot-number*—Control Board slot number:

- (TX Matrix and TX Matrix Plus routers only) On a TX Matrix router, if you specify the number of the T640 router by using the lcc *number* option (the recommended method), replace *cb-slot-number* with a value from 0 through 1.

  Likewise, on a TX Matrix Plus router, if you specify the number of the T1600 or T4000 router by using the lcc *number* option (the recommended method), replace *cb-slot-number* with a value from 0 through 1.
- M320 router—Replace *slot-number* with a value from 0 through 1.
- MX480/MX240 routers—Replace *slot-number* with a value from 0 through 1.
- MX960 router—Replace *slot-number* with a value from 0 through 2.
- MX2020, MX2010, and MX2008 routers—Replace *slot-number* with 0 or 1.
- EX8208 switch—Replace *slot-number* with a value from 0 through 2.
- EX8216 switch—Replace *slot-number* with a value from 0 through 1.
- QFabric System—Replace *slot-number* with a value from 0 through 1.

lcc *number*—(TX Matrix, TX Matrix Plus routers only) (Optional) Line-card chassis number.

Replace *number* with the following values depending on the LCC configuration:

- 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.
- 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.
- 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.
- 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.

sfc *number*—(TX Matrix Plus routers only) (Optional) Change the CB status for the TX Matrix Plus router (switch-fabric chassis). Replace *number* with 0.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

show chassis environment cb | 715

Understanding Switching Control Board Redundancy

List of Sample Output

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis cb

`user@host>` **request chassis cb offline slot 1**

```
Backup CB 1 cannot be set offline, backup RE is online
```

request chassis cb interconnect-device (QFabric System)

`user@switch>` **request chassis cb interconnect-device interconnect1 offline slot 1**

```
Backup CB 1 cannot be set offline, backup RE is online
```

request chassis cb (MX2020 Router)

`user@host>` **request chassis cb offline slot 1**

```
Backup CB 1 cannot be set offline, backup RE is online
```

request chassis cb (MX2010 Router)

`user@host>` **request chassis cb offline slot 1**

```
Backup CB 1 cannot be set offline, backup RE is online
```

request chassis cb (MX2008 Router)

`user@host>`**request chassis cb offline slot 1**

```
Backup CB 1 cannot be set offline, backup RE is online
```

request chassis cb (MX10003 Router)

`user@host>`**request chassis cb online slot 1**

```
CB 1 appears to be online already
```

request chassis cb (EX9253 Switch)

`user@switch>`**request chassis cb offline slot 1**

```
Offline initiated, use "show chassis environment cb" to verify
```

request chassis device-mode

Syntax

```
request chassis device-mode (interconnect-device | node-device | standalone)
```

Release Information

Command introduced in Junos OS Release 11.2 for the QFX Series.
interconnect-device option introduced in Junos OS Release 13.1 for the QFX Series.

Description

Select the operating mode for the device, which acts either as a device within a QFabric system or as a standalone switch.

NOTE:

- Issue the **request chassis device-mode** command only when your management station is connected directly to the device over a console port connection.
- Changing the device mode erases all configuration data on the device. When you convert a device to a different device mode, we recommend that you back up your device configuration to an external location before issuing the **request chassis device-mode** command.

Options

interconnect-device—Set the device to operate as an Interconnect device within a QFabric system. To complete the Interconnect device mode conversion process, you must connect the device to the QFabric system management control plane and reboot the device.

node-device—Set the device to operate as a Node device within a QFabric system. To complete the Node device mode conversion process, you must connect the device to the QFabric system management control plane and reboot the device.

standalone—Set the device to operate as a standalone switch. If the device starts in Node device or Interconnect device mode, you must reboot the device to return to standalone mode. Standalone mode is the factory default setting.

Required Privilege Level

admin

RELATED DOCUMENTATION

Converting the Device Mode for a QFabric System Component | 326

List of Sample Output

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis device-mode interconnect-device (Starting in Node Device or Standalone Mode)

user@switch> **request chassis device-mode interconnect-device**

```
Device mode set to 'interconnect-device' mode.
Please reboot the system to complete the process.
```

request chassis device-mode node-device (Starting in Interconnect Device or Standalone Mode)

user@switch> **request chassis device-mode node-device**

```
Device mode set to 'node-device' mode.
Please reboot the system to complete the process.
```

request chassis device-mode standalone (Starting in Interconnect Device or Node Device Mode)

user@switch> **request chassis device-mode standalone**

```
Device mode set to 'standalone' mode.
Please reboot the system to complete the process.
```

request chassis device-mode standalone (Starting in Standalone Mode)

user@switch> **request chassis device-mode standalone**

```
Device mode set to 'standalone' mode.
No reboot required.
```

request chassis fabric fpc

Syntax

```
request chassis fabric fpc interconnect-device interconnect-device-name slot slot-number (offline | online)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Set the Interconnect device Flexible PIC Concentrator (FPC) offline or online for the QFabric system. When the FPC is offline, traffic is redirected to other FPCs and is not lost while you remove or install an FPC. After issuing this command, you must issue the **request chassis fpc** command.

Options

interconnect-device *interconnect-device-name*—Set the Interconnect device containing the FPC you want to bring either offline or online.

slot *slot-number*—Set the specific FPC slot on the Interconnect device.

offline—Set the Interconnect device FPC to offline for removal.

online—Set the Interconnect device FPC to online after installation.

Required Privilege Level

admin

RELATED DOCUMENTATION

request chassis fpc

List of Sample Output

request chassis fabric fpc online on page 663
request chassis fabric fpc offline on page 663

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis fabric fpc online

`user@qfabric>` **request chassis fabric fpc interconnect-device IC-YW3781 offline slot 15**

```
Graceful offline of the fabric card has been initiated. Please wait 20 seconds
before offlining or removing the card.
```

request chassis fabric fpc offline

`user@qfabric>` **request chassis fabric fpc interconnect-device IC-YW3781 online slot 15**

```
Bring the FPC online by issuing the "request chassis fpc online" command.
```

request component login

Syntax

```
request component login component-name
```

Release Information

Command introduced in Junos OS Release 14.1X53-D20 for OCX Series switches.
Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Log in to a QFabric system component. To gain access to individual components by way of the **request component login** command, you must first provide the **qfabric-admin** or **qfabric-operator** class privilege to your user (for more information, see: *remote-debug-permission*).

Options

component-name—Specify the QFabric system component to which you wish to log in.

Required Privilege Level

admin

RELATED DOCUMENTATION

List of Sample Output

Sample Output

The three sample output displays show the results of attempts to log in to Node device EE3093. The results differ depending on the privilege level assigned to the user.

request component login (with qfabric-admin Privileges)

admin@qfabric> **request component login EE3093**

```
Warning: Permanently added 'qfabric-node-ee3093,192.0.2.0' (RSA) to the list of
known hosts.
--- JUNOS 11.3I built 2011-11-04 12:46:16 UTC
```

```
{master}
qfabric-admin@node-ee3093> ?
Possible completions:
  clear                  Clear information in the system
  file                   Perform file operations
  help                   Provide help information
  load                   Load information from file
  monitor                Show real-time debugging information
  mtrace                 Trace multicast path from source to receiver
  op                     Invoke an operation script
  ping                   Ping remote target
  quit                   Exit the management session
  request                Make system-level requests
  restart                Restart software process
  save                   Save information to file
  set                    Set CLI properties, date/time, craft interface message
  show                   Show system information
  ssh                    Start secure shell on another host
  start                  Start shell
  telnet                 Telnet to another host
  test                   Perform diagnostic debugging
  traceroute             Trace route to remote host{master}
qfabric-admin@node-ee3093>
```

request component login (with qfabric-operator Privileges)

`operator@qfabric>` **request component login EE3093**

```
Warning: Permanently added 'qfabric-node-EE3093,192.0.2.0' (RSA) to the list of
known hosts.
--- JUNOS 11.3I built 2011-11-04 12:46:16 UTC
{master}
qfabric-operator@node-EE3093> ?
Possible completions:
  file                   Perform file operations
  help                   Provide help information
  load                   Load information from file
  op                     Invoke an operation script
  quit                   Exit the management session
  request                Make system-level requests
  save                   Save information to file
  set                    Set CLI properties, date/time, craft interface message
  show                   Show system information
  start                  Start shell
```

```
  test                 Perform diagnostic debugging
{master}
qfabric-operator@node-ee3093>
```

request component login (with qfabric-user Privileges)

user0@qfabric> **request component login EE3093**

```
error: User user0 does not have sufficient permissions to login to device ee3093
```

request fabric administration director-group change-master

Syntax

```
request fabric administration director-group change-master (director-device director-device-name)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Select a Director device to become the new primary device within a Director group. The specified device becomes the new master Director device, and the previous master Director device becomes a backup Director device.

Options

none—Change the device that controls the Director group. Assign the current backup Director device as the new master and the current master Director device as the backup.

director-device *director-device-name*—Specify which Director device should become the primary device within the Director group.

Required Privilege Level

admin

RELATED DOCUMENTATION

show fabric administration inventory director-group status | 845

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

Understanding the Director Group | 24

List of Sample Output

request fabric administration director-group change-master on page 667

Sample Output

request fabric administration director-group change-master

```
user@qfabric> request fabric administration director-group change-master
```

```
Do you intend to switchover mastership? [yes,no] (no) yes

Cluster master successfully switched
```

request fabric administration power-off interconnect-device

Syntax

```
request fabric administration power-off interconnect--device (serial-id | alias-name)
```

Release Information

Command introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In QFX3000-G QFabric systems, you can use this command to power off QFX3008-I Interconnect devices.

This command systematically takes the device offline and gracefully shuts down the device while preserving system state information. A message appears on the console or console log, confirming that the operating system has stopped on the device.

Options

serial-id | alias-name—Provide the serial ID or alias name of the device.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

request fabric administration power-off interconnect-device fpc | 671
request fabric administration power-off node-device | 673
show fabric administration inventory | 839

List of Sample Output

request fabric administration power-off interconnect-device on page 669

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request fabric administration power-off interconnect-device

`user@qfabric` **request fabric administration power-off interconnect-device IC-12345**

```
STEP 1 of 7 (Acquiring lock):
Acquiring lock to perform this operation
Acquired lock to perform this operation
STEP 2 of 7 (Performing pre-checks):
interconnect-device IC-12345 is online
STEP 3 of 7 (Gracefully offlining the interconnect):
Disabling fabric protocol on interconnect-device
Disabled fabric protocol on interconnect-device
STEP 4 of 7 (Waiting for convergence):
Waiting for convergence(this will take few minutes)
Convergence complete
STEP 5 of 7 (Powering-off the interconnect):
Now, powering-off the interconnect-device (this may take some time)
Powered-off the interconnect-device
STEP 6 of 7 (Updating inventory):
Removing the interconnect-device - IC-A0004 from inventory
interconnect-device - IC-12345 is removed from inventory
STEP 7 of 7 (Releasing lock):
Releasing the lock
```

request fabric administration power-off interconnect-device fpc

Syntax

```
request fabric administration power-off interconnect--device (serial-id | alias-name) fpc slot-number
```

Release Information

Command introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In QFX3000-G QFabric systems, you can use this command to power off a 16-Port QSFP+ front card in a QFX3008-I Interconnect device.

A message appears on the console or console log, confirming that the operating system has stopped on the device.

Options

serial-id | alias-name—Provide the serial ID or alias name of the QFX3008-I Interconnect device.

slot *slot-number*—Provide the slot number of the 16-Port QSFP+ front card in the QFX3008-I Interconnect device. The range of slot numbers is 0 through 15

Required Privilege Level

maintenance

RELATED DOCUMENTATION

request fabric administration power-off interconnect-device | 669

request fabric administration power-off node-device | 673

show fabric administration inventory | 839

List of Sample Output

request fabric administration power-off interconnect-device fpc 13 on page 672

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request fabric administration power-off interconnect-device fpc 13

`user@qfabric` **request fabric administration power-off interconnect-device IC-12345 fpc 13**

```
STEP 1 of 6 (Acquiring lock):
Acquiring lock to perform this operation
Acquired lock to perform this operation
STEP 2 of 6 (Performing pre-checks):
interconnect-device IC-12345 is online
STEP 3 of 6 (Gracefully offlining the interconnect linecard):
Gracefully offlining the fpc
fpc is successfully offlined
STEP 4 of 6 (Waiting for convergence):
Waiting for convergence(this will take few minutes)
request fabric administration power-off interconnect-device IC-12345
Convergence complete
STEP 5 of 6 (Powering-off the interconnect linecard):
Now, powering-off the fpc on the interconnect-device
Powered-off the fpc on the interconnect-device
STEP 6 of 6 (Releasing lock):
Releasing the lock
```

request fabric administration power-off node-device

Syntax

```
request fabric administration power-off node-device (serial-id | alias-name)
```

Release Information

Command introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description

In QFX3000-G QFabric systems, you can use this command to power off QFX3500, QFX3600, QFX5100-48S, QFX5100-48T, and QFX5100-24Q devices in server Node groups, redundant server Node groups, and network Node groups. In QFX3000-M QFabric systems, you can use this command to power off QFX5100-24Q Interconnect devices and QFX3600-I Interconnect devices.

This command systematically takes the device offline and gracefully shuts down the device while preserving system state information. A message appears on the console or console log, confirming that the operating system has stopped on the device.

Options

serial-id | alias-name—Provide the serial ID or alias name of the device.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

request fabric administration power-off interconnect-device | 669
request fabric administration power-off interconnect-device fpc | 671
show fabric administration inventory | 839

List of Sample Output

request fabric administration power-off node-device on page 674

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request fabric administration power-off node-device

`user@qfabric` **request fabric administration power-off node-device ED1234**

```
STEP 1 of 8 (Acquiring lock):
Acquiring lock to perform this operation
Acquired lock to perform this operation
STEP 2 of 8 (Performing pre-checks):
node-device ED1491 is online
STEP 3 of 8 (Mastership switch-over):
node-device ED1491 is Server Node-group
STEP 4 of 8 (Gracefully offlining the node-device):
node-device is being offlined
node-device is successfully offlined
STEP 5 of 8 (Waiting for convergence):
Waiting for convergence(this will take few minutes)
Convergence complete
STEP 6 of 8 (Powering-off the node-device):
Now, powering-off the node-device
Powered-off the node-device
STEP 7 of 8 (Updating inventory):
Removing the node-device - ED1491 from inventory
node-device - ED1491 is removed from inventory
STEP 8 of 8 (Releasing lock):
Releasing the lock
```

request fabric administration remove

Syntax

```
request fabric administration remove (interconnect-device interconnect-device-name | node-device node-device-name)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Remove a disconnected Interconnect or Node device from the QFabric system inventory so that it does not appear in the output of the **show fabric administration inventory** command.

NOTE:

- You cannot remove any devices that appear in the **Connected** state in the output of the **show fabric administration inventory** command.
- For Node devices, you can only remove a device if it belongs to an autogenerated server Node group that contains a single Node device. Node devices contained within redundant server Node groups or network Node groups cannot be removed directly. To remove a Node device that is part of a group, delete the device from the Node group configuration first before attempting to remove the device from the inventory.

Options

interconnect-device *interconnect-device-name*—Remove a disconnected Interconnect device from the QFabric system inventory.

node-device *node-device-name*—Remove a disconnected Node device from the QFabric system inventory.

Required Privilege Level

admin

RELATED DOCUMENTATION

show fabric administration inventory | 839
show fabric administration inventory interconnect-devices | 856
show fabric administration inventory node-devices | 859
show fabric administration inventory node-groups | 861

List of Sample Output

request fabric administration remove interconnect-device on page 676
request fabric administration remove node-device on page 676

Sample Output

request fabric administration remove interconnect-device

`user@qfabric>` **request fabric administration remove interconnect-device IC1**

```
Device successfully removed
```

Sample Output

request fabric administration remove node-device

`user@qfabric>` **request fabric administration remove node-device node5**

```
Device successfully removed
```

request fabric administration system mac-pool add

Syntax

```
request fabric administration system mac-pool add mac-base starting-mac-address count number-of-mac-address
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Add a MAC address pool to expand the initial set of MAC addresses assigned to the QFabric system.

Options

mac-base *starting-mac-address*—Set the starting MAC address for a pool of addresses assigned to the QFabric system.

count *number-of-mac-address*—Set the total number of MAC addresses in the specified address pool assigned to the QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

request fabric administration system mac-pool delete | 678
show fabric administration system mac-pool | 864

List of Sample Output

request fabric administration system mac-pool add mac-base starting-mac-address count on page 677

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request fabric administration system mac-pool add mac-base starting-mac-address count

`user@switch>` **request fabric administration system mac-pool add mac-base 02:00:00:11:22:00 count 10**

request fabric administration system mac-pool delete

Syntax

```
request fabric administration system mac-pool delete mac-base starting-mac-address
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Delete a range of MAC addresses assigned manually to the QFabric system.

> **NOTE:** You cannot delete the MAC address range assigned during the initial setup of the QFabric system. Also, you cannot delete a MAC address range if the MAC address block is still in use.

Options

mac-base *starting-mac-address*—Specify the starting MAC address for a pool of addresses you wish to remove from the QFabric system.

Additional Information

After you issue the **request fabric administration system mac-pool delete** command, issue the **show fabric administration system mac-pool** command to verify that the MAC address range has been deleted.

Required Privilege Level

admin

RELATED DOCUMENTATION

request fabric administration system mac-pool add | 677
show fabric administration system mac-pool | 864

List of Sample Output

request fabric administration system mac-pool delete mac-base on page 679

Sample Output

request fabric administration system mac-pool delete mac-base

`user@switch>` **request fabric administration system mac-pool delete mac-base 02:00:00:11:22:00**

request system halt

List of Syntax

Syntax

```
request system halt
<at time>
<backup-routing-engine>
<both-routing-engines>
<other-routing-engine>
<in minutes>
<media (compact-flash | disk | removable-compact-flash | usb)>
<message "text">
```

Syntax (EX Series Switches)

```
request system halt
<all-members>
<at time>
<backup-routing-engine>
<both-routing-engines>
<in minutes>
<local>
<media (external | internal)>
<member member-id>
<message "text">
<other-routing-engine>
<slice slice>
```

Syntax (PTX Series)

```
request system halt
<at time>
<backup-routing-engine>
<both-routing-engines>
```

```
<other-routing-engine>
<in minutes>
<media (compact-flash | disk)>
<message "text">
```

Syntax (TX Matrix Router)

```
request system halt
<all-lcc | lcc number | scc>
<at time>
<backup-routing-engine>
<both-routing-engines>
<other-routing-engine>
<in minutes>
<media (compact-flash | disk)>
<message "text">
```

Syntax (TX Matrix Plus Router)

```
request system halt
<all-chassis | all-lcc | lcc number | sfc number>
<at time>
<backup-routing-engine>
<both-routing-engines>
<other-routing-engine>
<in minutes>
<media (compact-flash | disk)>
<message "text">
```

Syntax (MX Series Router)

```
request system halt
<all-members>
<at time>
<backup-routing-engine>
<both-routing-engines>
<in minutes>
<local>
<media (external | internal)>
<member member-id>
<message "text">
<other-routing-engine>
```

Syntax (QFX Series)

```
request system halt
<all-members>
<at time>
<both-routing-engines>
<director-device director-device-id>
<in minutes>
<local>
<media >
<member member-id>
<message "text">
<other-routing-engine>
<slice slice>
```

Release Information

Command introduced before Junos OS Release 7.4.
other-routing-engine option introduced in Junos OS Release 8.0.
Command introduced in Junos OS Release 9.0 for EX Series switches.
sfc option introduced for the TX Matrix Plus router in Junos OS Release 9.6.
Command introduced in Junos OS Release 11.1 for the QFX Series.
director-device option introduced for QFabric systems in Junos OS Release 12.2.
backup-routing-engine option introduced in Junos OS Release 13.1.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Stop the router or switch software.

> **NOTE:** When you issue this command on an individual component—for example, a Node device—in a QFabric system, you will receive a warning that says “Hardware-based members will halt, Virtual Junos Routing Engines will reboot.” If you want to halt only one member of a Node group, issue this command with the **member** option on the Node device CLI, because you cannot issue this command from the QFabric CLI. Also, issuing this command might cause traffic loss on an individual component.
>
> When you issue this command on a QFX5100 switch, you are not prompted to reboot. You must power cycle the switch to reboot.

NOTE: For the routers with the Routing Engines RE-S-2x00x6, RE-PTX-2x00x8, and RE-S-2x00x8, this command is deprecated and might be removed completely in a future release.

On these routers, this command is replaced with the **request vmhost halt** command which provides similar functionality.

Options

none—Stop the router or switch software immediately.

all-chassis—(TX Matrix and TX Matrix Plus routers only) (Optional) Halt all chassis.

all-lcc—(TX Matrix and TX Matrix Plus routers only) (Optional) On a TX Matrix router, halt all T640 routers (or line-card chassis) connected to the TX Matrix router. On a TX Matrix Plus router, halt all T1600 routers (or line-card chassis) connected to the TX Matrix Plus router.

all-members—(Optional) Halt all members of the Virtual Chassis configuration.

at *time* —(Optional) Time at which to stop the software, specified in one of the following ways:

- **now**—Stop the software immediately. This is the default.
- ***+minutes***—Number of minutes from now to stop the software.
- ***yymmddhhmm***—Absolute time at which to stop the software, specified as year, month, day, hour, and minute.
- ***hh:mm***—Absolute time on the current day at which to stop the software.

backup-routing-engine—(Optional) Halt the backup Routing Engine. This command halts the backup Routing Engine, regardless from which Routing Engine the command is executed. For example, if you issue the command from the master Routing Engine, the backup Routing Engine is halted. If you issue the command from the backup Routing Engine, the backup Routing Engine is halted.

both-routing-engines—(Optional) Halt both Routing Engines at the same time.

director-device *director-device-id*—(QFabric systems only) Halt a specific Director device.

lcc *number*—(TX Matrix routers and TX Matrix Plus routers only) (Optional) On a TX Matrix router, halt a specific T640 router that is connected to the TX Matrix router. On a TX Matrix Plus router, halt a specific router that is connected to the TX Matrix Plus router.

Replace *number* with the following values depending on the LCC configuration:

- 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.
- 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.

- 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.
- 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.

local—(Optional) Halt the local Virtual Chassis member.

in *minutes*—(Optional) Number of minutes from now to stop the software. This option is an alias for the at +*minutes* option.

media (compact-flash | disk)—(Optional) Boot medium for the next boot.

media (external | internal)—(EX Series and QFX Series switches and MX Series routers only) (Optional) Halt the boot media:

- **external**—Halt the external mass storage device.
- **internal**—Halt the internal flash device.

member *member-id*—(Optional) Halt the specified member of the Virtual Chassis configuration. For an MX Series Virtual Chassis, ***member-id*** can only be 0 or 1.

message "*text*"—(Optional) Message to display to all system users before stopping the software.

other-routing-engine—(Optional) Halt the other Routing Engine from which the command is issued. For example, if you issue the command from the master Routing Engine, the backup Routing Engine is halted. Similarly, if you issue the command from the backup Routing Engine, the master Routing Engine is halted.

scc—(TX Matrix routers only) (Optional) Halt the TX Matrix router (or switch-card chassis).

sfc *number*—(TX Matrix Plus routers only) (Optional) Halt the TX Matrix Plus router (or switch-fabric chassis). Replace *number* with 0.

slice *slice*—(EX Series and QFX Series switches only) (Optional) Halt a partition on the boot media. This option has the following suboptions:

- 1—Halt partition 1.
- 2—Halt partition 2.
- **alternate**—Reboot from the alternate partition.

Additional Information

On the M7i router, the **request system halt** command does not immediately power down the Packet Forwarding Engine. The power-down process can take as long as 5 minutes.

On a TX Matrix router and TX Matrix Plus router if you issue the **request system halt** command on the master Routing Engine, all the master Routing Engines connected to the routing matrix are halted. If you issue this command on the backup Routing Engine, all the backup Routing Engines connected to the routing matrix are halted.

> **NOTE:** If you have a router or switch with two Routing Engines and you want to shut the power off to the router or switch or remove a Routing Engine, you must first halt the backup Routing Engine (if it has been upgraded), and then halt the master Routing Engine. To halt a Routing Engine, issue the **request system halt** command. You can also halt both Routing Engines at the same time by issuing the **request system halt both-routing-engines** command.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

clear system reboot

request system power-off

request vmhost halt

show virtual-chassis

Routing Matrix with a TX Matrix Plus Router Solutions Page

List of Sample Output

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request system halt

```
user@host> request system halt
```

```
Halt the system ? [yes,no] (no) yes

*** FINAL System shutdown message from root@section2 ***
System going down IMMEDIATELY
Terminated
...
syncing disks... 11 8 done
The operating system has halted.
Please press any key to reboot.
```

request system halt (In 2 Hours)

The following example, which assumes that the time is 5 PM (1700), illustrates three different ways to request that the system stop 2 hours from now:

`user@host>` **request system halt at +120**

`user@host>` **request system halt in 120**

`user@host>` **request system halt at 19:00**

request system halt (Immediately)

`user@host>` **request system halt at now**

request system halt (At 1:20 AM)

To stop the system at 1:20 AM, enter the following command. Because 1:20 AM is the next day, you must specify the absolute time.

`user@host>` **request system halt at *yymmdd*120**

```
request system halt at 120
Halt the system at 120? [yes,no] (no) yes
```

request system reboot

List of Syntax

Syntax

```
request system reboot
<at time>
<both-routing-engines>
<in minutes>
<media (compact-flash | disk | removable-compact-flash | usb)>
<message "text">
<other-routing-engine>
```

Syntax (EX Series Switches and EX Series Virtual Chassis)

```
request system reboot
<all-members | local | member member-id>
<at time>
<in minutes>
<media (external | internal)> | <media (compact-flash | disk | removable-compact-flash | usb)>
<message "text">
<slice slice>
```

Syntax (MX Series Routers and MX Series Virtual Chassis, EX9200 Switches and EX9200 Virtual Chassis)

```
request system reboot
<all-members | local | member member-id>
<at time>
<both-routing-engines>
<in minutes>
<media (external | internal)> | <media (compact-flash | disk | usb)> | <junos | network | oam | usb>
<message "text">
<other-routing-engine>
```

Syntax (QFabric Systems)

```
request system reboot
<all <graceful>>
<at time>
<director-device name>
<director-group <graceful>>
<fabric <graceful>>
<in minutes>
<in-service>
<media>
<message "text">
<node-group name>
<slice slice>
```

Syntax (QFX Series Switches and QFX Series Virtual Chassis, Virtual Chassis Fabric)

```
request system reboot
<all-members | local | member member-id>
<at time>
<in minutes>
<in-service>
<hypervisor>
<junos | network | oam | usb>
<message "text">
<slice slice>
```

Syntax (TX Matrix Router)

```
request system reboot
<all-chassis | all-lcc | lcc number |  scc>
<at time>
<both-routing-engines>
<in minutes>
<media (compact-flash | disk)>
<message "text">
<other-routing-engine>
```

Syntax (TX Matrix Plus Router)

```
request system reboot
<all-chassis | all-lcc | lcc number | sfc number>
<at time>
```

```
<both-routing-engines>
<in minutes>
<media (compact-flash | disk)>
<message "text">
<other-routing-engine>
<partition (1 | 2 | alternate)>
```

Release Information

Command introduced before Junos OS Release 7.4.
Option **other-routing-engine** introduced in Junos OS Release 8.0.
Command introduced in Junos OS Release 9.0 for EX Series switches.
Option **sfc** introduced for the TX Matrix Plus router in Junos OS Release 9.6.
Option **partition** changed to **slice** in Junos OS Release 10.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Option **both-routing-engines** introduced in Junos OS Release 12.1.

Description

Reboot the software.

This command can be used on standalone devices and on devices supported in a Virtual Chassis, Virtual Chassis Fabric, or QFabric system.

> **NOTE:** Starting with Junos OS Release 15.1F3, the statement **request system reboot** reboots only the guest operating system on the PTX5000 with RE-PTX-X8-64G and, MX240, MX480, and MX960 with RE-S-X6-64G.
>
> Starting with Junos OS Release 15.1F5, the statement **request system reboot** reboots only the guest operating system on the MX2010, and MX2020 with REMX2K-X8-64G.

> **NOTE:** Starting from Junos OS Release 17.2R1, PTX10008 routers do not support the **request system reboot** command. Starting from Junos OS Release 17.4R1, PTX10016 routers do not support the **request system reboot** command. Use the **request vmhost reboot** command instead of the **request system reboot** command on the PTX10008 and PTX10016 routers to reboot the Junos OS software package or bundle on the router. See *request vmhost reboot*.

> **NOTE:** On a QFabric system, to avoid traffic loss on the network Node group, switch mastership of the Routing Engine to the backup Routing Engine, and then reboot.

Options

The options described here are not all supported on every platform or release of Junos OS. Refer to the Syntax sections for the options commonly available on each type of platform.

none—Reboot the software immediately.

all-chassis—(Optional) On a TX Matrix router or TX Matrix Plus router, reboot all routers connected to the TX Matrix or TX Matrix Plus router, respectively.

all-lcc—(Optional) On a TX Matrix router or TX Matrix Plus router, reboot all line card chassis connected to the TX Matrix or TX Matrix Plus router, respectively.

all-members | local | member *member-id*—(Optional) Specify which member of the Virtual Chassis to reboot:

- **all-members**—Reboots each switch that is a member of the Virtual Chassis.
- **local**—Reboots only the local switch (switch where you are logged in).
- **member *member-id***—Reboots the specified member switch of the Virtual Chassis

at *time*—(Optional) Time at which to reboot the software, specified in one of the following ways:

- **now**—Stop or reboot the software immediately. This is the default.
- ***+minutes***—Number of minutes from now to reboot the software.
- ***yymmddhhmm***—Absolute time at which to reboot the software, specified as year, month, day, hour, and minute.
- ***hh:mm***—Absolute time on the current day at which to stop the software, specified in 24-hour time.

both-routing-engines—(Optional) Reboot both Routing Engines at the same time.

hypervisor—(Optional) Reboot Junos OS, host OS, and any installed guest VMs.

in *minutes*—(Optional) Number of minutes from now to reboot the software. The minimum value is 1. This option is an alias for the **at *+minutes*** option.

in-service—(Optional) Enables you to reset the software state (no software version change) of the system with minimal disruption in data and control traffic.

junos—(Optional) Reboot from the Junos OS (main) volume.

lcc *number*——(Optional) Line-card chassis (LLC) number.

Replace *number* with the following values depending on the LCC configuration:

- 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.
- 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.

- 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.
- 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.

media (compact-flash | disk | removable-compact-flash | usb)—(Optional) Use the indicated boot medium for the next boot.

media (external | internal)—(Optional) Use the indicated boot medium for the next boot:

- **external**—Reboot the device using a software package stored on an external boot source, such as a USB flash drive.
- **internal**—Reboot the device using a software package stored in an internal memory source.

message "*text*"—(Optional) Message to display to all system users before stopping or rebooting the software.

network—(Optional) Reboot using the Preboot Execution Environment (PXE) boot method over the network.

oam—(Optional) Reboot from the maintenance volume (OAM volume, usually the compact flash drive).

other-routing-engine—(Optional) Reboot the other Routing Engine from which the command is issued. For example, if you issue the command from the master Routing Engine, the backup Routing Engine is rebooted. Similarly, if you issue the command from the backup Routing Engine, the master Routing Engine is rebooted.

partition *partition*—(Optional) Reboot using the specified partition on the boot media. This option is equivalent to the **slice** option that is supported on some devices. Specify one of the following *partition* values:

- **1**—Reboot from partition 1.
- **2**—Reboot from partition 2.
- **alternate**—Reboot from the alternate partition.

scc—(Optional) Reboot the Routing Engine on the TX Matrix switch-card chassis. If you issue the command from re0, re0 is rebooted. If you issue the command from re1, re1 is rebooted.

sfc *number*—(Optional) Reboot the Routing Engine on the TX Matrix Plus switch-fabric chassis. If you issue the command from re0, re0 is rebooted. If you issue the command from re1, re1 is rebooted. Replace *number* with 0.

slice *slice*—(Optional) Reboot using the specified partition on the boot media. This option was originally the **partitiion** option but was renamed to **slice** on EX Series and QFX Series switches. Specify one of the following *slice* values:

- **1**—Reboot from partition 1.

- **2**—Reboot from partition 2.
- **alternate**—Reboot from the alternate partition (which did not boot the switch at the last bootup).

> **NOTE:** The **slice** option is not supported on QFX Series switches that have no alternate slice when Junos OS boots as a Virtual Machine (VM). To switch to the previous version of Junos OS, issue the **request system software rollback** command.

usb—(Optional) Reboot from a USB device.

The following options are available only on QFabric Systems:

all—(Optional) Reboots the software on the Director group, fabric control Routing Engines, fabric manager Routing Engines, Interconnect devices, and network and server Node groups.

director-device *name*—(Optional) Reboots the software on the Director device and the default partition (QFabric CLI).

director-group—(Optional) Reboots the software on the Director group and the default partition (QFabric CLI).

fabric—(Optional) Reboots the fabric control Routing Engines and the Interconnect devices.

node-group *name*—(Optional) Reboots the software on a server Node group or a network Node group.

graceful—(Optional) Enables the QFabric component to reboot with minimal impact to network traffic. This sub-option is only available for the **all**, **fabric**, and**director-group** options.

Additional Information

Reboot requests are recorded in the system log files, which you can view with the **show log** command (see **show log**). Also, the names of any running processes that are scheduled to be shut down are changed. You can view the process names with the **show system processes** command (see *show system processes*).

On a TX Matrix or TX Matrix Plus router, if you issue the **request system reboot** command on the master Routing Engine, all the master Routing Engines connected to the routing matrix are rebooted. If you issue this command on the backup Routing Engine, all the backup Routing Engines connected to the routing matrix are rebooted.

> **NOTE:** Before issuing the **request system reboot** command on a TX Matrix Plus router with no options or the **all-chassis**, **all-lcc**, **lcc *number***, or **sfc** options, verify that master Routing Engine for all routers in the routing matrix are in the same slot number. If the master Routing Engine for a line-card chassis is in a different slot number than the master Routing Engine for a TX Matrix Plus router, the line-card chassis might become logically disconnected from the routing matrix after the **request system reboot** command.

> **NOTE:** To reboot a router that has two Routing Engines, reboot the backup Routing Engine (if you have upgraded it) first, and then reboot the master Routing Engine.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

clear system reboot

request system halt | 680

Routing Matrix with a TX Matrix Plus Router Solutions Page

request vmhost reboot

List of Sample Output

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request system reboot

```
user@host> request system reboot
```

```
Reboot the system ? [yes,no] (no)
```

request system reboot (at 2300)

`user@host>` **request system reboot at 2300 message ?Maintenance time!?**

```
Reboot the system ? [yes,no] (no) yes

shutdown: [pid 186]
*** System shutdown message from root@test.example.net ***
System going down at 23:00
```

request system reboot (in 2 Hours)

```
The following example, which assumes that the time is 5 PM (17:00), illustrates
three different ways to request the system to reboot in two hours:
```

`user@host>` **request system reboot at +120**

`user@host>` **request system reboot in 120**

`user@host>` **request system reboot at 19:00**

request system reboot (Immediately)

`user@host>` **request system reboot at now**

request system reboot (at 1:20 AM)

```
To reboot the system at 1:20 AM, enter the following command. Because 1:20 AM is
the next day, you must specify the absolute time.
```

`user@host>` **request system reboot at 06060120**

```
request system reboot at 120
Reboot the system at 120? [yes,no] (no) yes
```

request system reboot in-service

`user@switch>` **request system reboot in-service**

```
Reboot the system ? [yes,no]
[Feb 22 02:37:04]:ISSU: Validating Image

 PRE ISSR CHECK:
 ---------------
 PFE Status                            : Online
 Member Id zero                        : Valid
 VC not in mixed or fabric mode        : Valid
 Member is single node vc              : Valid
 BFD minimum-interval check done       : Valid
 GRES enabled                          : Valid
 NSR enabled                           : Valid
 drop-all-tcp not configured           : Valid
 Ready for ISSR                        : Valid

warning: Do NOT use /user during ISSR. Changes to /user during ISSR may get lost!
Current image is jinstall-jcp-i386-flex-18.1.img
[Feb 22 02:37:14]:ISSU: Preparing Backup RE
Prepare for ISSR
[Feb 22 02:37:19]:ISSU: Backup RE Prepare Done
Spawning the backup RE
Spawn backup RE, index 1 successful
Starting secondary dataplane
Second dataplane container started
GRES in progress
Waiting for backup RE switchover ready
GRES operational
Copying home directories
Copying home directories successful
Initiating Chassis In-Service-Upgrade for ISSR
Chassis ISSU Started
[Feb 22 02:42:55]:ISSU: Preparing Daemons
[Feb 22 02:43:00]:ISSU: Daemons Ready for ISSU
[Feb 22 02:43:05]:ISSU: Starting Upgrade for FRUs
[Feb 22 02:43:15]:ISSU: FPC Warm Booting
[Feb 22 02:44:16]:ISSU: FPC Warm Booted
[Feb 22 02:44:27]:ISSU: Preparing for Switchover
[Feb 22 02:44:31]:ISSU: Ready for Switchover
Checking In-Service-Upgrade status
  Item           Status                  Reason
  FPC 0          Online (ISSU)
Send ISSR done to chassisd on backup RE
Chassis ISSU Completed
Removing dcpfe0 eth1 128.168.0.16 IP
```

```
Bringing down bme00
Post Chassis ISSU processing done
[Feb 22 02:44:33]:ISSU: IDLE
Stopping primary dataplane
Clearing ISSU states
Console and management sessions will be disconnected. Please login again.
device_handoff successful ret: 0
Shutdown NOW!
[pid 14305]

*** FINAL System shutdown message from root@sw-duckhorn-01 ***

System going down IMMEDIATELY
```

request system software format-qfabric-backup

Syntax

```
request system software format-qfabric-backup
```

Release Information

Command introduced in Junos OS Release 13.1 for the QFX Series.

Description

(QFabric systems only) Copy the install media files from a USB flash drive to your QFabric system recovery directory on the Director group. You must issue this command before you can use the **request system software system-backup** and **request system software system-backup copy-to-usb** commands.

Options

none—Copy the install media files from a USB flash drive to a Director group recovery directory.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

Performing System Backup and Recovery for a QFabric System | 640
request system software system-backup | 706
Performing a QFabric System Recovery Installation on the Director Group | 894

List of Sample Output

request system software format-qfabric-backup on page 697

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request system software format-qfabric-backup

`user@qfabric>` **request system software format-qfabric-backup**

```
Copying QFabric USB template image from /dev/sdb(Unigen,PQS4000,4009 MB)......
```

request system software nonstop-upgrade

Syntax

```
request system software nonstop-upgrade package-name
<fabric >
<director-group>
<node-group name>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Nonstop software upgrade enables you to upgrade a QFabric system with minimal packet loss and maximum uptime. You should upgrade the devices in the following order: Director group, fabric controls and Interconnect devices, and network and server Node groups.

> **NOTE:** Before you perform a nonstop software upgrade, contact JTAC to perform a pre-upgrade health check on the QFabric system.

Options

package-name—Location from which the software is to be installed. For example:

- ***protocol*://*hostname*/*pathname*/*package-name***—For a software package or bundle that is to be downloaded and installed from a remote location. Replace ***protocol*** with one of the following:
  - **ftp**—File Transfer Protocol.
    Use **ftp://*hostname*/*pathname*/*package-name***. To specify authentication credentials, use **ftp://<*username*>:<*password*>@*hostname*/*pathname*/*package-name***. To have the system prompt you for the password, specify **prompt** in place of the password. If a password is required, and you do not specify the password or **prompt**, an error message is displayed.
  - **http**—Hypertext Transfer Protocol.
    Use **http://*hostname*/*pathname*/*package-name***. To specify authentication credentials, use **http://<*username*>:<*password*>@*hostname*/*pathname*/*package-name***. If a password is required and you omit it, you are prompted for it.
  - **scp**—Secure copy (available only for Canada and U.S. version).

Use **scp://*hostname/pathname/package-name***. To specify authentication credentials, use **scp://<*username*>:<*password*>@*hostname/pathname/package-name***.

NOTE:

- The ***pathname*** in the protocol is the relative path to the user's home directory on the remote system and not the root directory.

director-group—Install software package on the Director group and Fabric managers.

fabric—Install software package on the Interconnect devices and Fabric controls.

node-group *name* —Install software package on the redundant server Node group, server Node group, or network Node group.

Required Privilege Level
maintenance

RELATED DOCUMENTATION

List of Sample Output

Output Fields
When you enter this command, you are provided feedback on the status of your request.

Sample Output

request system software nonstop-upgrade director-group

`user@qfabric>` **request system software nonstop-upgrade director-group jinstall-qfabric-12.2X50-D10.3.rpm**

```
Validating update package jinstall-qfabric-12.2X50-D10.3.rpm
Installing update package jinstall-qfabric-12.2X50-D10.3.rpm
Installing fabric images version 12.2X50-D10.3
Performing cleanup
Package install complete
Installing update package jinstall-qfabric-12.2X50-D10.3.rpm on peer
Triggering Initial Stage of Fabric Manager Upgrade
Updating CCIF default image to 12.2X50-D10.3
Updating FM-0 to Junos version 12.2X50-D10.3
[Status   2012-06-05 15:25:29]: Fabric Manager: Upgrade Initial Stage started
[FM-0     2012-06-05 15:25:38]: FM-0 Master already running on LOCAL DG
[NW-NG-0  2012-06-05 15:25:45]: NW-NG-0 Master already running on LOCAL DG
[FM-0     2012-06-05 15:26:12]: Retrieving package
[FM-0     2012-06-05 15:27:11]: Pushing bundle to re0
[Status   2012-06-05 15:29:06]: Load completed with 0 errors...
[Status   2012-06-05 15:29:06]: Reboot is required to complete upgrade ...
[Status   2012-06-05 15:29:07]: Trying to Connect to Node: FM-0
[Status   2012-06-05 15:29:13]: Rebooting FM-0
[FM-0     2012-06-05 15:29:13]: Waiting for FM-0 to terminate ...
Starting Peer upgrade

Initiating rolling upgrade of Director peer:  version 12.2X50-D10.3

Inform CCIF regarding rolling upgrade
[Peer Update Status]: Validating install package jinstall-qfabric-12.2X50-D10.3.rpm
[Peer Update Status]: Cleaning up node for rolling phase one upgrade
[Peer Update Status]: Director group upgrade complete
[Peer Update Status]: COMPLETED
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
```

```
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to reboot and start phase one of rolling
upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to return after reboot and start phase one
 of rolling upgrade
[Peer Update Status]: Waiting for peer to complete phase one of rolling upgrade
[Peer Update Status]: Peer completed phase one of rolling upgrade
Setting peer DG node as the master SFC

Delaying start of local upgrade to allow peer services time to initialize [15
minutes]
Delaying start of local upgrade to allow peer services time to initialize [15
minutes]
Delaying start of local upgrade to allow peer services time to initialize [12
minutes]
Delaying start of local upgrade to allow peer services time to initialize [9
minutes]
Delaying start of local upgrade to allow peer services time to initialize [6
minutes]
Delaying start of local upgrade to allow peer services time to initialize [3
minutes]
[Peer Update Status]: Check for VMs on dg0
Triggering Final Stage of Fabric Manager Upgrade:
Updating FM-0 to Junos version 12.2X50-D10.3
[Status   2012-06-05 16:10:12]: Fabric Manager: Upgrade Final Stage started
[NW-NG-0  2012-06-05 16:10:22]: Transferring NW-NG-0 Mastership to REMOTE DG
[NW-NG-0  2012-06-05 16:11:44]: Finished NW-NG-0 Mastership switch
```

```
[Status   2012-06-05 16:11:45]: Upgrading FM-0 VM on worker DG to 12.2X50-D10.3
[DRE-0    2012-06-05 16:12:43]: Retrieving package
[DRE-0    2012-06-05 16:13:46]: ------- re0: -------
[Status   2012-06-05 16:15:17]: Load completed with 0 errors...
[Status   2012-06-05 16:15:17]: Reboot is required to complete upgrade ...
[DRE-0    2012-06-05 16:15:22]: Waiting for DRE-0 to terminate ...
[DRE-0    2012-06-05 16:15:34]: Waiting for DRE-0 to come back ...
[DRE-0    2012-06-05 16:18:44]: Running Uptime Test for DRE-0
[DRE-0    2012-06-05 16:18:51]: Uptime Test for DRE-0 Passed ...
[Status   2012-06-05 16:18:51]: DRE-0 booted successfully ...
Performing post install shutdown and cleanup

Broadcast message from root (Tue Jun  5 16:18:51 2012):

The system is going down for reboot NOW!
Director group upgrade complete

root@qfabric> Read from remote host qfabric-partition0: Connection reset by peer
Connection to qfabric-partition0 closed.
```

request system software nonstop-upgrade fabric

`user@qfabric>` **request system software nonstop-upgrade fabric jinstall-qfabric-12.2X50-D10.3.rpm**

```
[FC-0     2012-06-05 16:48:53]: Retrieving package
[FC-1     2012-06-05 16:48:53]: Retrieving package
[IC-F4912 2012-06-05 16:48:59]: Retrieving package
[FC-0     2012-06-05 16:49:51]: ------- re0: -------
[FC-1     2012-06-05 16:49:52]: ------- re0: -------
[IC-F4912 2012-06-05 16:49:54]: ------- re0: -------
[IC-F4912 2012-06-05 16:50:42]: Step 1 of 20 Creating temporary file system
[IC-F4912 2012-06-05 16:50:42]: Step 2 of 20 Determining installation source
[IC-F4912 2012-06-05 16:50:43]: Step 3 of 20 Processing format options
[IC-F4912 2012-06-05 16:50:43]: Step 4 of 20 Determining installation slice
[IC-F4912 2012-06-05 16:50:43]: Step 5 of 20 Creating and labeling new slices
[IC-F4912 2012-06-05 16:50:44]: Step 6 of 20 Create and mount new file system
[IC-F4912 2012-06-05 16:50:53]: Step 7 of 20 Getting OS bundles
[IC-F4912 2012-06-05 16:50:53]: Step 8 of 20 Updating recovery media
[IC-F4912 2012-06-05 16:51:17]: Step 9 of 20 Extracting incoming image
[IC-F4912 2012-06-05 16:52:56]: Step 10 of 20 Unpacking OS packages
[IC-F4912 2012-06-05 16:52:59]: Step 11 of 20 Mounting jbase package
[IC-F4912 2012-06-05 16:53:28]: Step 12 of 20 Creating base OS symbolic links
[IC-F4912 2012-06-05 16:54:45]: Step 13 of 20 Creating fstab
[IC-F4912 2012-06-05 16:54:45]: Step 14 of 20 Creating new system files
```

```
[IC-F4912 2012-06-05 16:54:46]: Step 15 of 20 Adding jbundle package
[IC-F4912 2012-06-05 16:58:15]: Step 16 of 20 Backing up system data
[IC-F4912 2012-06-05 16:58:18]: Step 17 of 20 Setting up shared partition data
[IC-F4912 2012-06-05 16:58:18]: Step 18 of 20 Checking package sanity in
installation
[IC-F4912 2012-06-05 16:58:18]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[IC-F4912 2012-06-05 16:58:22]: Step 20 of 20 Setting da0s1 as new active partition
[Status   2012-06-05 16:58:34]: Load completed with 0 errors...
[Status   2012-06-05 16:58:34]: Reboot is required to complete upgrade ...
[Status   2012-06-05 16:58:34]: Trying to Connect to Node: FC-0
[Status   2012-06-05 16:58:39]: Rebooting FC-0
[Status   2012-06-05 16:58:39]: Trying to Connect to Node: FC-1
[Status   2012-06-05 16:58:44]: Rebooting FC-1
[Status   2012-06-05 16:58:44]: Trying to Connect to Node: IC-F4912
[Status   2012-06-05 16:58:50]: Rebooting IC-F4912
Success
```

request system software nonstop-upgrade node-group (Redundant Server Node Group)

`user@qfabric>` **request system software nonstop-upgrade node-group RSNG jinstall-qfabric-12.2X50-D10.3.rpm**

```
Upgrading target(s): RSNG

[RSNG     2012-06-05 17:26:44]: Starting with package
ftp://169.254.0.3/pub/images/12.2X50-D10.3/jinstall-qfx.tgz
[RSNG     2012-06-05 17:26:44]: Retrieving package
[RSNG     2012-06-05 17:28:56]: Pushing bundle to fpc1
[RSNG     2012-06-05 17:29:26]: fpc1: Validate package...
[RSNG     2012-06-05 17:35:22]: fpc0: Validate package...
[RSNG     2012-06-05 17:35:49]: ------- fpc1 -------
[RSNG     2012-06-05 17:36:25]: Step 1 of 20 Creating temporary file system
[RSNG     2012-06-05 17:36:26]: Step 2 of 20 Determining installation source
[RSNG     2012-06-05 17:36:26]: Step 3 of 20 Processing format options
[RSNG     2012-06-05 17:36:26]: Step 4 of 20 Determining installation slice
[RSNG     2012-06-05 17:36:27]: Step 5 of 20 Creating and labeling new slices
[RSNG     2012-06-05 17:36:27]: Step 6 of 20 Create and mount new file system
[RSNG     2012-06-05 17:36:35]: Step 7 of 20 Getting OS bundles
[RSNG     2012-06-05 17:36:35]: Step 8 of 20 Updating recovery media
[RSNG     2012-06-05 17:36:56]: Step 9 of 20 Extracting incoming image
[RSNG     2012-06-05 17:38:07]: Step 10 of 20 Unpacking OS packages
[RSNG     2012-06-05 17:38:16]: Step 11 of 20 Mounting jbase package
```

```
[RSNG     2012-06-05 17:38:41]: Step 12 of 20 Creating base OS symbolic links
[RSNG     2012-06-05 17:39:41]: Step 13 of 20 Creating fstab
[RSNG     2012-06-05 17:39:42]: Step 14 of 20 Creating new system files
[RSNG     2012-06-05 17:39:42]: Step 15 of 20 Adding jbundle package
[RSNG     2012-06-05 17:42:16]: Step 16 of 20 Backing up system data
[RSNG     2012-06-05 17:42:32]: Step 17 of 20 Setting up shared partition data
[RSNG     2012-06-05 17:42:33]: Step 18 of 20 Checking package sanity in
installation
[RSNG     2012-06-05 17:42:33]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[RSNG     2012-06-05 17:42:36]: Step 20 of 20 Setting da0s2 as new active partition
[RSNG     2012-06-05 17:42:51]: ------- fpc0 - master -------
[RSNG     2012-06-05 17:42:51]: Step 1 of 20 Creating temporary file system
[RSNG     2012-06-05 17:42:51]: Step 2 of 20 Determining installation source
[RSNG     2012-06-05 17:42:51]: Step 3 of 20 Processing format options
[RSNG     2012-06-05 17:42:51]: Step 4 of 20 Determining installation slice
[RSNG     2012-06-05 17:42:51]: Step 5 of 20 Creating and labeling new slices
[RSNG     2012-06-05 17:42:51]: Step 6 of 20 Create and mount new file system
[RSNG     2012-06-05 17:42:51]: Step 7 of 20 Getting OS bundles
[RSNG     2012-06-05 17:42:51]: Step 8 of 20 Updating recovery media
[RSNG     2012-06-05 17:42:51]: Step 9 of 20 Extracting incoming image
[RSNG     2012-06-05 17:42:51]: Step 10 of 20 Unpacking OS packages
[RSNG     2012-06-05 17:42:51]: Step 11 of 20 Mounting jbase package
[RSNG     2012-06-05 17:42:51]: Step 12 of 20 Creating base OS symbolic links
[RSNG     2012-06-05 17:42:51]: Step 13 of 20 Creating fstab
[RSNG     2012-06-05 17:42:51]: Step 14 of 20 Creating new system files
[RSNG     2012-06-05 17:42:51]: Step 15 of 20 Adding jbundle package
[RSNG     2012-06-05 17:42:51]: Step 16 of 20 Backing up system data
[RSNG     2012-06-05 17:42:51]: Step 17 of 20 Setting up shared partition data
[RSNG     2012-06-05 17:42:51]: Step 18 of 20 Checking package sanity in
installation
[RSNG     2012-06-05 17:42:51]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[RSNG     2012-06-05 17:42:51]: Step 20 of 20 Setting da0s2 as new active partition
[RSNG     2012-06-05 17:43:36]: Rebooting Backup RE
[RSNG     2012-06-05 17:43:36]: ------- Rebooting fpc1 -------
[RSNG     2012-06-05 17:50:12]: Initiating Chassis In-Service-Upgrade
[RSNG     2012-06-05 17:50:33]: Upgrading group: 0 fpc: 0
[RSNG     2012-06-05 17:52:38]: Upgrade complete for group:0
[RSNG     2012-06-05 17:52:38]: Upgrading group: 1 fpc: 1
[RSNG     2012-06-05 17:54:42]: Upgrade complete for group:1
[RSNG     2012-06-05 17:54:42]: Finished processing all upgrade groups, last group
 :1
[RSNG     2012-06-05 17:54:48]: Preparing for Switchover
```

```
[RSNG     2012-06-05 17:55:38]: Switchover Completed
[Status   2012-06-05 17:55:41]: Upgrade completed with 0 errors
Success
```

request system software nonstop-upgrade node-group (Server Node Group)

`user@qfabric>` **request system software nonstop-upgrade node-group P1507-C jinstall-qfabric-12.2X50-D10.3.rpm**

```
Upgrading target(s): P1507-C

[P1507-C  2012-06-26 14:02:44]: Retrieving package
[P1507-C  2012-06-26 14:03:21]: ------- P1507-C: -------
[P1507-C  2012-06-26 14:03:59]: Step 1 of 20 Creating temporary file system
[P1507-C  2012-06-26 14:03:59]: Step 2 of 20 Determining installation source
[P1507-C  2012-06-26 14:03:59]: Step 3 of 20 Processing format options
[P1507-C  2012-06-26 14:03:59]: Step 4 of 20 Determining installation slice
[P1507-C  2012-06-26 14:04:00]: Step 5 of 20 Creating and labeling new slices
[P1507-C  2012-06-26 14:04:00]: Step 6 of 20 Create and mount new file system
[P1507-C  2012-06-26 14:04:08]: Step 7 of 20 Getting OS bundles
[P1507-C  2012-06-26 14:04:09]: Step 8 of 20 Updating recovery media
[P1507-C  2012-06-26 14:04:29]: Step 9 of 20 Extracting incoming image
[P1507-C  2012-06-26 14:05:42]: Step 10 of 20 Unpacking OS packages
[P1507-C  2012-06-26 14:05:49]: Step 11 of 20 Mounting jbase package
[P1507-C  2012-06-26 14:06:14]: Step 12 of 20 Creating base OS symbolic links
[P1507-C  2012-06-26 14:07:15]: Step 13 of 20 Creating fstab
[P1507-C  2012-06-26 14:07:15]: Step 14 of 20 Creating new system files
[P1507-C  2012-06-26 14:07:16]: Step 15 of 20 Adding jbundle package
[P1507-C  2012-06-26 14:09:52]: Step 16 of 20 Backing up system data
[P1507-C  2012-06-26 14:10:07]: Step 17 of 20 Setting up shared partition data
[P1507-C  2012-06-26 14:10:07]: Step 18 of 20 Checking package sanity in 
installation
[P1507-C  2012-06-26 14:10:08]: Step 19 of 20 Unmounting and cleaning up temporary
 file systems
[P1507-C  2012-06-26 14:10:11]: Step 20 of 20 Setting da0s2 as new active partition
[Status   2012-06-26 14:10:25]: Trying to Connect to Node: P1507-C
[Status   2012-06-26 14:10:32]: Rebooting P1507-C
[Status   2012-06-26 14:10:32]: Upgrade completed with 0 errors
Success
```

request system software system-backup

Syntax

```
request system software system-backup
<usb-create>
```

Release Information

Command introduced in Junos OS Release 13.1 for the QFX Series.

Description

(QFabric systems only) Save a copy of the current QFabric system configuration file and the current software package for recovery purposes. You can use these saved files to restore your QFabric system to full operation after a system failure or shutdown.

Options

none—Copy the QFabric system software package and system configuration file to a Director group recovery directory.

> NOTE: If this command fails, insert a Juniper Networks software installation USB flash drive into the master Director device and issue the **request system software format-qfabric-backup** command. For more details about this prerequisite procedure that is required before you can use the QFabric system backup and recovery feature, see "Performing System Backup and Recovery for a QFabric System" on page 640.

usb-create—Copy the QFabric system software package and system configuration file from the Director group recovery directory to a USB flash drive. When the files have been copied, you can use the USB flash drive to help your QFabric system recover from a failure condition.

> NOTE: You must issue the **request system software system-backup** command (which saves the files to the Director group) before you can issue the **request system software system-backup usb-create** command.

Required Privilege Level

maintenance

RELATED DOCUMENTATION

Performing System Backup and Recovery for a QFabric System | 640
request system software format-qfabric-backup | 697
save
request system software configuration-backup
Performing a QFabric System Recovery Installation on the Director Group | 894

List of Sample Output

request system software system-backup on page 707
request system software system-backup usb-create on page 707

Output Fields

When you enter these commands, you are provided feedback on the status of your request.

Sample Output

request system software system-backup

`user@qfabric>` **request system software system-backup**

```
user@qfabric>
```

request system software system-backup usb-create

`user@qfabric>` **request system software system-backup usb-create /dev/sdb**

```
Issuing this command will overwrite the contents of the USB drive.
Continue? [yes,no] (no) yes

This operation will access the USB drive on 0281042010000013.
Are you sure you want to continue? [yes,no] (no) yes

Copying QFabric recovery media to /dev/sdb...
Successfully copied QFabric recovery media to /dev/sdb
```

set chassis display message

List of Syntax

Syntax on page 708
Syntax (TX Matrix Router) on page 708
Syntax (TX Matrix Plus Router) on page 708

Syntax

```
set chassis display message "message"
<permanent>
```

Syntax (TX Matrix Router)

```
set chassis display message "message" (lcc number | scc)
<permanent>
```

Syntax (TX Matrix Plus Router)

```
set chassis display message “message ” (fpc-slot slot-number | lcc number |  sfc number)
<permanent>
```

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
sfc option for TX Matrix Plus router introduced in Junos OS Release 9.6.

Description

Display or stop a text message on the craft interface display, which is on the front of the router, or on the LCD panel display on the switch. The craft interface alternates the display of text messages with standard craft interface messages three times, switching between messages every 60 seconds.

> **NOTE:** On T Series routers, when this command is executed with the **permanent** option, the display of the text message alternates with that of the standard craft interface message continuously every 60 seconds.

By default, on both the router and the switch, the text message is displayed for 5 minutes. The craft interface display has four 20-character lines. The LCD panel display has two 16-character lines, and text messages appear only on the second line.

Options

"message"—Message to display. On the craft interface display, if the message is longer than 20 characters, it wraps onto the next line. If a word does not fit on one line, the entire word moves down to the next line. Any portion of the message that does not fit on the display is truncated. An empty pair of quotation marks (“ ”) deletes the text message from the craft interface display. On the LCD panel display, the message is limited to 16 characters.

fpc-slot *slot-number*—(TX Matrix Plus routers and EX4200 and QFX Series only) On the router or switch, display the text message on the craft interface for a specific Flexible PIC Concentrator (FPC). Replace ***slot-number*** with a value from **0** through **31**. On the switch, display the text message for a specific member of a Virtual Chassis, where **fpc-slot *slot-number*** corresponds to the member ID. Replace ***slot-number*** with a value from **0** through **9**. On the QFX Series, the ***slot-number*** is always **0**. On a TX Matrix Plus router with 3D SIBs replace *slot-number* with a value from **0** through **63**.

lcc *number*—(TX Matrix router and TX Matrix Plus router only) (Optional) Line-card chassis number.

Replace *number* with the following values depending on the LCC configuration:

- 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.
- 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.
- 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.
- 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.

permanent—(Optional) Display a text message on the craft interface display or LCD panel display permanently.

scc—(TX Matrix routers only) Display the text message on the craft interface display of the TX Matrix router (switch-card chassis).

sfc *number*—(TX Matrix Plus routers only) Display the text message on the craft interface display of the TX Matrix Plus router (or switch-fabric chassis).

Required Privilege Level

clear

RELATED DOCUMENTATION

Configuring the LCD Panel on EX Series Switches (CLI Procedure)

clear chassis display message

show chassis craft-interface

List of Sample Output

set chassis display message (Creating) on page 710
set chassis display message (Deleting) on page 710

Output Fields

See *show chassis craft-interface* for an explanation of output fields.

Sample Output

set chassis display message (Creating)

The following example shows how to set the display message and verify the result:

user@host> **set chassis display message "NOC contact Dusty (888) 555-1234"**

```
message sent
```

user@host> **show chassis craft-interface**

```
Red alarm:     LED off, relay off
Yellow alarm:  LED off, relay off
Host OK LED:   On
Host fail LED: Off
FPCs     0  1  2  3  4  5  6  7
-------------------------------
Green   ..  *..  *  *.
Red     ........
LCD screen:
     +--------------------+
     |NOC contact Dusty   |
     |(888) 555-1234      |
     +--------------------+
```

set chassis display message (Deleting)

The following example shows how to delete the display message and verify that the message is removed:

user@host> **set chassis display message ""**

```
message sent
```

user@host> **show chassis craft-interface**

```
Red alarm:     LED off, relay off
Yellow alarm:  LED off, relay off
Host OK LED:   On
Host fail LED: Off
FPCs     0  1  2  3  4  5  6  7
-------------------------------
Green  ..  *..  *  *.
Red    ........
LCD screen:
     +--------------------+
     |host                |
     |Up: 0+17:05:47      |
     |                    |
     |Temperature OK      |
     +--------------------+
```

show chassis device-mode

Syntax

```
show chassis device-mode
```

Release Information

Command introduced in Junos OS Release 11.2 for the QFX Series.

Description

Display information about the operating mode of the device. For example, QFX3500 devices operate either as a single switch in standalone mode or as a QFabric system Node device in node-device mode.

> **NOTE:** Issue the **show chassis device-mode** command only when your management station is connected directly to the device over a console port connection.

Options

There are no options for this command.

Required Privilege Level

admin

RELATED DOCUMENTATION

Converting the Device Mode for a QFabric System Component | 326
request chassis device-mode | 659
Understanding Interconnect Devices | 27
Understanding Node Devices | 31

List of Sample Output

show chassis device-mode (Interconnect Device Mode) on page 713
show chassis device-mode (Interconnect Device Mode, but Node Device-Ready) on page 713
show chassis device-mode (Interconnect Device Mode, but Standalone-Ready) on page 713
show chassis device-mode (Node Device Mode) on page 714
show chassis device-mode (Node Device Mode, but Interconnect Device-Ready) on page 714
show chassis device-mode (Node Device Mode, but Standalone-Ready) on page 714
show chassis device-mode (Standalone Mode) on page 714
show chassis device-mode (Standalone Mode, but Interconnect Device-Ready) on page 714

show chassis device-mode (Standalone Mode, but Node Device-Ready) on page 714

Output Fields

Table 104 on page 713 lists the output fields for the **show chassis device-mode** command. Output fields are listed in the approximate order in which they appear.

Table 104: show chassis device-mode Output Fields

Field Name	Field Description
Current device-mode	Existing operational mode for the device. The device can be in Interconnect device mode, Node device mode, or standalone mode.
Future device-mode after reboot	Future operational mode for the device after you reboot it. The device can be set to enter Interconnect device mode, Node device mode, or standalone mode. **NOTE:** To set the future mode of the device, issue the **request chassis device-mode** command.

Sample Output

show chassis device-mode (Interconnect Device Mode)

user@switch> **show chassis device-mode**

```
Current device-mode : Interconnect-device
Future device-mode after reboot : Interconnect-device
```

show chassis device-mode (Interconnect Device Mode, but Node Device-Ready)

user@switch> **show chassis device-mode**

```
Current device-mode : Interconnect-device
Future device-mode after reboot : Node-device
```

show chassis device-mode (Interconnect Device Mode, but Standalone-Ready)

user@switch> **show chassis device-mode**

```
Current device-mode : Interconnect-device
Future device-mode after reboot : Standalone
```

show chassis device-mode (Node Device Mode)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Node-device
Future device-mode after reboot : Node-device
```

show chassis device-mode (Node Device Mode, but Interconnect Device-Ready)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Node-device
Future device-mode after reboot : Interconnect-device
```

show chassis device-mode (Node Device Mode, but Standalone-Ready)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Node-device
Future device-mode after reboot : Standalone
```

show chassis device-mode (Standalone Mode)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Standalone
Future device-mode after reboot : Standalone
```

show chassis device-mode (Standalone Mode, but Interconnect Device-Ready)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Standalone
Future device-mode after reboot : Interconnect-device
```

show chassis device-mode (Standalone Mode, but Node Device-Ready)

`user@switch>` **show chassis device-mode**

```
Current device-mode : Standalone
Future device-mode after reboot : Node-device
```

show chassis environment cb

List of Syntax

Syntax on page 715
Syntax (TX Matrix Routers) on page 715
Syntax (TX Matrix Plus Routers) on page 715
Syntax (MX Series Routers) on page 715
Syntax (MX104 Universal Routing Platforms) on page 715
Syntax (MX2010, MX2020, MX10003, MX204, MX2008, and MX10008 Universal Routing Platforms; EX9251 and EX9253 Switches) on page 716
Syntax (QFabric System) on page 716

Syntax

```
show chassis environment cb
<slot>
```

Syntax (TX Matrix Routers)

```
show chassis environment cb
<lcc number | scc>
<slot>
```

Syntax (TX Matrix Plus Routers)

```
show chassis environment cb
<lcc number | sfc number >
<slot>
```

Syntax (MX Series Routers)

```
show chassis environment cb
<slot>
<all-members>
<local>
<member member-id>
```

Syntax (MX104 Universal Routing Platforms)

```
show chassis environment cb
```

Syntax (MX2010, MX2020, MX10003, MX204, MX2008, and MX10008 Universal Routing Platforms; EX9251 and EX9253 Switches)

```
show chassis environment cb
<slot>
```

Syntax (QFabric System)

```
show chassis environment cb
<slot interconnect-device interconnect-device-name>
< interconnect-device interconnect-device-name slot>
```

Release Information

Command introduced before Junos Release 7.4.
Command introduced in Junos OS Release 9.4 for EX Series switches.
Command introduced in Junos OS Release 12.1x48 for PTX Series Packet Transport Routers.
Command introduced in Junos OS Release 12.1 for T4000 Core Routers.
option introduced for the TX Matrix Plus router in Junos Release 9.6.
Command introduced in Junos OS Release 11.3 for the QFX Series.
Command introduced in Junos OS Release 12.3 for MX2010 and MX2020 Universal Routing Platforms.
Command introduced in Junos OS Release 13.2 for MX104 Universal Routing Platforms.
Command introduced in Junos OS Release 17.2 for MX2008 Universal Routing Platforms and PTX10008 Routers.
Command introduced in Junos OS Release 17.3 for MX10003 Universal Routing Platforms.
Command introduced in Junos OS Release 17.4 for MX204 Universal Routing Platforms.
Command introduced in Junos OS Release 18.1R1 for EX9251 switches.
Command introduced in Junos OS Release 18.2R1 for MX10008 Universal Routing Platforms, and EX9253 switches.

Description

(M120, M320, MX Series, and T Series routers, EX8200 switches, and PTX Series Packet Transport Routers only) Display environmental information about the Control Boards (CBs).

Options

none—Display environmental information about all CBs. For a TX Matrix router, display environmental information about all CBs on the TX Matrix router and its attached T640 routers. For a TX Matrix Plus router, display environmental information about all CBs on the TX Matrix Plus router and its attached T1600 or T4000 routers.

all-members—(MX Series routers only) (Optional) Display environmental information about the CBs on all the members of the Virtual Chassis configuration.

interconnect-device—(QFabric systems only) Display environmental information about CBs on the Interconnect device.

lcc *number*—(TX Matrix router and TX Matrix Plus router only) (Optional) Line-card chassis number.

Replace *number* with the following values depending on the LCC configuration:

- 0 through 3, when T640 routers are connected to a TX Matrix router in a routing matrix.
- 0 through 3, when T1600 routers are connected to a TX Matrix Plus router in a routing matrix.
- 0 through 7, when T1600 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.
- 0, 2, 4, or 6, when T4000 routers are connected to a TX Matrix Plus router with 3D SIBs in a routing matrix.

local—(MX Series routers only) (Optional) Display environmental information about the CBs on the local Virtual Chassis member.

member *member-id*—(MX Series routers only) (Optional) Display environmental information about the CBs on the specified member of the Virtual Chassis configuration. Replace ***member-id*** with a value of 0 or 1.

scc—(TX Matrix router only) (Optional) Display environmental information about the CBs in the TX Matrix router (switch-card chassis).

sfc *number*—(TX Matrix Plus router only) (Optional) Display environmental information about the CBs in the TX Matrix Plus router (or switch-fabric chassis).

slot—(Optional) Display environmental information about the specified CB. On routers and PTX Series Packet Transport Routers, replace ***slot*** with **0** or **1**. On EX Series switches replace ***slot*** with **0**, **1**, or **2**. On QFX Series switches, replace ***slot*** with **0** or **1**.

Required Privilege Level
view

RELATED DOCUMENTATION

request chassis cb | 655

Understanding Switching Control Board Redundancy

List of Sample Output

show chassis environment cb (M120 Router) on page 719
show chassis environment cb (M320 Router) on page 720
show chassis environment cb (MX80 Router) on page 721

Output Fields

Table 105 on page 718 lists the output fields for the **show chassis environment cb** command. Output fields are listed in the approximate order in which they appear.

Table 105: show chassis environment cb Output Fields

Field Name	Field Description
State	Status of the CB. If two CBs are installed and online, one is functioning as the master, and the other is the standby. • **Online**—CB is online and running. • **Offline**— CB is powered down. NOTE: On the EX8208 switch, the installation can include three CBs.

Table 105: show chassis environment cb Output Fields *(continued)*

Field Name	Field Description
Temperature	Temperature in Celsius (C) and Fahrenheit (F) of the air flowing past the CB. • **Temperature Intake**—Measures the temperature of the air intake to cool the power supplies. • **Temperature Exhaust**—Measures the temperature of the hot air exhaust. NOTE: On the MX2010, MX2020, and MX2008 routers, the intake temperature measures the temperature of the air intake to cool the Control Board (CB). The MX2010, MX2020, and MX2008 routers include intake and exhaust temperatures for multiple zones (**Intake A**, **Intake B**, **Intake C**, **Exhaust A**, **Exhaust B**, and **TCBC**).
Power	Power required and measured on the CB. The left column displays the required power, in volts. The right column displays the measured power, in millivolts.
BUS Revision	Revision level of the generic bus device. (Not on switches.)
FPGA Revision	Revision level of the field-programmable gate array (FPGA). (Not on switches.)
PMBus device (on MX240, MX480, and MX960 routers with Enhanced MX SCB)	Enhanced SCB on MX 240, MX480, and MX960 routers allows the system to save power by supplying only the amount of voltage that is required. Configurable PMBus devices are used to provide the voltage for each individual device. There is one PMBus device for each XF ASIC so that the output can be customized to each device. The following PMBus device information is displayed for routers with Enhanced MX SCB: • **Expected voltage** • **Measured voltage** • **Measured current** • **Calculated power**

Sample Output

show chassis environment cb (M120 Router)

user@host> **show chassis environment cb**

```
CB 0 status:
  State                       Online Master
  Temperature                 33 degrees C / 91 degrees F
  Power
    1.2 V                      1214 mV
    1.5 V                      1495 mV
```

```
    2.5 V                      2494 mV
    3.3 V                      3319 mV
    5.0 V                      5085 mV
    3.3 V bias                 3296 mV
  Bus Revision                12
  FPGA Revision               17
CB 1 status:
  State                       Online Standby
  Temperature                 34 degrees C / 93 degrees F
  Power
    1.2 V                      1195 mV
    1.5 V                      1495 mV
    2.5 V                      2504 mV
    3.3 V                      3312 mV
    5.0 V                      5111 mV
    3.3 V bias                 3296 mV
  Bus Revision                12
  FPGA Revision               17
```

show chassis environment cb (M320 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                            Online Master
  Temperature                   29 degrees C / 84 degrees F
  Power:
    1.8 V                     1805 mV
    2.5 V                     2501 mV
    3.3 V                     3293 mV
    4.6 V                     4725 mV
    5.0 V                     5032 mV
    12.0 V                   11975 mV
    3.3 V bias                3286 mV
    8.0 V bias                7589 mV
  BUS Revision                  40
  FPGA Revision                  7
CB 1 status:
  State                            Online Standby
  Temperature                   32 degrees C / 89 degrees F
  Power:
    1.8 V                     1802 mV
    2.5 V                     2482 mV
    3.3 V                     3289 mV
```

```
    4.6 V                        4720 mV
    5.0 V                        5001 mV
    12.0 V                      11946 mV
    3.3 V bias                   3274 mV
    8.0 V bias                   7562 mV
  BUS Revision                     40
  FPGA Revision                     7
```

show chassis environment cb (MX80 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  Temperature                  36 degrees C / 96 degrees F
  Power 1
    1.0 V                       1034 mV
    1.0 V MQ                    1037 mV
    1.0 V LU                    1005 mV
    1.2 V                       1218 mV
    1.5 V                       1524 mV
    1.8 V                       1814 mV
    2.5 V                       2558 mV
    3.3 V                       3296 mV
    5.0 V                       5233 mV
    5.0 V bias                  5207 mV
    12.0 V                     12162 mV
```

show chassis environment cb (MX104 Router)

`user@host >` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  Temperature                  33 degrees C / 91 degrees F
  Power 1
    0.75 V                       751 mV
    1.0 V                       1005 mV
    1.1 V                       1113 mV
    1.5 V                       1494 mV
    2.5 V                       2518 mV
    3.3 V                       3338 mV
    5.0 V                       4960 mV
```

```
    12.0 V                    12006 mV
  FPGA Revision               25
CB 1 status:
  State                       Empty
```

show chassis environment cb (MX240 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                       Online Standby
  Temperature                 37 degrees C / 98 degrees F
  Power 1
    1.2 V                      1208 mV
    1.5 V                      1521 mV
    1.8 V                      1811 mV
    2.5 V                      2513 mV
    3.3 V                      3332 mV
    5.0 V                      5059 mV
    12.0 V                    12162 mV
    1.25 V                     1260 mV
    3.3 V SM3                  3306 mV
    5.0 V RE                   5085 mV
    12.0 V RE                 11872 mV
  Power 2
    11.3 V bias PEM           11272 mV
    4.6 V bias MidPlane        4827 mV
    11.3 V bias FPD           11272 mV
    11.3 V bias POE 0         11292 mV
    11.3 V bias POE 1         11253 mV
  Bus Revision                42
  FPGA Revision               1
```

show chassis environment cb (MX240 Router with Enhanced MX SCB)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                       Online Standby
  Temperature                 37 degrees C / 98 degrees F
  Power 1
    1.2 V                      1208 mV
    1.5 V                      1521 mV
```

```
    1.8 V                      1811 mV
    2.5 V                      2513 mV
    3.3 V                      3332 mV
    5.0 V                      5059 mV
    12.0 V                    12162 mV
    1.25 V                     1260 mV
    3.3 V SM3                  3306 mV
    5.0 V RE                   5085 mV
    12.0 V RE                 11872 mV
  Power 2
    11.3 V bias PEM           11272 mV
    4.6 V bias MidPlane        4827 mV
    11.3 V bias FPD           11272 mV
    11.3 V bias POE 0         11292 mV
    11.3 V bias POE 1         11253 mV
  Bus Revision                42
  FPGA Revision               1
  PMBus               Expected   Measured   Measured   Calculated
  device              voltage    voltage    current    power
    XF ASIC A          1000 mV     997 mV   11031 mA   10997 mW
    XF ASIC B          1000 mV     996 mV   12125 mA   12076 mW
```

show chassis environment cb (MX480 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                       Online Master
  Temperature                 41 degrees C / 105 degrees F
  Power 1
    1.2 V                      1202 mV
    1.5 V                      1511 mV
    1.8 V                      1798 mV
    2.5 V                      2507 mV
    3.3 V                      3312 mV
    5.0 V                      5027 mV
    12.0 V                    12200 mV
    1.25 V                     1260 mV
    3.3 V SM3                  3293 mV
    5 V RE                     5040 mV
    12 V RE                   11910 mV
  Power 2
    11.3 V bias PEM           11156 mV
    4.6 V bias MidPlane        4801 mV
```

```
    11.3 V bias FPD          11214 mV
    11.3 V bias POE 0        11098 mV
    11.3 V bias POE 1        11330 mV
  Bus Revision               42
  FPGA Revision              1
```

show chassis environment cb (MX480 Router with Enhanced MX SCB)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                      Online Master
  Temperature                41 degrees C / 105 degrees F
  Power 1
    1.2 V                     1202 mV
    1.5 V                     1511 mV
    1.8 V                     1798 mV
    2.5 V                     2507 mV
    3.3 V                     3312 mV
    5.0 V                     5027 mV
    12.0 V                   12200 mV
    1.25 V                    1260 mV
    3.3 V SM3                 3293 mV
    5 V RE                    5040 mV
    12 V RE                  11910 mV
  Power 2
    11.3 V bias PEM          11156 mV
    4.6 V bias MidPlane       4801 mV
    11.3 V bias FPD          11214 mV
    11.3 V bias POE 0        11098 mV
    11.3 V bias POE 1        11330 mV
  Bus Revision               42
  FPGA Revision              1
  PMBus             Expected   Measured   Measured   Calculated
  device            voltage    voltage    current    power
    XF ASIC A        1000 mV     997 mV   11031 mA   10997 mW
    XF ASIC B        1000 mV     996 mV   12125 mA   12076 mW
```

show chassis environment cb (MX960 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                          Online Master
  Temperature                    24 degrees C / 75 degrees F
  Power 1
    1.2 V                         1965 mV
    1.5 V                         2465 mV
    1.8 V                         2990 mV
    2.5 V                         3296 mV
    3.3 V                         3296 mV
    5.0 V                         6593 mV
    12.0 V                       13187 mV
    3.3 V bias                    3296 mV
    1.25 V                        1994 mV
    3.3 V SM3                     3296 mV
    5 V RE                        6593 mV
    12 V RE                      13174 mV
  Power 2                        Sensor failure
  Bus Revision                   4
  FPGA Revision                  3
```

show chassis environment cb (MX960 Router with Enhanced MX SCB)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                          Online Master
  Temperature                    24 degrees C / 75 degrees F
  Power 1
    1.2 V                         1965 mV
    1.5 V                         2465 mV
    1.8 V                         2990 mV
    2.5 V                         3296 mV
    3.3 V                         3296 mV
    5.0 V                         6593 mV
    12.0 V                       13187 mV
    3.3 V bias                    3296 mV
    1.25 V                        1994 mV
    3.3 V SM3                     3296 mV
    5 V RE                        6593 mV
    12 V RE                      13174 mV
  Power 2                        Sensor failure
  Bus Revision                   4
  FPGA Revision                  3
  PMBus                Expected   Measured   Measured  Calculated
```

```
  device            voltage    voltage    current   power
    XF ASIC A        1000 mV     997 mV   11031 mA   10997 mW
    XF ASIC B        1000 mV     996 mV   12125 mA   12076 mW
```

show chassis environment cb (MX2020 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  IntakeA-Zone0 Temperature    44 degrees C / 111 degrees F
  IntakeB-Zone1 Temperature    34 degrees C / 93 degrees F
  IntakeC-Zone0 Temperature    45 degrees C / 113 degrees F
  ExhaustA-Zone0 Temperature 43 degrees C / 109 degrees F
  ExhaustB-Zone1 Temperature 36 degrees C / 96 degrees F
  TCBC-Zone0 Temperature     39 degrees C / 102 degrees F
  Power 1
    1.0 V                       1011 mV
    1.2 V                       1208 mV
    1.8 V                       1801 mV
    2.5 V                       2552 mV
    3.3 V                       3312 mV
    5.0 V                       5040 mV
    5.0 V RE                    4988 mV
    12.0 V                     12065 mV
    12.0 V RE                  12046 mV
  Bus Revision                 99
  FPGA Revision                270
CB 1 status:
  State                        Online Standby
  IntakeA-Zone0 Temperature    45 degrees C / 113 degrees F
  IntakeB-Zone1 Temperature    41 degrees C / 105 degrees F
  IntakeC-Zone0 Temperature    46 degrees C / 114 degrees F
  ExhaustA-Zone0 Temperature 44 degrees C / 111 degrees F
  ExhaustB-Zone1 Temperature 41 degrees C / 105 degrees F
  TCBC-Zone0 Temperature     45 degrees C / 113 degrees F
  Power 1
    1.0 V                       1008 mV
    1.2 V                       1208 mV
    1.8 V                       1798 mV
    2.5 V                       2539 mV
    3.3 V                       3325 mV
    5.0 V                       5033 mV
    5.0 V RE                    4950 mV
```

```
    12.0 V                    12046 mV
    12.0 V RE                 11968 mV
  Bus Revision                99
  FPGA Revision               0
```

show chassis environment cb (MX2010 Router)

user@host> **show chassis environment cb**

```
CB 0 status:
  State                       Online Master
  IntakeA-Zone0 Temperature   36 degrees C / 96 degrees F
  IntakeB-Zone1 Temperature   30 degrees C / 86 degrees F
  IntakeC-Zone0 Temperature   38 degrees C / 100 degrees F
  ExhaustA-Zone0 Temperature 36 degrees C / 96 degrees F
  ExhaustB-Zone1 Temperature 32 degrees C / 89 degrees F
  TCBC-Zone0 Temperature     34 degrees C / 93 degrees F
  Power 1
    1.0 V                     1015 mV
    1.2 V                     1205 mV
    1.8 V                     1804 mV
    2.5 V                     2552 mV
    3.3 V                     3325 mV
    5.0 V                     5020 mV
    5.0 V RE                  4988 mV
    12.0 V                   12104 mV
    12.0 V RE                12026 mV
  Bus Revision               100
  FPGA Revision              270
CB 1 status:
  State                      Online
  IntakeA-Zone0 Temperature  35 degrees C / 95 degrees F
  IntakeB-Zone1 Temperature  28 degrees C / 82 degrees F
  IntakeC-Zone0 Temperature  37 degrees C / 98 degrees F
  ExhaustA-Zone0 Temperature 34 degrees C / 93 degrees F
  ExhaustB-Zone1 Temperature 29 degrees C / 84 degrees F
  TCBC-Zone0 Temperature     32 degrees C / 89 degrees F
  Power 1
    1.0 V                     1011 mV
    1.2 V                     1208 mV
    1.8 V                     1788 mV
    2.5 V                     2526 mV
    3.3 V                     3319 mV
    5.0 V                     5046 mV
```

```
    5.0 V RE                    4975 mV
    12.0 V                     12046 mV
    12.0 V RE                  12007 mV
  Bus Revision                 100
  FPGA Revision                0
```

show chassis environment cb (MX2008 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  Inlet1 Temperature           37 degrees C / 98 degrees F
  Inlet2 Temperature           45 degrees C / 113 degrees F
  Inlet3 Temperature           44 degrees C / 111 degrees F
  Inlet4 Temperature           42 degrees C / 107 degrees F
  Exhaust1 Temperature         30 degrees C / 86 degrees F
  Exhaust2 Temperature         40 degrees C / 104 degrees F
  Exhaust3 Temperature         48 degrees C / 118 degrees F
  Exhaust4 Temperature         46 degrees C / 114 degrees F
  Power 1
    1.0 V PHY                     989 mV
    1.15 V                       1150 mV
    1.2 V bias                   1189 mV
    1.5 V                        1488 mV
    1.8 V                        1772 mV
    2.5 V                        2462 mV
    3.3 V bias                   3296 mV
    VCCIO                        1028 mV
  Power 2
    1.1 V                        1099 mV
    3.3 V                        3300 mV
  Power 3
    0.95 V XL710                  949 mV
    1.05 V                       1050 mV
  Power 4
    1.2 V                        1199 mV
    5.0 V                        4999 mV
  Power 5
    1.0 V                        1000 mV
    1.2 V PHY                    1199 mV
  Bus Revision                 114
  FPGA Revision                1
CB 1 status:
```

```
  State                         Online Standby
  Inlet1 Temperature            30 degrees C / 86 degrees F
  Inlet2 Temperature            31 degrees C / 87 degrees F
  Inlet3 Temperature            29 degrees C / 84 degrees F
  Inlet4 Temperature            32 degrees C / 89 degrees F
  Exhaust1 Temperature          30 degrees C / 86 degrees F
  Exhaust2 Temperature          33 degrees C / 91 degrees F
  Exhaust3 Temperature          34 degrees C / 93 degrees F
  Exhaust4 Temperature          35 degrees C / 95 degrees F
  Power 1
    1.0 V PHY                     986 mV
    1.15 V                       1153 mV
    1.2 V bias                   1195 mV
    1.5 V                        1498 mV
    1.8 V                        1798 mV
    2.5 V                        2494 mV
    3.3 V bias                   3296 mV
    VCCIO                        1034 mV
  Power 2
    1.1 V                        1100 mV
    3.3 V                        3300 mV
  Power 3
    0.95 V XL710                  949 mV
    1.05 V                       1050 mV
  Power 4
    1.2 V                        1199 mV
    5.0 V                        5000 mV
  Power 5
    1.0 V                        1000 mV
    1.2 V PHY                    1199 mV
  Bus Revision                  114
  FPGA Revision                 1
```

show chassis environment cb (MX10003 Router)

`user@host>` **show chassis environment cb**

```

CB 0 status:
  State                         Online Master
  CB 0 Exhaust Temp Sensor 0x49 35 degrees C / 95 degrees F
  CB 0 Inlet Temp Sensor 0x49 28 degrees C / 82 degrees F
  Power
    VDD1V5_PCH                   1489 mV
```

```
    VDDIO                           940 mV
    VDD3V3_PCH                     3332 mV
    VDD2V5_AB                      2508 mV
    VDD1V8_CLC                     1764 mV
    VDD3V3                         3292 mV
    VDD2V5_CD                      2508 mV
    VDD1V2_CBC_GTX                    0 mV
    VDD1V8_GLS_GTX                    0 mV
    VDD1V2_CBC                        0 mV
    VDD1V8_GLS                        0 mV
    BIAS3V3_BP                        0 mV
    VDD1V2_GH                      1200 mV
    VDD3V3_CBC                     3299 mV
    VDD1V2_CD                      1199 mV
    BIAS3V3                        3340 mV
    VDD1V2_AB                      1200 mV
    VDD5V0                         5000 mV
    VDD1V05                        1049 mV
    VDD1V05                        1050 mV
    VCORE                          1780 mV
         12V                           12272 mV    3952 mA   48984 mW
CB 1 status:
  State                        Online Standby
  CB 1 Exhaust Temp Sensor 0x49 35 degrees C / 95 degrees F
  CB 1 Inlet Temp Sensor 0x49 31 degrees C / 87 degrees F
  Power
    VDD1V5_PCH                     1489 mV
    VDDIO                           940 mV
    VDD3V3_PCH                     3351 mV
    VDD2V5_AB                      2508 mV
    VDD1V8_CLC                     1764 mV
    VDD3V3                         3312 mV
    VDD2V5_CD                      2508 mV
    VDD1V2_CBC_GTX                 1195 mV
    VDD1V8_GLS_GTX                 1764 mV
    VDD1V2_CBC                     1195 mV
    VDD1V8_GLS                     1783 mV
    BIAS3V3_BP                     4096 mV
    VDD1V2_GH                      1200 mV
    VDD3V3_CBC                     3300 mV
    VDD1V2_CD                      1200 mV
    BIAS3V3                        3339 mV
    VDD1V2_AB                      1200 mV
    VDD5V0                         5000 mV
```

```
    VDD1V05                    1050 mV
    VDD1V05                    1050 mV
    VCORE                      1780 mV
         12V                       12351 mV    3823 mA   45007 mW
```

show chassis environment cb (MX204 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                      Online Master
  CB 0 Top Right Inlet Sensor35 degrees C / 95 degrees F
  CB 0 Top Left Inlet Sensor 37 degrees C / 98 degrees F
  CB 0 Top Right Exhaust Sensor43 degrees C / 109 degrees F
  CB 0 Top Left Exhaust Sensor50 degrees C / 122 degrees F
  CB 0 CPU Core-0 Temp       48 degrees C / 118 degrees F
  CB 0 CPU Core-1 Temp       48 degrees C / 118 degrees F
  CB 0 CPU Core-2 Temp       48 degrees C / 118 degrees F
  CB 0 CPU Core-3 Temp       47 degrees C / 116 degrees F
  CB 0 CPU Core-4 Temp       47 degrees C / 116 degrees F
  CB 0 CPU Core-5 Temp       47 degrees C / 116 degrees F
  CB 0 CPU Core-6 Temp       47 degrees C / 116 degrees F
  CB 0 CPU Core-7 Temp       47 degrees C / 116 degrees F
  Power
    VDD1V5_PCH                 1509 mV
    VDDIO                       950 mV
    VDD3V3_PCH                 3312 mV
    VDD2V5_AB                  2508 mV
    VDD1V8_FRMR                1813 mV
    VDD3V3                     3312 mV
    VDD2V5_CD                  2508 mV
    VDD1V8_PLL                 1813 mV
    VDD1V5                     1499 mV
    EA0_1V5                    1499 mV
    EA0_1V04                   1038 mV
    EA0_PLL_1V0                 999 mV
    EA0_2V5                    2508 mV
    BIAS3V                     3332 mV
    VDD1V2_CD                  1214 mV
    VDD1V2_AB                  1215 mV
    VDD1V05                    1050 mV
    BIAS3V3                    3309 mV
    VDD1V0                     1015 mV
```

```
    VDD1V8                      1804 mV
    VDD1V2                      1199 mV
    VDD2V5                      2504 mV
    EA0_VDD0V9                   949 mV
    EA0_HM1_VDD0V9               899 mV
    EA0_VDD0V9R2                 952 mV
    EA0_VDD1V0                  1000 mV
    VDD3V3                      3304 mV
    EA0_XR_VDD1V2               1199 mV
    EA0_XR_VDD0V9                903 mV
    EA0_HM_VDDM1V2              1199 mV
    EA0_HM_VDD1V2               1199 mV
    VDDCPU0                     1770 mV
         12V Hotswap A              11968 mV    4696 mA   55466 mW
         12V Hotswap B              12048 mV   14936 mA  180652 mW
```

show chassis environment cb (MX10008 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                           Online Master
  CB 0 Intake A Temp Sensor                     24 degrees C / 75 degrees F
  CB 0 Intake B Temp Sensor                     24 degrees C / 75 degrees F
  CB 0 Exhaust A Temp Sensor                    28 degrees C / 82 degrees F
  CB 0 Exhaust B Temp Sensor                    30 degrees C / 86 degrees F
  CB 0 Middle Temp Sensor                       28 degrees C / 82 degrees F
  Power
    GESW_VDD1V0                 1000 mV
    VDD1V0                      1000 mV
    VDD1V2                      1199 mV
    VDD3V3                      3299 mV
    XL710_VCCD                   950 mV
    VDD1V05                     1050 mV
    VDD2V5                      2500 mV
    FPGA_VDD1V2                 1200 mV
    VDD1V8                      1800 mV
    VDD1V15                     1150 mV
    VDD1V1                      1099 mV
    VCCIO                        950 mV
    PHY_VDD1V0                  1000 mV
    VDD5V0                      4998 mV
    FPGA_VDD1V5                 1496 mV
    VDD1V5                      1496 mV
```

```
        12V                          12281 mV    7700 mA   92400 mW
CB 1 status:
  State                          Online Standby
  CB 1 Intake A Temp Sensor                   24 degrees C / 75 degrees F
  CB 1 Intake B Temp Sensor                   23 degrees C / 73 degrees F
  CB 1 Exhaust A Temp Sensor                  27 degrees C / 80 degrees F
  CB 1 Exhaust B Temp Sensor                  30 degrees C / 86 degrees F
  CB 1 Middle Temp Sensor                     28 degrees C / 82 degrees F
  Power
    GESW_VDD1V0                    999 mV
    VDD1V0                        1000 mV
    VDD1V2                        1199 mV
    VDD3V3                        3299 mV
    XL710_VCCD                     950 mV
    VDD1V05                       1050 mV
    VDD2V5                        2499 mV
    FPGA_VDD1V2                   1200 mV
    VDD1V8                        1799 mV
    VDD1V15                       1150 mV
    VDD1V1                        1100 mV
    VCCIO                          949 mV
    PHY_VDD1V0                     999 mV
    VDD5V0                        5000 mV
    FPGA_VDD1V5                   1502 mV
    VDD1V5                        1496 mV
        12V                          12281 mV    8002 mA   96024 mW
```

show chassis environment cb (T4000 Core Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                          Online Master
  Temperature                    33 degrees C / 91 degrees F
  Power 1
    1.8 V                         1805 mV
    2.5 V                         2523 mV
    3.3 V                         3324 mV
    3.3 V bias                    3296 mV
    4.6 V                         4680 mV
    5.0 V                         4893 mV
    8.0 V bias                    7572 mV
    12.0 V                       11916 mV
  Power 2
```

```
    1.0 V                        993 mV
    1.2 V                       1210 mV
    3.3 V RE                    3330 mV
  Bus Revision                 51
  FPGA Revision                5
CB 1 status:
  State                        Online Standby
  Temperature                  33 degrees C / 91 degrees F
  Power 1
    1.8 V                       1810 mV
    2.5 V                       2496 mV
    3.3 V                       3308 mV
    3.3 V bias                  3286 mV
    4.6 V                       4692 mV
    5.0 V                       4954 mV
    8.0 V bias                  7282 mV
    12.0 V                     11926 mV
  Power 2
    1.0 V                        993 mV
    1.2 V                       1185 mV
    3.3 V RE                    3316 mV
  Bus Revision                 51
  FPGA Revision                5
```

show chassis environment cb (TX Matrix Router)

`user@host>` **show chassis environment cb**

```
--------------------------------------------------------------------------
CB 0 status:
  State                             Online Master
  Temperature                     32 degrees C / 89 degrees F
  Power:
    1.8 V                      1797 mV
    2.5 V                      2477 mV
    3.3 V                      3311 mV
    4.6 V                      4727 mV
    5.0 V                      5015 mV
    12.0 V                    12185 mV
    3.3 V bias                 3304 mV
    8.0 V bias                 7870 mV
  BUS Revision                   40
  FPGA Revision                   1
CB 1 status:
```

```
  State                               Online Standby
...

lcc0-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                               Online Master
  Temperature                      32 degrees C / 89 degrees F
  Power:
    1.8 V                        1787 mV
    2.5 V                        2473 mV
    3.3 V                        3306 mV
    4.6 V                        4793 mV
    5.0 V                        5025 mV
    12.0 V                      12156 mV
    3.3 V bias                   3289 mV
    8.0 V bias                   7609 mV
  BUS Revision                     40
  FPGA Revision                     5
CB 1 status:
  State                               Online Standby
 ....
  BUS Revision                     40
  FPGA Revision                     5

lcc2-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                               Online Master
 ...
CB 1 status:
  State                               Online Standby
 ...
```

show chassis environment cb (TX Matrix Plus Router)

`user@host>` **show chassis environment cb**

```
sfc0-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                          Online Master
  Temperature                    38 degrees C / 100 degrees F
  Power 1
```

```
    1.0 V                      1005 mV
    1.1 V                      1108 mV
    1.2 V                      1205 mV
    1.25 V                     1269 mV
    1.5 V                      1508 mV
    1.8 V                      1814 mV
    2.5 V                      2507 mV
    3.3 V                      3306 mV
    3.3 V bias                 3300 mV
    9.0 V                      9058 mV
    9.0 V RE                   9107 mV
  Power 2
    3.9 V                      3963 mV
    5.0 V                      5020 mV
    9.0 V                      9087 mV
  Bus Revision                79
  FPGA Revision               23
CB 1 status:
  State                       Online Standby
  Temperature                 39 degrees C / 102 degrees F
  Power 1
    1.0 V                      1002 mV
    1.1 V                      1105 mV
    1.2 V                      1198 mV
    1.25 V                     1276 mV
    1.5 V                      1504 mV
    1.8 V                      1804 mV
    2.5 V                      2507 mV
    3.3 V                      3300 mV
    3.3 V bias                 3293 mV
    9.0 V                      9039 mV
    9.0 V RE                   9049 mV
  Power 2
    3.9 V                      3892 mV
    5.0 V                      5040 mV
    9.0 V                      9058 mV
  Bus Revision                79
  FPGA Revision               23

lcc0-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                       Online Master
  Temperature                 39 degrees C / 102 degrees F
```

```
  Power 1
    1.8 V                      1799 mV
    2.5 V                      2499 mV
    3.3 V                      3327 mV
    3.3 V bias                 3299 mV
    4.6 V                      4673 mV
    5.0 V                      4918 mV
    8.0 V bias                 7308 mV
    12.0 V                    11887 mV
  Power 2
    1.0 V                       996 mV
    1.2 V                      1199 mV
    3.3 V RE                   3319 mV
  Bus Revision                51
  FPGA Revision               3
CB 1 status:
  State                       Online Standby
  Temperature                 40 degrees C / 104 degrees F
  Power 1
    1.8 V                      1800 mV
    2.5 V                      2496 mV
    3.3 V                      3322 mV
    3.3 V bias                 3284 mV
    4.6 V                      4680 mV
    5.0 V                      4954 mV
    8.0 V bias                 7284 mV
    12.0 V                    11902 mV
  Power 2
    1.0 V                       998 mV
    1.2 V                      1205 mV
    3.3 V RE                   3327 mV
  Bus Revision                51
  FPGA Revision               3

lcc1-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                       Online Master
  Temperature                 41 degrees C / 105 degrees F
  Power 1
    1.8 V                      1804 mV
    2.5 V                      2517 mV
    3.3 V                      3300 mV
    3.3 V bias                 3284 mV
```

```
    4.6 V                      4681 mV
    5.0 V                      4927 mV
    8.0 V bias                 7357 mV
    12.0 V                    11907 mV
  Power 2
    1.0 V                       991 mV
    1.2 V                      1202 mV
    3.3 V RE                   3301 mV
  Bus Revision                51
  FPGA Revision               3
CB 1 status:
  State                       Online Standby
  Temperature                 40 degrees C / 104 degrees F
  Power 1
    1.8 V                      1805 mV
    2.5 V                      2528 mV
    3.3 V                      3324 mV
    3.3 V bias                 3289 mV
    4.6 V                      4694 mV
    5.0 V                      4959 mV
    8.0 V bias                 7311 mV
    12.0 V                    11926 mV
  Power 2
    1.0 V                       998 mV
    1.2 V                      1200 mV
    3.3 V RE                   3313 mV
  Bus Revision                51
  FPGA Revision               3

lcc2-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                       Online Master
  Temperature                 41 degrees C / 105 degrees F
  Power 1
    1.8 V                      1805 mV
    2.5 V                      2494 mV
    3.3 V                      3333 mV
    3.3 V bias                 3296 mV
    4.6 V                      4673 mV
    5.0 V                      4901 mV
    8.0 V bias                 7343 mV
    12.0 V                    11916 mV
  Power 2
```

```
    1.0 V                        993 mV
    1.2 V                       1213 mV
    3.3 V RE                    3328 mV
  Bus Revision                 51
  FPGA Revision                3
CB 1 status:
  State                        Online Standby
  Temperature                  41 degrees C / 105 degrees F
  Power 1
    1.8 V                       1804 mV
    2.5 V                       2523 mV
    3.3 V                       3334 mV
    3.3 V bias                  3291 mV
    4.6 V                       4697 mV
    5.0 V                       4969 mV
    8.0 V bias                  7308 mV
    12.0 V                     11936 mV
  Power 2
    1.0 V                        996 mV
    1.2 V                       1200 mV
    3.3 V RE                    3328 mV
  Bus Revision                 51
  FPGA Revision                3

lcc3-re0:
--------------------------------------------------------------------------
CB 0 status:
  State                        Online Master
  Temperature                  37 degrees C / 98 degrees F
  Power 1
    1.8 V                       1809 mV
    2.5 V                       2510 mV
    3.3 V                       3296 mV
    3.3 V bias                  3291 mV
    4.6 V                       4670 mV
    5.0 V                       4905 mV
    8.0 V bias                  7211 mV
    12.0 V                     11882 mV
  Power 2
    1.0 V                        996 mV
    1.2 V                       1188 mV
    3.3 V RE                    3326 mV
  Bus Revision                 51
  FPGA Revision                5
```

```
CB 1 status:
  State                      Online Standby
  Temperature                38 degrees C / 100 degrees F
  Power 1
    1.8 V                     1813 mV
    2.5 V                     2510 mV
    3.3 V                     3322 mV
    3.3 V bias                3289 mV
    4.6 V                     4692 mV
    5.0 V                     4967 mV
    8.0 V bias                7194 mV
    12.0 V                   11916 mV
  Power 2
    1.0 V                      996 mV
    1.2 V                     1205 mV
    3.3 V RE                  3273 mV
  Bus Revision               51
  FPGA Revision              5
```

show chassis environment cb (EX8200 Switch)

`user@host>` **show chassis environment cb**

```

CB 0 status:
  State                      Online Master
  Temperature Intake         20 degrees C / 68 degrees F
  Temperature Exhaust        24 degrees C / 75 degrees F
  Power 1
    1.1 V                     1086 mV
    1.2 V                     1179 mV
    1.2 V *                   1182 mV
    1.2 V *                   1182 mV
    1.25 V                    1211 mV
    1.5 V                     1472 mV
    1.8 V                     1756 mV
    2.5 V                     2449 mV
    3.3 V                     3254 mV
    3.3 V bias                3300 mV
    5.0 V                     4911 mV
    12.0 V                   11891 mV
  Power 2
    3.3 V bias *              3615 mV
    3.3 V bias *              3615 mV
```

```
    3.3 V bias *              3567 mV
    3.3 V bias *              3664 mV
    4.3 V bias *              4224 mV
    4.3 V bias *              4215 mV
    4.3 V bias *              4224 mV
    4.3 V bias *              4205 mV
    4.3 V bias *              4195 mV
    4.3 V bias *              4215 mV
    5.0 V bias                4920 mV
CB 1 status:
  State                      Online Standby
  Temperature Intake         19 degrees C / 66 degrees F
  Temperature Exhaust        23 degrees C / 73 degrees F
  Power 1
    1.1 V                     1082 mV
    1.2 V                     1169 mV
    1.2 V *                   1179 mV
    1.2 V *                   1179 mV
    1.25 V                    1214 mV
    1.5 V                     1482 mV
    1.8 V                     1759 mV
    2.5 V                     2481 mV
    3.3 V                     3248 mV
    3.3 V bias                3306 mV
    5.0 V                     4911 mV
    12.0 V                   11910 mV
  Power 2
    3.3 V bias *              3644 mV
    3.3 V bias *              3664 mV
    3.3 V bias *              3586 mV
    3.3 V bias *              3654 mV
    4.3 V bias *              4224 mV
    4.3 V bias *              4215 mV
    4.3 V bias *              4224 mV
    4.3 V bias *              4205 mV
    4.3 V bias *              4244 mV
    4.3 V bias *              4215 mV
    5.0 V bias                4930 mV
CB 2 status:
  State                      Online
  Temperature Intake         19 degrees C / 66 degrees F
  Temperature Exhaust        23 degrees C / 73 degrees F
  Power 1
    1.2 V                     1195 mV
```

```
    1.5 V                      1511 mV
    1.8 V                      1804 mV
    2.5 V                      2526 mV
    3.3 V                      3300 mV
    3.3 V bias                 3306 mV
    12.0 V                    12220 mV
```

show chassis environment cb (EX8208 Switch)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                       Online Master
  Temperature Intake          20 degrees C / 68 degrees F
  Temperature Exhaust         24 degrees C / 75 degrees F
  Power 1
    1.1 V                      1086 mV
    1.2 V                      1179 mV
    1.2 V *                    1182 mV
    1.2 V *                    1182 mV
    1.25 V                     1211 mV
    1.5 V                      1466 mV
    1.8 V                      1759 mV
    2.5 V                      2455 mV
    3.3 V                      3261 mV
    3.3 V bias                 3300 mV
    5.0 V                      4930 mV
    12.0 V                    11891 mV
  Power 2
    3.3 V bias *               3606 mV
    3.3 V bias *               3615 mV
    3.3 V bias *               3567 mV
    3.3 V bias *               3673 mV
    4.3 V bias *               4224 mV
    4.3 V bias *               4215 mV
    4.3 V bias *               4234 mV
    4.3 V bias *               4205 mV
    4.3 V bias *               4186 mV
    4.3 V bias *               4215 mV
    5.0 V bias                 4940 mV
CB 1 status:
  State                       Online Standby
  Temperature Intake          19 degrees C / 66 degrees F
  Temperature Exhaust         23 degrees C / 73 degrees F
```

```
  Power 1
    1.1 V                     1086 mV
    1.2 V                     1169 mV
    1.2 V *                   1179 mV
    1.2 V *                   1179 mV
    1.25 V                    1211 mV
    1.5 V                     1479 mV
    1.8 V                     1759 mV
    2.5 V                     2475 mV
    3.3 V                     3235 mV
    3.3 V bias                3306 mV
    5.0 V                     4930 mV
    12.0 V                   11891 mV
  Power 2
    3.3 V bias *              3644 mV
    3.3 V bias *              3664 mV
    3.3 V bias *              3586 mV
    3.3 V bias *              3654 mV
    4.3 V bias *              4215 mV
    4.3 V bias *              4224 mV
    4.3 V bias *              4215 mV
    4.3 V bias *              4215 mV
    4.3 V bias *              4234 mV
    4.3 V bias *              4224 mV
    5.0 V bias                4920 mV
CB 2 status:
  State                      Online
  Temperature Intake         20 degrees C / 68 degrees F
  Temperature Exhaust        24 degrees C / 75 degrees F
  Power 1
    1.2 V                     1202 mV
    1.5 V                     1508 mV
    1.8 V                     1804 mV
    2.5 V                     2520 mV
    3.3 V                     3300 mV
    3.3 V bias                3300 mV
    12.0 V                   12200 mV
```

show chassis environment cb (EX9251 Switch)

`user@switch>` **show chassis environment cb**

```
CB 0 status:
  State                      Online Master
```

```
CB 0 Top Right Inlet Sensor29 degrees C / 84 degrees F
CB 0 Top Left Inlet Sensor 28 degrees C / 82 degrees F
CB 0 Top Right Exhaust Sensor40 degrees C / 104 degrees F
CB 0 Top Left Exhaust Sensor59 degrees C / 138 degrees F
CB 0 CPU Core-0 Temp       45 degrees C / 113 degrees F
CB 0 CPU Core-1 Temp       44 degrees C / 111 degrees F
CB 0 CPU Core-2 Temp       44 degrees C / 111 degrees F
CB 0 CPU Core-3 Temp       44 degrees C / 111 degrees F
CB 0 CPU Core-4 Temp       45 degrees C / 113 degrees F
CB 0 CPU Core-5 Temp       44 degrees C / 111 degrees F
CB 0 CPU Core-6 Temp       44 degrees C / 111 degrees F
CB 0 CPU Core-7 Temp       43 degrees C / 109 degrees F
Power
  VDD1V5_PCH                  1499 mV
  VDDIO                        950 mV
  VDD3V3_PCH                  3312 mV
  VDD2V5_AB                   2489 mV
  VDD1V8_FRMR                 1793 mV
  VDD3V3                      3292 mV
  VDD2V5_CD                   2508 mV
  VDD1V8_PLL                  1793 mV
  VDD1V5                      1499 mV
  EA0_1V5                     1499 mV
  EA0_1V04                     999 mV
  EA0_PLL_1V0                  999 mV
  EA0_2V5                     2508 mV
  BIAS3V                      3292 mV
  VDD1V2_CD                   1215 mV
  VDD1V2_AB                   1214 mV
  VDD1V05                     1050 mV
  BIAS3V3                     3309 mV
  VDD1V0                      1014 mV
  VDD1V8                      1805 mV
  VDD1V2                      1200 mV
  VDD2V5                      2504 mV
  EA0_VDD0V9                   949 mV
  EA0_HM1_VDD0V9               899 mV
  EA0_VDD0V9R2                 952 mV
  EA0_VDD1V0                   999 mV
  VDD3V3                      3305 mV
  EA0_XR_VDD1V2               1199 mV
  EA0_XR_VDD0V9                903 mV
  EA0_HM_VDDM1V2              1199 mV
  EA0_HM_VDD1V2               1199 mV
```

```
    VDDCPU0                        1770 mV
         12V Hotswap A                 11955 mV    4861 mA   59347 mW
         12V Hotswap B                 11916 mV   15046 mA  180887 mW
```

show chassis environment cb (EX9253 Switch)

`user@switch>` **show chassis environment cb**

```
CB 0 status:
  State                           Online Master
  CB 0 Exhaust Temp Sensor        38 degrees C / 100 degrees F
  CB 0 Inlet Temp Sensor          32 degrees C / 89 degrees F
  CB 0 CPU DIE Temp Sensor        43 degrees C / 109 degrees F
  Power
    VDD1V5_PCH                     1489 mV
    VDDIO                           940 mV
    VDD3V3_PCH                     3332 mV
    VDD2V5_AB                      2508 mV
    VDD1V8_CLC                     1783 mV
    VDD3V3                         3312 mV
    VDD2V5_CD                      2508 mV
    VDD1V2_CBC_GTX                 1195 mV
    VDD1V8_GLS_GTX                 1783 mV
    VDD1V2_CBC                     1176 mV
    VDD1V8_GLS                     1783 mV
    BIAS3V3_BP                     3978 mV
    VDD1V2_GH                      1200 mV
    VDD3V3_CBC                     3299 mV
    VDD1V2_CD                      1200 mV
    BIAS3V3                        3340 mV
    VDD1V2_AB                      1199 mV
    VDD5V0                         5000 mV
    VDD1V05                        1050 mV
    VDD1V05                        1050 mV
    VCORE                          1770 mV
         12V                           12061 mV    4806 mA   57841 mW
CB 1 status:
  State                           Offline
  CB 1 Exhaust Temp Sensor        32 degrees C / 89 degrees F
  CB 1 Inlet Temp Sensor          29 degrees C / 84 degrees F
  CB 1 CPU DIE Temp Sensor        43 degrees C / 109 degrees F
  Power                           Disabled
```

show chassis environment cb (PTX5000 Packet Transport Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  Intake Temperature           38 degrees C / 100 degrees F
  Exhaust A Temperature        45 degrees C / 113 degrees F
  Exhaust B Temperature        42 degrees C / 107 degrees F
  Power 1
    1.2 V                       1200 mV
    1.25 V                      1250 mV
    2.5 V                       2500 mV
    3.3 V                       3300 mV
  Power 2
    1.0 V                       1000 mV
    3.3 V bias                  3293 mV
    3.9 V                       3921 mV
  Bus Revision                 132
  FPGA Revision                27
CB 1 status:
  State                        Online Standby
  Intake Temperature           34 degrees C / 93 degrees F
  Exhaust A Temperature        39 degrees C / 102 degrees F
  Exhaust B Temperature        36 degrees C / 96 degrees F
  Power 1
    1.2 V                       1199 mV
    1.25 V                      1250 mV
    2.5 V                       2499 mV
    3.3 V                       3299 mV
  Power 2
    1.0 V                       1000 mV
    3.3 V bias                  3312 mV
    3.9 V                       3961 mV
  Bus Revision                 132
  FPGA Revision                28
```

show chassis environment cb (PTX10008 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  CB 0 Intake Temp Sensor      28 degrees C / 82 degrees F
  CB 0 Exhaust Temp Sensor     32 degrees C / 89 degrees F
```

```
  Power
    VDD 2.5V                    2489 mV
    Bias 3.3V                   3332 mV
    VDD 3.3V                    3292 mV
    VCC 1.8V                    1822 mV
    VDD 1.2V                    1205 mV
    VCC 1V                       999 mV
    VCC CPU 1.8V                1803 mV
    VDD 2.5V                    2489 mV
    VCC Aux 5V                  5115 mV
    VDD DDR 1.5V                1499 mV
    VTT SA CPU 0.8V              803 mV
    VTT CPU 1.05V               1048 mV
    VCC Core CPU                 901 mV
    VCC PCH 1.5V                1519 mV
    VDD 1.05V                   1048 mV
    VCC 2.5V                    2508 mV
    FORT VCCA 1V                 960 mV
    VDD .85V                     862 mV
    VTT DDRA .75V                744 mV
    VTT DDRB .75V                744 mV
         12V                        12285 mV    3779 mA   46339 mW
CB 1 status:
  State                      Online Standby
  CB 1 Intake Temp Sensor    27 degrees C / 80 degrees F
  CB 1 Exhaust Temp Sensor   32 degrees C / 89 degrees F
  Power
    VDD 2.5V                    2489 mV
    Bias 3.3V                   3332 mV
    VDD 3.3V                    3273 mV
    VCC 1.8V                    1822 mV
    VDD 1.2V                    1195 mV
    VCC 1V                       999 mV
    VCC CPU 1.8V                1783 mV
    VDD 2.5V                    2489 mV
    VCC Aux 5V                  5056 mV
    VDD DDR 1.5V                1499 mV
    VTT SA CPU 0.8V              793 mV
    VTT CPU 1.05V               1048 mV
    VCC Core CPU                 882 mV
    VCC PCH 1.5V                1509 mV
    VDD 1.05V                   1048 mV
    VCC 2.5V                    2489 mV
    FORT VCCA 1V                 960 mV
```

```
    VDD .85V                    862 mV
    VTT DDRA .75V               744 mV
    VTT DDRB .75V               744 mV
         12V                      12391 mV    3779 mA   46727 mW
```

show chassis environment cb (PTX10016 Router)

`user@host>` **show chassis environment cb**

```
CB 0 status:
  State                        Online Master
  CB 0 Intake Temp Sensor      20 degrees C / 68 degrees F
  CB 0 Exhaust Temp Sensor     24 degrees C / 75 degrees F
  Power
    VDD 2.5V                   2508 mV
    Bias 3.3V                  3351 mV
    VDD 3.3V                   3292 mV
    VCC 1.8V                   1832 mV
    VDD 1.2V                   1205 mV
    VCC 1V                      999 mV
    VCC CPU 1.8V               1793 mV
    VDD 2.5V                   2508 mV
    VCC Aux 5V                 5056 mV
    VDD DDR 1.5V               1509 mV
    VTT SA CPU 0.8V             803 mV
    VTT CPU 1.05V              1048 mV
    VCC Core CPU                960 mV
    VCC PCH 1.5V               1519 mV
    VDD 1.05V                  1058 mV
    VCC 2.5V                   2528 mV
    FORT VCCA 1V                960 mV
    VDD .85V                    852 mV
    VTT DDRA .75V               744 mV
    VTT DDRB .75V               744 mV
         12V                      12259 mV    3649 mA   45173 mW
CB 1 status:
  State                        Online Standby
  CB 1 Intake Temp Sensor      20 degrees C / 68 degrees F
  CB 1 Exhaust Temp Sensor     23 degrees C / 73 degrees F
  Power
    VDD 2.5V                   2508 mV
    Bias 3.3V                  3312 mV
    VDD 3.3V                   3273 mV
    VCC 1.8V                   1822 mV
```

```
    VDD 1.2V                    1195 mV
    VCC 1V                       989 mV
    VCC CPU 1.8V                1783 mV
    VDD 2.5V                    2489 mV
    VCC Aux 5V                  5086 mV
    VDD DDR 1.5V                1499 mV
    VTT SA CPU 0.8V              803 mV
    VTT CPU 1.05V               1048 mV
    VCC Core CPU                1029 mV
    VCC PCH 1.5V                1519 mV
    VDD 1.05V                   1048 mV
    VCC 2.5V                    2528 mV
    FORT VCCA 1V                 960 mV
    VDD .85V                     862 mV
    VTT DDRA .75V                744 mV
    VTT DDRB .75V                744 mV
         12V                        12285 mV    3952 mA   48447 mW
```

show chassis environment cb (QFabric System)

`user@switch>` **show chassis environment cb interconnect-device IC-123 0**

```
CB 0 status:
  State                       Online Master
  Left Intake Temperature     33 degrees C / 91 degrees F
  Right Intake Temperature    33 degrees C / 91 degrees F
  Left Exhaust Temperature    36 degrees C / 96 degrees F
  Right Exhaust Temperature   35 degrees C / 95 degrees F
  Power                       OK
    VDD 3V3                    3294 mV
    VDD 2V5                    2436 mV
    VDD 1V8                    1746 mV
    VDD 1V5                    1460 mV
    VDD 1V25                   1210 mV
    VDD 1V2                    1164 mV
    CPU CORE 1V2               1120 mV
    VDD 1V0                     968 mV
    VDD 5V0                    5088 mV
    CPU MP BIAS 4V3            4050 mV
    BIAS 3V3                   3180 mV
    VTT 0V9                     866 mV
```

show chassis environment cb 0 (PTX10003-80C and PTX10003-160C Routers)

`user@router> show chassis environment cb 0`

```
CB 0 status:
  State                      Online Master
  Power 1
    PCIe SW0 power, CORE 0.9 V     894 mV
  Power 2
    CLOCK MAIN, 2.5 V           2495 mV
    PCIe SW0 power, SERDES 0.9 V     897 mV
  Power 3
    PCIe SW1 power, CORE 0.9 V     897 mV
  Power 4
    PCIe SW1 power, SERDES 0.9 V     894 mV
  Power 5
    Ethernet SW0 power, 1.0 V     998 mV
  Power 6
    Ethernet SW1 power, CORE 1.0 V     998 mV
  Power 7
    12 V                         12034 mV
  Bus Revision               0
  FPGA Revision              0
```

Starting in Junos OS Evolved Release 19.1R1, on PTX10003-80C and PTX10003-160C devices, the **show chassis environment cb** command does not show the Bus and FPGA revision information. If you want to view the FPGA revision or version information for the CB, use the **show system firmware** command.

show chassis ethernet-switch interconnect-device cb

Syntax

```
show chassis ethernet-switch interconnect-device name cb
<detail>
<port number>
<slotnumber>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFX3000-G QFabric systems only) Display Ethernet switch information for the Control Board (CB) ports in an Interconnect device.

Options

none—Display Ethernet switch information about each connected port on each online CB in the Interconnect device.

detail—(Optional) Display detailed status information for all CBs or for the CB in the specified slot in the Interconnect device.

port *number*—(Optional) Display Ethernet switch information about a specific port on a CB in the Interconnect device.

slot *number*—(Optional) Display Ethernet switch information about a CB in a specific slot in the Interconnect device.

Required Privilege Level

view

RELATED DOCUMENTATION

chassis | 522
show chassis environment cb | 715
show chassis ethernet-switch interconnect-device fpc | 774

List of Sample Output

show chassis ethernet-switch interconnect-device cb on page 756
show chassis ethernet-switch interconnect-device cb detail on page 758
show chassis ethernet-switch interconnect-device cb detail slot port on page 765

Output Fields

Table 106 on page 752 lists the output fields for the **show chassis ethernet-switch interconnect-device cb** command. Output fields are listed in the approximate order in which they appear.

Table 106: show chassis ethernet-switch interconnect-device fpc Output Fields

Field Name	Field Description
Link is good on port n connected to device	Information about the link between each port on the FPC's Ethernet switch and one of the following devices: • FWD-SWITCH-0 • FWD-SWITCH-1 • CB0 • CB1
Speed is	Speed at which the Ethernet link is running: **10 Mb**When the device is **RE** or **Other RE** on the TX Matrix router, the speed is **1000 Mb**.
Duplex is	Duplex type of the Ethernet link: **full** or **half**.
Autonegotiate is Enabled (or Disabled)	By default, built-in Fast Ethernet ports on a PIC autonegotiate whether to operate at 10 Mbps or 100 Mbps. All other interfaces automatically choose the correct speed based on the PIC type and whether the PIC is configured to operate in multiplexed mode (using the **no-concatenate** statement at the **[edit chassis]** hierarchy level, as described in the *Junos OS System Basics Configuration Guide*).
Flow Control TX is Enabled (or Disabled)	Flow control in the transmit direction is enabled (or disabled). Flow control regulates the flow of packets from the switch to the remote side of the connection.
Flow Control RX is Enabled (or Disabled)	Flow control in the receive direction is enabled (or disabled). Flow control regulates the flow of packets from the remote side of the connection to the switch.
TX Octets	Number of octets sent.
TX Packets 64 Octets	Number of transmitted packets of size 64 octets.
TX Packets 65-127 Octets	Number of transmitted frames of size 65 through 127 octets.
TX Packets 128-255 Octets	Number of transmitted frames of size 128 through 255 octets.
TX Packets 256-511 Octets	Number of transmitted frames of size 256 through 511 octets.

Table 106: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
TX Packets 512-1023 Octets	Number of transmitted frames of size 512 through 1023 octets.
TX Packets 1024-1518 Octets	Number of transmitted frames of size 1024 through 1518 octets.
TX Packets 1519-2047 Octets	Number of transmitted frames of size 1519 through 2047 octets.
TX Packets 2048-4095 Octets	Number of transmitted frames of size 2048 through 4095 octets.
TX Packets 4096-9216 Octets	Number of transmitted frames of size 4096 through 9216 octets.
TX Packets 9217-16383 Octets	Number of transmitted frames of size 9217 through 16383 octets.
TX Multicast packets	Number of multicast packets sent.
TX Broadcast packets	Number of broadcast packets sent.
TX Single Collision frames	Number of packets sent after one collision.
TX Mult. Collision frames	Number of packets sent after multiple collisions.
TX Late Collision Frames	Number of packets aborted during sending because of collisions after 64 bytes.
TX Excessive collisions	Number of packets not sent because of too many collisions.
TX Collision frames	Number of collision packets sent.
TX PAUSEMAC Ctrl Frames	Number of Media Access Control (MAC) frames containing PAUSE commands sent.
TX MAC ctrl frames	Number of MAC control packets sent.

Table 106: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
TX Frame deferred Xmns	Number of frames deferred in *x* milliseconds.
TX Oversize Packets	Number of oversized packets sent.
TX Jabbers	Total number of frames sent that exceed the maximum byte count and contain CRC errors .
TX FCS Error Counter	Number of packets discarded because of frame check sequence errors.
TX Fragment Counter	Number of fragmented packets sent.
TX Byte Counter	Number of bytes sent.
RX Octets	Number of octets received.
RX Packets 64 Octets	Number of received packets of size 64 octets.
RX Packets 65-127 Octets	Number of received packets of size 65 through 127 octets.
RX Packets 128-255 Octets	Number of received packets of size 128 through 255 octets.
RX Packets 256-511 Octets	Number of received packets of size 256 through 511 octets.
RX Packets 512-1023 Octets	Number of received packets of size 512 through 1023 octets.
RX Packets 1024-1518 Octets	Number of received packets of size 65 through 127 octets.
RX Packets 1519-2047 Octets	Number of received packets of size 1519 through 2047 octets.
RX Packets 2048-4095 Octets	Number of received packets of size 2048 through 4095 octets.
RX Packets 4096-9216 Octets	Number of received packets of size 4096 through 9216 octets.

Table 106: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
RX Multicast Packets	Number of multicast packets received.
RX Broadcast Packets	Number of broadcast packets received.
RX FCS Errors	Number of packets discarded because of frame check sequence errors.
RX Align Errors	Number of incomplete octets received.
RX Fragments	Number of fragmented packets received.
RX Symbol errors	Number of symbols received that the router did not correctly decode.
RX Unsupported opcodes	Number of packets received with unsupported op codes.
RX Out of Range Length	Number of packets received with an out of range length.
RX False Carrier Errors	Number of packets received with false carrier errors.
RX Undersize Packets	Number of undersized packets received.
RX Oversize Packets	Number of oversized packets received.
RX Jabbers	Total number of frames received that exceed the maximum byte count and contain CRC errors .
RX 1519-1522 Good Vlan frms	
RX MTU Exceed Counter	Number of packets received that exceed the MTU.
RX Control Frame Counter	Number of control frames received.
RX Pause Frame Counter	Number of pause frames received.

Table 106: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
RX Byte Counter	Number of bytes received.

Sample Output

show chassis ethernet-switch interconnect-device cb

`user@switch>` **show chassis ethernet-switch interconnect-device IC-WS001 cb**

```
Displaying summary for switch 0
Link is down on XE port 1 connected to device: FPC7
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 2 connected to device: FPC6
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 3 connected to device: FPC5
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 5 connected to device: FPC4
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 7 connected to device: FPC3
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 9 connected to device: FPC2
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is good on XE port 10 connected to device: FPC1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  TX Octets                    326358
  RX Octets                    237947
```

```
Link is good on XE port 11 connected to device: FPC0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  TX Octets                   548249
  RX Octets                   386013

Link is down on XE port 20 connected to device: SFP3
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is down on XE port 21 connected to device: SFP2
  Flow Control TX is Disabled
  Flow Control RX is Disabled

Link is good on XE port 22 connected to device: SFP1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Enabled
  TX Octets                   1
  RX Octets                   11704758

Link is good on XE port 23 connected to device: SFP0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Enabled
  TX Octets                   1500022
  RX Octets                   11629453

Link is good on XE port 24 connected to device: VCCPD
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  TX Octets                   23332467
  RX Octets                   1500023

Link is good on GE port 25 connected to device: SFI
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  TX Octets                   643918
  RX Octets                   894548
```

show chassis ethernet-switch interconnect-device cb detail

`user@qfabric>` **show chassis ethernet-switch interconnect-device IC-WS001 cb detail**

```
Port statistics for CB switch

Link is down on XE port 1 connected to device: FPC7

Link is down on XE port 2 connected to device: FPC6

Link is down on XE port 3 connected to device: FPC5

Link is down on XE port 5 connected to device: FPC4

Link is down on XE port 7 connected to device: FPC3

Link is down on XE port 9 connected to device: FPC2
Statistics for port 10 connected to device FPC1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   319293
  TX Packets 256-511 Octets   5043
  TX Packets 512-1023 Octets  2072
  TX Packets 1024-1518 Octets  6
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   326415
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             71659246
  TX Packet OK Counter        326415
  TX Pause Packet Counter     0
  TX Unicast Counter          326414
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   235428
  RX Packets 256-511 Octets   2134
  RX Packets 512-1023 Octets  420
  RX Packets 1024-1518 Octets  6
```

```
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   237988
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             55821504
  RX Unicast Frame Count      237988
  RX Packet OK Count          237988
Statistics for port 11 connected to device FPC0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   535483
  TX Packets 256-511 Octets   9289
  TX Packets 512-1023 Octets  3564
  TX Packets 1024-1518 Octets  5
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   548342
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             120498414
  TX Packet OK Counter        548342
  TX Pause Packet Counter     0
  TX Unicast Counter          548341
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   382931
```

```
  RX Packets 256-511 Octets   2762
  RX Packets 512-1023 Octets  386
  RX Packets 1024-1518 Octets  3
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   386082
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             90717369
  RX Unicast Frame Count      386082
  RX Packet OK Count          386082

Link is down on XE port 20 connected to device: SFP3

Link is down on XE port 21 connected to device: SFP2
Statistics for port 22 connected to device SFP1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  1
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  0
  TX Octets                   1
  TX Multicast Packets        1
  TX Broadcast Packets        0
  TX Single Collision Frames  0
  TX Mult. Collision Frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
```

```
  TX Collision Frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC Ctrl Frames          0
  TX Frame Deferred Xmns      0
  TX Frame Excessive Deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             1422
  RX Packet OK Count          1
  RX Packets 64 Octets        230013
  RX Packets 65-127 Octets    174529
  RX Packets 128-255 Octets   286735
  RX Packets 256-511 Octets   343412
  RX Packets 512-1023 Octets  172152
  RX Packets 1024-1518 Octets  10500065
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   11706906
  RX Multicast Packets        11672320
  RX Broadcast Packets        34460
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol Errors            0
  RX Unsupported Opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             2379464164
  RX Packet OK Count          11706906
Statistics for port 23 connected to device SFP0:
  TX Packets 64 Octets        3
  TX Packets 65-127 Octets    484733
  TX Packets 128-255 Octets   219112
  TX Packets 256-511 Octets   129014
```

```
TX Packets 512-1023 Octets  503
TX Packets 1024-1518 Octets  666958
TX Packets 1519-2047 Octets  0
TX Packets 2048-4095 Octets  0
TX Packets 4096-9216 Octets  0
TX 1519-1522 Good Vlan Frms  0
TX Octets                   1500323
TX Multicast Packets        794098
TX Broadcast Packets        1040
TX Single Collision Frames  0
TX Mult. Collision Frames   0
TX Late Collisions          0
TX Excessive Collisions     0
TX Collision Frames         0
TX PAUSEMAC Ctrl Frames     0
TX MAC Ctrl Frames          0
TX Frame Deferred Xmns      0
TX Frame Excessive Deferl   0
TX Oversize Packets         0
TX Jabbers                  0
TX FCS Error Counter        0
TX Fragment Counter         0
TX Byte Counter             1065466891
RX Packet OK Count          1500323
RX Packets 64 Octets        341563
RX Packets 65-127 Octets    430810
RX Packets 128-255 Octets   318279
RX Packets 256-511 Octets   347147
RX Packets 512-1023 Octets  184798
RX Packets 1024-1518 Octets  10008993
RX Packets 1519-2047 Octets  0
RX Packets 2048-4095 Octets  0
RX Packets 4096-9216 Octets  0
RX Octets                   11631590
RX Multicast Packets        10878484
RX Broadcast Packets        33420
RX FCS Errors               0
RX Align Errors             0
RX Fragments                0
RX Symbol Errors            0
RX Unsupported Opcodes      0
RX Out of Range Length      0
RX False Carrier Errors     0
RX Undersize Packets        0
```

```
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             1720484325
  RX Packet OK Count          11631591
Statistics for port 24 connected to device VCCPD:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1176546
  TX Packets 128-255 Octets   604988
  TX Packets 256-511 Octets   690561
  TX Packets 512-1023 Octets  356942
  TX Packets 1024-1518 Octets  20507438
  TX Packets 1519-2047 Octets  278
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  278
  TX Octets                   23336753
  TX Multicast Packets        22549383
  TX Broadcast Packets        67862
  TX Single Collision Frames  0
  TX Mult. Collision Frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision Frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC Ctrl Frames          0
  TX Frame Deferred Xmns      0
  TX Frame Excessive Deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             4191296788
  RX Packet OK Count          23336753
  RX Packets 64 Octets        3
  RX Packets 65-127 Octets    484673
  RX Packets 128-255 Octets   219074
  RX Packets 256-511 Octets   129100
  RX Packets 512-1023 Octets  516
  RX Packets 1024-1518 Octets  666959
  RX Packets 1519-2047 Octets  0
```

```
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   1500325
  RX Multicast Packets        794099
  RX Broadcast Packets        1040
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol Errors            0
  RX Unsupported Opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             1071469739
  RX Packet OK Count          1500325
Statistics for port 25 connected to device SFI:
  TX Packets 64 Octets        12
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   618363
  TX Packets 256-511 Octets   4896
  TX Packets 512-1023 Octets  806
  TX Packets 1024-1518 Octets  19950
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  0
  TX Octets                   644028
  TX Multicast Packets        4
  TX Broadcast Packets        19954
  TX Single Collision Frames  0
  TX Mult. Collision Frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision Frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC Ctrl Frames          0
  TX Frame Deferred Xmns      0
  TX Frame Excessive Deferl   0
```

```
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             167039705
  RX Packet OK Count          644028
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   854776
  RX Packets 256-511 Octets   14332
  RX Packets 512-1023 Octets  5636
  RX Packets 1024-1518 Octets  19954
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   894698
  RX Multicast Packets        0
  RX Broadcast Packets        19943
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol Errors            0
  RX Unsupported Opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             212658920
  RX Packet OK Count          894698
```

show chassis ethernet-switch interconnect-device cb detail slot port

`user@qfabric>` **show chassis ethernet-switch interconnect-device IC-WS001 cb slot 1 port 1**

```
re0:
--------------------------------------------------------------------------
Port statistics for CB switch

Link is down on XE port 1 connected to device: FPC7
```

```
Link is down on XE port 2 connected to device: FPC6

Link is down on XE port 3 connected to device: FPC5

Link is down on XE port 5 connected to device: FPC4

Link is down on XE port 7 connected to device: FPC3

Link is down on XE port 9 connected to device: FPC2
Statistics for port 10 connected to device FPC1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   319366
  TX Packets 256-511 Octets   5043
  TX Packets 512-1023 Octets  2072
  TX Packets 1024-1518 Octets  6
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   326488
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             71675330
  TX Packet OK Counter        326488
  TX Pause Packet Counter     0
  TX Unicast Counter          326487
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   235481
  RX Packets 256-511 Octets   2134
  RX Packets 512-1023 Octets  420
  RX Packets 1024-1518 Octets  6
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   238041
  RX Multicast Packets        0
```

```
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             55834224
  RX Unicast Frame Count      238041
  RX Packet OK Count          238041
Statistics for port 11 connected to device FPC0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   535606
  TX Packets 256-511 Octets   9289
  TX Packets 512-1023 Octets  3564
  TX Packets 1024-1518 Octets  5
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   548465
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             120525524
  TX Packet OK Counter        548465
  TX Pause Packet Counter     0
  TX Unicast Counter          548464
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   383018
  RX Packets 256-511 Octets   2762
  RX Packets 512-1023 Octets  386
  RX Packets 1024-1518 Octets  3
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
```

```
  RX Packets 9217-16383 Octets  0
  RX Octets                   386169
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             90738249
  RX Unicast Frame Count      386169
  RX Packet OK Count          386169

Link is down on XE port 20 connected to device: SFP3

Link is down on XE port 21 connected to device: SFP2
Statistics for port 22 connected to device SFP1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  1
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  0
  TX Octets                   1
  TX Multicast Packets        1
  TX Broadcast Packets        0
  TX Single Collision Frames  0
  TX Mult. Collision Frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision Frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC Ctrl Frames          0
  TX Frame Deferred Xmns      0
  TX Frame Excessive Deferl   0
  TX Oversize Packets         0
```

```
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             1422
  RX Packet OK Count          1
  RX Packets 64 Octets        230071
  RX Packets 65-127 Octets    174571
  RX Packets 128-255 Octets   286812
  RX Packets 256-511 Octets   343500
  RX Packets 512-1023 Octets  172203
  RX Packets 1024-1518 Octets  10502544
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   11709701
  RX Multicast Packets        11675110
  RX Broadcast Packets        34465
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol Errors            0
  RX Unsupported Opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             2383079858
  RX Packet OK Count          11709701
Statistics for port 23 connected to device SFP0:
  TX Packets 64 Octets        3
  TX Packets 65-127 Octets    485048
  TX Packets 128-255 Octets   219200
  TX Packets 256-511 Octets   129053
  TX Packets 512-1023 Octets  503
  TX Packets 1024-1518 Octets  667127
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  0
```

```
TX Octets                    1500934
TX Multicast Packets         794300
TX Broadcast Packets         1040
TX Single Collision Frames   0
TX Mult. Collision Frames    0
TX Late Collisions           0
TX Excessive Collisions      0
TX Collision Frames          0
TX PAUSEMAC Ctrl Frames      0
TX MAC Ctrl Frames           0
TX Frame Deferred Xmns       0
TX Frame Excessive Deferl    0
TX Oversize Packets          0
TX Jabbers                   0
TX FCS Error Counter         0
TX Fragment Counter          0
TX Byte Counter              1065764997
RX Packet OK Count           1500934
RX Packets 64 Octets         341648
RX Packets 65-127 Octets     431183
RX Packets 128-255 Octets    318367
RX Packets 256-511 Octets    347225
RX Packets 512-1023 Octets   184849
RX Packets 1024-1518 Octets   10011311
RX Packets 1519-2047 Octets   0
RX Packets 2048-4095 Octets   0
RX Packets 4096-9216 Octets   0
RX Octets                    11634583
RX Multicast Packets         10881071
RX Broadcast Packets         33425
RX FCS Errors                0
RX Align Errors              0
RX Fragments                 0
RX Symbol Errors             0
RX Unsupported Opcodes       0
RX Out of Range Length       0
RX False Carrier Errors      0
RX Undersize Packets         0
RX Oversize Packets          0
RX Jabbers                   0
RX 1519-1522 Good Vlan Frms 0
RX MTU Exceed Counter        0
RX Control Frame Counter     0
RX Pause Frame Counter       0
```

```
  RX Byte Counter             1723893006
  RX Packet OK Count          11634583
Statistics for port 24 connected to device VCCPD:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1177102
  TX Packets 128-255 Octets   605153
  TX Packets 256-511 Octets   690727
  TX Packets 512-1023 Octets  357044
  TX Packets 1024-1518 Octets  20512235
  TX Packets 1519-2047 Octets  278
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  278
  TX Octets                   23342539
  TX Multicast Packets        22554760
  TX Broadcast Packets        67872
  TX Single Collision Frames  0
  TX Mult. Collision Frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision Frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC Ctrl Frames          0
  TX Frame Deferred Xmns      0
  TX Frame Excessive Deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             4198344167
  RX Packet OK Count          23342539
  RX Packets 64 Octets        3
  RX Packets 65-127 Octets    484985
  RX Packets 128-255 Octets   219164
  RX Packets 256-511 Octets   129139
  RX Packets 512-1023 Octets  516
  RX Packets 1024-1518 Octets  667128
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   1500935
  RX Multicast Packets        794301
  RX Broadcast Packets        1040
  RX FCS Errors               0
```

```
  RX Align Errors            0
  RX Fragments               0
  RX Symbol Errors           0
  RX Unsupported Opcodes     0
  RX Out of Range Length     0
  RX False Carrier Errors    0
  RX Undersize Packets       0
  RX Oversize Packets        0
  RX Jabbers                 0
  RX 1519-1522 Good Vlan Frms 0
  RX MTU Exceed Counter      0
  RX Control Frame Counter   0
  RX Pause Frame Counter     0
  RX Byte Counter            1071770147
  RX Packet OK Count         1500935
Statistics for port 25 connected to device SFI:
  TX Packets 64 Octets       12
  TX Packets 65-127 Octets   1
  TX Packets 128-255 Octets  618503
  TX Packets 256-511 Octets  4896
  TX Packets 512-1023 Octets 806
  TX Packets 1024-1518 Octets  19950
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan Frms  0
  TX Octets                  644168
  TX Multicast Packets       4
  TX Broadcast Packets       19954
  TX Single Collision Frames 0
  TX Mult. Collision Frames  0
  TX Late Collisions         0
  TX Excessive Collisions    0
  TX Collision Frames        0
  TX PAUSEMAC Ctrl Frames    0
  TX MAC Ctrl Frames         0
  TX Frame Deferred Xmns     0
  TX Frame Excessive Deferl  0
  TX Oversize Packets        0
  TX Jabbers                 0
  TX FCS Error Counter       0
  TX Fragment Counter        0
  TX Byte Counter            167073305
  RX Packet OK Count         644168
```

```
RX Packets 64 Octets        0
RX Packets 65-127 Octets    0
RX Packets 128-255 Octets   854972
RX Packets 256-511 Octets   14332
RX Packets 512-1023 Octets  5636
RX Packets 1024-1518 Octets  19954
RX Packets 1519-2047 Octets  0
RX Packets 2048-4095 Octets  0
RX Packets 4096-9216 Octets  0
RX Octets                   894894
RX Multicast Packets        0
RX Broadcast Packets        19943
RX FCS Errors               0
RX Align Errors             0
RX Fragments                0
RX Symbol Errors            0
RX Unsupported Opcodes      0
RX Out of Range Length      0
RX False Carrier Errors     0
RX Undersize Packets        0
RX Oversize Packets         0
RX Jabbers                  0
RX 1519-1522 Good Vlan Frms 0
RX MTU Exceed Counter       0
RX Control Frame Counter    0
RX Pause Frame Counter      0
RX Byte Counter             212702114
RX Packet OK Count          894894
```

show chassis ethernet-switch interconnect-device fpc

Syntax

```
show chassis ethernet-switch interconnect-device name fpc
<detail>
<port number>
<slot number>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFX3000-G QFabric systems only) Display Ethernet switch information for the front card Flexible Port Concentrators (FPCs) in an Interconnect device.

Options

none—Display Ethernet switch information about each connected port on each online FPC in the Interconnect device.

detail—(Optional) Display detailed status information for all FPCs or for the FPC in the specified slot in the Interconnect device.

port *number*—(Optional) Display Ethernet switch information about a specific port on an FPC in the Interconnect device.

slot *number*—(Optional) Display Ethernet switch information about an FPC in a specific slot in the Interconnect device.

Required Privilege Level

view

RELATED DOCUMENTATION

chassis | 522

show chassis environment fpc

show chassis ethernet-switch interconnect-device cb | 751

List of Sample Output

show chassis ethernet-switch fpc interconnect-device detail port on page 803

Output Fields

Table 106 on page 752 lists the output fields for the **show chassis ethernet-switch interconnect-device fpc** command. Output fields are listed in the approximate order in which they appear.

Table 107: show chassis ethernet-switch interconnect-device fpc Output Fields

Field Name	Field Description
Link is good on port n connected to device	Information about the link between each port on the FPC's Ethernet switch and one of the following devices: • FWD-SWITCH-0 • FWD-SWITCH-1 • CB0 • CB1
Speed is	Speed at which the Ethernet link is running: **10 Mb**When the device is **RE** or **Other RE** on the TX Matrix router, the speed is **1000 Mb**.
Duplex is	Duplex type of the Ethernet link: **full** or **half**.
Autonegotiate is Enabled (or Disabled)	By default, built-in Fast Ethernet ports on a PIC autonegotiate whether to operate at 10 Mbps or 100 Mbps. All other interfaces automatically choose the correct speed based on the PIC type and whether the PIC is configured to operate in multiplexed mode (using the **no-concatenate** statement at the **[edit chassis]** hierarchy level, as described in the *Junos OS System Basics Configuration Guide*).
TX Octets	Number of octets sent.
TX Packets 64 Octets	Number of transmitted frames of size 64 octets.
TX Packets 65-127 Octets	Number of transmitted frames of size 65 through 127 octets.
TX Packets 128-255 Octets	Number of transmitted frames of size 128 through 255 octets.
TX Packets 256-511 Octets	Number of transmitted frames of size 256 through 511 octets.
TX Packets 512-1023 Octets	Number of transmitted frames of size 512 through 1023 octets.

Table 107: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
TX Packets 1024-1518 Octets	Number of transmitted frames of size 1024 through 1518 octets.
TX Packets 1519-2047 Octets	Number of transmitted frames of size 1519 through 2047 octets.
TX Packets 2048-4095 Octets	Number of transmitted frames of size 2048 through 4095 octets.
TX Packets 4096-9216 Octets	Number of transmitted frames of size 4096 through 9216 octets.
TX Packets 9217-16383 Octets	Number of transmitted frames of size 9217 through 16383 octets.
TX Multicast packets	Number of multicast packets sent.
TX Broadcast packets	Number of broadcast packets sent.
TX Single Collision frames	Number of packets sent after one collision.
TX Mult. Collision frames	Number of packets sent after multiple collisions.
TX Late Collision Frames	Number of packets aborted during sending because of collisions after 64 bytes.
TX Excessive collisions	Number of packets not sent because of too many collisions.
TX Collision frames	Number of collision packets sent.
TX PAUSEMAC Ctrl Frames	Number of Media Access Control (MAC) frames containing PAUSE commands sent.
TX MAC ctrl frames	Number of MAC control packets sent.
TX Frame deferred Xmns	Number of frames deferred in *x* milliseconds.

Table 107: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
TX Oversize Packets	Number of oversized packets sent.
TX Jabbers	Total number of frames sent that exceed the maximum byte count and contain CRC errors .
TX FCS Error Counter	Number of packets discarded because of frame check sequence errors.
TX Fragment Counter	Number of fragmented packets sent.
TX Byte Counter	Number of bytes sent.
RX Octets	Number of octets received.
RX Packets 64 Octets	Number of received packets of size 64 octets.
RX Packets 65-127 Octets	Number of received packets of size 65 through 127 octets.
RX Packets 128-255 Octets	Number of received packets of size 128 through 255 octets.
RX Packets 256-511 Octets	Number of received packets of size 256 through 511 octets.
RX Packets 512-1023 Octets	Number of received packets of size 512 through 1023 octets.
RX Packets 1024-1518 Octets	Number of received packets of size 65 through 127 octets.
RX Packets 1519-2047 Octets	Number of received packets of size 1519 through 2047 octets.
RX Packets 2048-4095 Octets	Number of received packets of size 2048 through 4095 octets.
RX Packets 4096-9216 Octets	Number of received packets of size 4096 through 9216 octets.
RX Multicast Packets	Number of multicast packets received.

Table 107: show chassis ethernet-switch interconnect-device fpc Output Fields *(continued)*

Field Name	Field Description
RX Broadcast Packets	Number of broadcast packets received.
RX FCS Errors	Number of packets discarded because of frame check sequence errors.
RX Align Errors	Number of incomplete octets received.
RX Fragments	Number of fragmented packets received.
RX Symbol errors	Number of symbols received that the router did not correctly decode.
RX Unsupported opcodes	Number of packets received with unsupported op codes.
RX Out of Range Length	Number of packets received with an out of range length.
RX False Carrier Errors	Number of packets received with false carrier errors.
RX Undersize Packets	Number of undersized packets received.
RX Oversize Packets	Number of oversized packets received.
RX Jabbers	Total number of frames received that exceed the maximum byte count and contain CRC errors .
RX 1519-1522 Good Vlan frms	Number of transmitted frames of size 1519 through 1522 octets that are good VLAN frames.
RX MTU Exceed Counter	Number of packets received that exceed the MTU.
RX Control Frame Counter	Number of control frames received.
RX Pause Frame Counter	Number of pause frames received.
RX Byte Counter	Number of bytes received.

Sample Output

show chassis ethernet-switch interconnect-device fpc

`user@qfabric>` **show chassis ethernet-switch interconnect-device IC-WS001 fpc**

```
Summary for switch on FC0
Link is good on GE port 2 connected to device: FWD-SWITCH-0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   124638
  RX Octets                   86496

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   82191
  RX Octets                   58979

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   145475
  RX Octets                   206828

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   1
  RX Octets                   0

Summary for switch on FC1
Link is good on GE port 2 connected to device: FWD-SWITCH-0
```

```
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   82290
  RX Octets                   59443

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   40900
  RX Octets                   30013

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   89456
  RX Octets                   123189

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   1
  RX Octets                   0

root@qfabric> show chassis ethernet-switch interconnect-device IC-WS001 fpc
Summary for switch on FC0
Link is good on GE port 2 connected to device: FWD-SWITCH-0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   124697
```

```
  RX Octets                   86535

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   82229
  RX Octets                   59009

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   145544
  RX Octets                   206925

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   1
  RX Octets                   0

Summary for switch on FC1
Link is good on GE port 2 connected to device: FWD-SWITCH-0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   82327
  RX Octets                   59472

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
```

```
  Flow Control RX is Disabled
  TX Octets                    40918
  RX Octets                    30028

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                    89500
  RX Octets                    123244

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                    1
  RX Octets                    0
```

show chassis ethernet-switch interconnect-device fpc detail

`user@host>` **show chassis ethernet-switch interconnect-device IC-WS001 fpc detail**

```
Port statistics for FC0 switch
Statistics for port 2 connected to device FWD-SWITCH-0:
  TX Packets 64 Octets         0
  TX Packets 65-127 Octets     1
  TX Packets 128-255 Octets    121716
  TX Packets 256-511 Octets    2200
  TX Packets 512-1023 Octets   823
  TX Packets 1024-1518 Octets   2
  TX Packets 1519-2047 Octets   0
  TX Packets 2048-4095 Octets   0
  TX Packets 4096-9216 Octets   0
  TX 1519-1522 Good Vlan frms   0
  TX Octets                    124742
  TX Multicast Packets         0
  TX Broadcast Packets         1
  TX Single Collision frames   0
  TX Mult. Collision frames    0
  TX Late Collisions           0
```

```
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
  TX Frame deferred Xmns      0
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             27391588
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   85924
  RX Packets 256-511 Octets   555
  RX Packets 512-1023 Octets  86
  RX Packets 1024-1518 Octets  1
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   86566
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             20380581
Statistics for port 4 connected to device FWD-SWITCH-1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   80374
  TX Packets 256-511 Octets   1347
  TX Packets 512-1023 Octets  532
```

```
TX Packets 1024-1518 Octets  3
TX Packets 1519-2047 Octets  0
TX Packets 2048-4095 Octets  0
TX Packets 4096-9216 Octets  0
TX 1519-1522 Good Vlan frms  0
TX Octets                   82257
TX Multicast Packets        0
TX Broadcast Packets        1
TX Single Collision frames  0
TX Mult. Collision frames   0
TX Late Collisions          0
TX Excessive Collisions     0
TX Collision frames         0
TX PAUSEMAC Ctrl Frames     0
TX MAC ctrl frames          0
TX Frame deferred Xmns      0
TX Frame excessive deferl   0
TX Oversize Packets         0
TX Jabbers                  0
TX FCS Error Counter        0
TX Fragment Counter         0
TX Byte Counter             18146746
RX Packets 64 Octets        0
RX Packets 65-127 Octets    0
RX Packets 128-255 Octets   58410
RX Packets 256-511 Octets   522
RX Packets 512-1023 Octets  96
RX Packets 1024-1518 Octets  2
RX Packets 1519-2047 Octets  0
RX Packets 2048-4095 Octets  0
RX Packets 4096-9216 Octets  0
RX Octets                   59030
RX Multicast Packets        0
RX Broadcast Packets        0
RX FCS Errors               0
RX Align Errors             0
RX Fragments                0
RX Symbol errors            0
RX Unsupported opcodes      0
RX Out of Range Length      0
RX False Carrier Errors     0
RX Undersize Packets        0
RX Oversize Packets         0
RX Jabbers                  0
```

```
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             13882179
Statistics for port 28 connected to device CB0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   144334
  TX Packets 256-511 Octets   1077
  TX Packets 512-1023 Octets  182
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   145596
  TX Multicast Packets        0
  TX Broadcast Packets        0
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             34262760
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    1
  RX Packets 128-255 Octets   202090
  RX Packets 256-511 Octets   3547
  RX Packets 512-1023 Octets  1355
  RX Packets 1024-1518 Octets  5
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   206998
  RX Multicast Packets        0
  RX Broadcast Packets        1
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
```

```
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             45538262
Statistics for port 29 connected to device CB1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  0
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   1
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             72
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   0
  RX Packets 256-511 Octets   0
  RX Packets 512-1023 Octets  0
  RX Packets 1024-1518 Octets  0
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   0
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
```

```
  RX Byte Counter             0

Port statistics for FC1 switch
Statistics for port 2 connected to device FWD-SWITCH-0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   80560
  TX Packets 256-511 Octets   1279
  TX Packets 512-1023 Octets  514
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                   82357
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX Single Collision frames  0
  TX Mult. Collision frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
  TX Frame deferred Xmns      0
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             18059906
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   58733
  RX Packets 256-511 Octets   639
  RX Packets 512-1023 Octets  119
  RX Packets 1024-1518 Octets  3
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   59494
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
```

```
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             13994432
Statistics for port 4 connected to device FWD-SWITCH-1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   39971
  TX Packets 256-511 Octets   668
  TX Packets 512-1023 Octets  290
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                   40933
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX Single Collision frames  0
  TX Mult. Collision frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
  TX Frame deferred Xmns      0
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             9050841
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
```

```
  RX Packets 128-255 Octets   29767
  RX Packets 256-511 Octets   225
  RX Packets 512-1023 Octets  44
  RX Packets 1024-1518 Octets  3
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   30039
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             7043738
Statistics for port 28 connected to device CB0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   88500
  TX Packets 256-511 Octets   864
  TX Packets 512-1023 Octets  163
  TX Packets 1024-1518 Octets  6
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   89533
  TX Multicast Packets        0
  TX Broadcast Packets        0
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             21038170
```

```
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    1
  RX Packets 128-255 Octets   120531
  RX Packets 256-511 Octets   1947
  RX Packets 512-1023 Octets  804
  RX Packets 1024-1518 Octets  6
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   123289
  RX Multicast Packets        0
  RX Broadcast Packets        1
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             27110675
Statistics for port 29 connected to device CB1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  0
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   1
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             72
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
```

```
  RX Packets 128-255 Octets   0
  RX Packets 256-511 Octets   0
  RX Packets 512-1023 Octets  0
  RX Packets 1024-1518 Octets  0
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   0
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             0

Port statistics for FC2 switch
Empty fpc slot number 2

Port statistics for FC3 switch
Empty fpc slot number 3

Port statistics for FC4 switch
Empty fpc slot number 4

Port statistics for FC5 switch
Empty fpc slot number 5

Port statistics for FC6 switch
Empty fpc slot number 6

Port statistics for FC7 switch
Empty fpc slot number 7
```

show chassis ethernet-switch fpc detail slot

`user@qfabric>` **show chassis ethernet-switch fpc detail 0**

```
re0:
--------------------------------------------------------------------------
Port statistics for FC0 switch
Statistics for port 2 connected to device FWD-SWITCH-0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   121823
  TX Packets 256-511 Octets   2200
  TX Packets 512-1023 Octets  823
  TX Packets 1024-1518 Octets  2
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                   124849
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX Single Collision frames  0
  TX Mult. Collision frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
  TX Frame deferred Xmns      0
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             27414524
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   85998
  RX Packets 256-511 Octets   557
  RX Packets 512-1023 Octets  86
  RX Packets 1024-1518 Octets  1
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   86642
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
```

```
    RX Align Errors             0
    RX Fragments                0
    RX Symbol errors            0
    RX Unsupported opcodes      0
    RX Out of Range Length      0
    RX False Carrier Errors     0
    RX Undersize Packets        0
    RX Oversize Packets         0
    RX Jabbers                  0
    RX 1519-1522 Good Vlan frms 0
    RX MTU Exceed Counter       0
    RX Control Frame Counter    0
    RX Pause Frame Counter      0
    RX Byte Counter             20398564
  Statistics for port 4 connected to device FWD-SWITCH-1:
    TX Packets 64 Octets        0
    TX Packets 65-127 Octets    1
    TX Packets 128-255 Octets   80443
    TX Packets 256-511 Octets   1347
    TX Packets 512-1023 Octets  532
    TX Packets 1024-1518 Octets  3
    TX Packets 1519-2047 Octets  0
    TX Packets 2048-4095 Octets  0
    TX Packets 4096-9216 Octets  0
    TX 1519-1522 Good Vlan frms  0
    TX Octets                   82326
    TX Multicast Packets        0
    TX Broadcast Packets        1
    TX Single Collision frames  0
    TX Mult. Collision frames   0
    TX Late Collisions          0
    TX Excessive Collisions     0
    TX Collision frames         0
    TX PAUSEMAC Ctrl Frames     0
    TX MAC ctrl frames          0
    TX Frame deferred Xmns      0
    TX Frame excessive deferl   0
    TX Oversize Packets         0
    TX Jabbers                  0
    TX FCS Error Counter        0
    TX Fragment Counter         0
    TX Byte Counter             18161734
    RX Packets 64 Octets        0
    RX Packets 65-127 Octets    0
```

```
  RX Packets 128-255 Octets   58460
  RX Packets 256-511 Octets   523
  RX Packets 512-1023 Octets  96
  RX Packets 1024-1518 Octets  2
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   59081
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             13894171
Statistics for port 28 connected to device CB0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   144458
  TX Packets 256-511 Octets   1080
  TX Packets 512-1023 Octets  182
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   145723
  TX Multicast Packets        0
  TX Broadcast Packets        0
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             34292735
```

```
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    1
  RX Packets 128-255 Octets   202266
  RX Packets 256-511 Octets   3547
  RX Packets 512-1023 Octets  1355
  RX Packets 1024-1518 Octets  5
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   207174
  RX Multicast Packets        0
  RX Broadcast Packets        1
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             45576186
Statistics for port 29 connected to device CB1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  0
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   1
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             72
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
```

```
  RX Packets 128-255 Octets   0
  RX Packets 256-511 Octets   0
  RX Packets 512-1023 Octets  0
  RX Packets 1024-1518 Octets  0
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   0
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             0

Port statistics for FC1 switch
Statistics for port 2 connected to device FWD-SWITCH-0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   80629
  TX Packets 256-511 Octets   1279
  TX Packets 512-1023 Octets  514
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                   82426
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX Single Collision frames  0
  TX Mult. Collision frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
```

```
  TX Frame deferred Xmns      0
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             18074790
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   58785
  RX Packets 256-511 Octets   640
  RX Packets 512-1023 Octets  119
  RX Packets 1024-1518 Octets  3
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   59547
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             14006842
Statistics for port 4 connected to device FWD-SWITCH-1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   40004
  TX Packets 256-511 Octets   668
  TX Packets 512-1023 Octets  290
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
```

```
TX 1519-1522 Good Vlan frms  0
TX Octets                   40966
TX Multicast Packets        0
TX Broadcast Packets        1
TX Single Collision frames  0
TX Mult. Collision frames   0
TX Late Collisions          0
TX Excessive Collisions     0
TX Collision frames         0
TX PAUSEMAC Ctrl Frames     0
TX MAC ctrl frames          0
TX Frame deferred Xmns      0
TX Frame excessive deferl   0
TX Oversize Packets         0
TX Jabbers                  0
TX FCS Error Counter        0
TX Fragment Counter         0
TX Byte Counter             9058102
RX Packets 64 Octets        0
RX Packets 65-127 Octets    0
RX Packets 128-255 Octets   29794
RX Packets 256-511 Octets   225
RX Packets 512-1023 Octets  44
RX Packets 1024-1518 Octets  3
RX Packets 1519-2047 Octets  0
RX Packets 2048-4095 Octets  0
RX Packets 4096-9216 Octets  0
RX Octets                   30066
RX Multicast Packets        0
RX Broadcast Packets        0
RX FCS Errors               0
RX Align Errors             0
RX Fragments                0
RX Symbol errors            0
RX Unsupported opcodes      0
RX Out of Range Length      0
RX False Carrier Errors     0
RX Undersize Packets        0
RX Oversize Packets         0
RX Jabbers                  0
RX 1519-1522 Good Vlan frms 0
RX MTU Exceed Counter       0
RX Control Frame Counter    0
RX Pause Frame Counter      0
```

```
  RX Byte Counter             7050000
Statistics for port 28 connected to device CB0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   88579
  TX Packets 256-511 Octets   865
  TX Packets 512-1023 Octets  163
  TX Packets 1024-1518 Octets  6
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   89613
  TX Multicast Packets        0
  TX Broadcast Packets        0
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             21056842
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    1
  RX Packets 128-255 Octets   120633
  RX Packets 256-511 Octets   1947
  RX Packets 512-1023 Octets  804
  RX Packets 1024-1518 Octets  6
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   123391
  RX Multicast Packets        0
  RX Broadcast Packets        1
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             27132820
Statistics for port 29 connected to device CB1:
```

```
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  0
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   1
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             72
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   0
  RX Packets 256-511 Octets   0
  RX Packets 512-1023 Octets  0
  RX Packets 1024-1518 Octets  0
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   0
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             0

Port statistics for FC2 switch
Empty fpc slot number 2
```

```
Port statistics for FC3 switch
Empty fpc slot number 3

Port statistics for FC4 switch
Empty fpc slot number 4

Port statistics for FC5 switch
Empty fpc slot number 5

Port statistics for FC6 switch
Empty fpc slot number 6

Port statistics for FC7 switch
Empty fpc slot number 7
```

show chassis ethernet-switch fpc interconnect-device port

`user@qfabric>` **show chassis ethernet-switch fpc interconnect-device IC-WS001 port 2**

```
Summary for switch on FC0
Link is good on GE port 2 connected to device: FWD-SWITCH-0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   319466
  RX Octets                   221869

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   210295
  RX Octets                   151164

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
```

```
  Flow Control RX is Disabled
  TX Octets                   373033
  RX Octets                   529760

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   1
  RX Octets                   0

Summary for switch on FC1
Link is good on GE port 2 connected to device: FWD-SWITCH-0
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   210760
  RX Octets                   152617

Link is good on GE port 4 connected to device: FWD-SWITCH-1
  Speed is 1000Mb
  Duplex is full
  Autonegotiate is Disabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   104587
  RX Octets                   77315

Link is good on XE port 28 connected to device: CB0
  Speed is 10000Mb
  Duplex is full
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                   229932
  RX Octets                   315346

Link is good on XE port 29 connected to device: CB1
  Speed is 10000Mb
  Duplex is full
```

```
  Autonegotiate is Enabled
  Flow Control TX is Disabled
  Flow Control RX is Disabled
  TX Octets                    1
  RX Octets                    0
```

show chassis ethernet-switch fpc interconnect-device detail port

`user@qfabric>` **show chassis ethernet-switch fpc interconnect-device IC-WS001 detail port 2**

```
Port statistics for FC0 switch
Statistics for port 2 connected to device FWD-SWITCH-0:
  TX Packets 64 Octets         0
  TX Packets 65-127 Octets     1
  TX Packets 128-255 Octets    311974
  TX Packets 256-511 Octets    5552
  TX Packets 512-1023 Octets   2084
  TX Packets 1024-1518 Octets  2
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                    319613
  TX Multicast Packets         0
  TX Broadcast Packets         1
  TX Single Collision frames   0
  TX Mult. Collision frames    0
  TX Late Collisions           0
  TX Excessive Collisions      0
  TX Collision frames          0
  TX PAUSEMAC Ctrl Frames      0
  TX MAC ctrl frames           0
  TX Frame deferred Xmns       0
  TX Frame excessive deferl    0
  TX Oversize Packets          0
  TX Jabbers                   0
  TX FCS Error Counter         0
  TX Fragment Counter          0
  TX Byte Counter              70091196
  RX Packets 64 Octets         0
  RX Packets 65-127 Octets     0
  RX Packets 128-255 Octets    220284
  RX Packets 256-511 Octets    1486
  RX Packets 512-1023 Octets   198
```

```
  RX Packets 1024-1518 Octets  1
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   221969
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             52192002
Statistics for port 4 connected to device FWD-SWITCH-1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   205595
  TX Packets 256-511 Octets   3426
  TX Packets 512-1023 Octets  1366
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX 1519-1522 Good Vlan frms  0
  TX Octets                   210391
  TX Multicast Packets        0
  TX Broadcast Packets        1
  TX Single Collision frames  0
  TX Mult. Collision frames   0
  TX Late Collisions          0
  TX Excessive Collisions     0
  TX Collision frames         0
  TX PAUSEMAC Ctrl Frames     0
  TX MAC ctrl frames          0
  TX Frame deferred Xmns      0
```

```
  TX Frame excessive deferl   0
  TX Oversize Packets         0
  TX Jabbers                  0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             46380018
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    0
  RX Packets 128-255 Octets   149866
  RX Packets 256-511 Octets   1194
  RX Packets 512-1023 Octets  173
  RX Packets 1024-1518 Octets  2
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Octets                   151235
  RX Multicast Packets        0
  RX Broadcast Packets        0
  RX FCS Errors               0
  RX Align Errors             0
  RX Fragments                0
  RX Symbol errors            0
  RX Unsupported opcodes      0
  RX Out of Range Length      0
  RX False Carrier Errors     0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX 1519-1522 Good Vlan frms 0
  RX MTU Exceed Counter       0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             35496911
Statistics for port 28 connected to device CB0:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    0
  TX Packets 128-255 Octets   370150
  TX Packets 256-511 Octets   2680
  TX Packets 512-1023 Octets  371
  TX Packets 1024-1518 Octets  3
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
```

```
  TX Octets                   373204
  TX Multicast Packets        0
  TX Broadcast Packets        0
  TX PAUSEMAC Ctrl Frames     0
  TX Oversize Packets         0
  TX FCS Error Counter        0
  TX Fragment Counter         0
  TX Byte Counter             87688913
  RX Packets 64 Octets        0
  RX Packets 65-127 Octets    1
  RX Packets 128-255 Octets   517569
  RX Packets 256-511 Octets   8978
  RX Packets 512-1023 Octets  3450
  RX Packets 1024-1518 Octets  5
  RX Packets 1519-2047 Octets  0
  RX Packets 2048-4095 Octets  0
  RX Packets 4096-9216 Octets  0
  RX Packets 9217-16383 Octets  0
  RX Octets                   530003
  RX Multicast Packets        0
  RX Broadcast Packets        1
  RX FCS Errors               0
  RX Fragments                0
  RX MAC Control Packets      0
  RX Out of Range Length      0
  RX Undersize Packets        0
  RX Oversize Packets         0
  RX Jabbers                  0
  RX Control Frame Counter    0
  RX Pause Frame Counter      0
  RX Byte Counter             116471142
Statistics for port 29 connected to device CB1:
  TX Packets 64 Octets        0
  TX Packets 65-127 Octets    1
  TX Packets 128-255 Octets   0
  TX Packets 256-511 Octets   0
  TX Packets 512-1023 Octets  0
  TX Packets 1024-1518 Octets  0
  TX Packets 1519-2047 Octets  0
  TX Packets 2048-4095 Octets  0
  TX Packets 4096-9216 Octets  0
  TX Packets 9217-16383 Octets  0
  TX Octets                   1
  TX Multicast Packets        0
```

```
TX Broadcast Packets        1
TX PAUSEMAC Ctrl Frames     0
TX Oversize Packets         0
TX FCS Error Counter        0
TX Fragment Counter         0
TX Byte Counter             72
RX Packets 64 Octets        0
RX Packets 65-127 Octets    0
RX Packets 128-255 Octets   0
RX Packets 256-511 Octets   0
RX Packets 512-1023 Octets  0
RX Packets 1024-1518 Octets  0
RX Packets 1519-2047 Octets  0
RX Packets 2048-4095 Octets  0
RX Packets 4096-9216 Octets  0
RX Packets 9217-16383 Octets  0
RX Octets                   0
RX Multicast Packets        0
RX Broadcast Packets        0
RX FCS Errors               0
RX Fragments                0
RX MAC Control Packets      0
RX Out of Range Length      0
RX Undersize Packets        0
RX Oversize Packets         0
RX Jabbers                  0
RX Control Frame Counter    0
RX Pause Frame Counter      0
RX Byte Counter             0
```

show chassis fabric connectivity

Syntax

```
show chassis fabric connectivity (device | slot)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the status of the data plane connections in your QFabric system.

Options

none—Display the status of all data plane connections in your QFabric system.

device—Display the status of the data plane connections for a specific device.

slot—Display the status of the data plane connections for a specific Flexible PIC Concentrator (FPC) slot on a specific device.

Required Privilege Level

admin

RELATED DOCUMENTATION

request chassis fabric fpc | 662
show chassis fabric device | 817
Understanding Interconnect Devices | 27

List of Sample Output

show chassis fabric connectivity on page 809
show chassis fabric connectivity device on page 813
show chassis fabric connectivity device device-name slot on page 815

Output Fields

Table 108 on page 808 lists the output fields for the **show chassis fabric connectivity** command. Output fields are listed in the approximate order in which they appear.

Table 108: show chassis fabric connectivity Output Fields

Field Name	Field Description
Device ID	Hardware serial identifier of the QFabric system component.

Table 108: show chassis fabric connectivity Output Fields *(continued)*

Field Name	Field Description
Type	Model number of the QFabric system component. Values include **qfxc08-3008** (QFX3008-I Interconnect device), **qfx3600-I** (QFX3600-I Interconnect device), and supported Node device names such as **qfx3500** (QFX3500 Node device) and **qfx3600-16q** (QFX3600 Node device).
Fabric: Incoming links	Displays inbound data plane (fte-) connections between Node devices and Interconnect devices, and their status (such as **Ok**).
Fabric: Outgoing links	Displays outbound data plane (fte-) connections between Node devices and Interconnect devices, and their status (such as **Ok**).

Sample Output

show chassis fabric connectivity

`user@qfabric>` **show chassis fabric connectivity**

```
Device ID: ED1487, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/1                    -> ED1487:fte-0/1/2                   Ok
  A0010:fte-3/0/1                    -> ED1487:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED1487:fte-0/1/2                   -> A0010:fte-0/0/1                    Ok
  ED1487:fte-0/1/3                   -> A0010:fte-3/0/1                    Ok
Device ID: ED3683, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/2                    -> ED3683:fte-0/1/2                   Ok
  A0010:fte-3/0/2                    -> ED3683:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED3683:fte-0/1/2                   -> A0010:fte-0/0/2                    Ok
  ED3683:fte-0/1/3                   -> A0010:fte-3/0/2                    Ok
Device ID: ED3705, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/0                    -> ED3705:fte-0/1/2                   Ok
  A0010:fte-3/0/0                    -> ED3705:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED3705:fte-0/1/2                   -> A0010:fte-0/0/0                    Ok
  ED3705:fte-0/1/3                   -> A0010:fte-3/0/0                    Ok
Device ID: ED3707, Type: qfx3500
  Fabric: Incoming links:
```

```
  A0010:fte-0/0/8                  -> ED3707:fte-0/1/2                   Ok
  A0010:fte-3/0/8                  -> ED3707:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED3707:fte-0/1/2                 -> A0010:fte-0/0/8                    Ok
  ED3707:fte-0/1/3                 -> A0010:fte-3/0/8                    Ok
Device ID: ED3711, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/9                  -> ED3711:fte-0/1/2                   Ok
  A0010:fte-3/0/9                  -> ED3711:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED3711:fte-0/1/2                 -> A0010:fte-0/0/9                    Ok
  ED3711:fte-0/1/3                 -> A0010:fte-3/0/9                    Ok
Device ID: ED3702, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/10                 -> ED3702:fte-0/1/2                   Ok
  A0010:fte-3/0/10                 -> ED3702:fte-0/1/3                   Ok
  Fabric: Outgoing links:
  ED3702:fte-0/1/2                 -> A0010:fte-0/0/10                   Ok
  ED3702:fte-0/1/3                 -> A0010:fte-3/0/10                   Ok
Device ID: BBAK8737, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/11                 -> BBAK8737:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8737:fte-0/1/1               -> A0010:fte-0/0/11                   Ok
Device ID: BBAK8777, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/5                  -> BBAK8777:fte-0/1/0                 Ok
  A0010:fte-0/0/6                  -> BBAK8777:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8777:fte-0/1/0               -> A0010:fte-0/0/5                    Ok
  BBAK8777:fte-0/1/1               -> A0010:fte-0/0/6                    Ok
Device ID: BBAK8866, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/3                  -> BBAK8866:fte-0/1/0                 Ok
  A0010:fte-0/0/4                  -> BBAK8866:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8866:fte-0/1/0               -> A0010:fte-0/0/3                    Ok
  BBAK8866:fte-0/1/1               -> A0010:fte-0/0/4                    Ok
Device ID: BBAK8810, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/5                  -> BBAK8810:fte-0/1/0                 Ok
  A0010:fte-3/0/6                  -> BBAK8810:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8810:fte-0/1/0               -> A0010:fte-3/0/5                    Ok
```

```
  BBAK8810:fte-0/1/1                -> A0010:fte-3/0/6                    Ok
Device ID: BBAK8854, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/3                   -> BBAK8854:fte-0/1/0                 Ok
  A0010:fte-3/0/4                   -> BBAK8854:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8854:fte-0/1/0                -> A0010:fte-3/0/3                    Ok
  BBAK8854:fte-0/1/1                -> A0010:fte-3/0/4                    Ok
Device ID: BBAK8885, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/14                  -> BBAK8885:fte-0/1/0                 Ok
  A0010:fte-0/0/15                  -> BBAK8885:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8885:fte-0/1/0                -> A0010:fte-0/0/14                   Ok
  BBAK8885:fte-0/1/1                -> A0010:fte-0/0/15                   Ok
Device ID: BBAK8864, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/7                   -> BBAK8864:fte-0/1/0                 Ok
  A0010:fte-3/0/11                  -> BBAK8864:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8864:fte-0/1/0                -> A0010:fte-3/0/7                    Ok
  BBAK8864:fte-0/1/1                -> A0010:fte-3/0/11                   Ok
Device ID: BBAK8759, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/12                  -> BBAK8759:fte-0/1/0                 Ok
  A0010:fte-3/0/13                  -> BBAK8759:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8759:fte-0/1/0                -> A0010:fte-3/0/12                   Ok
  BBAK8759:fte-0/1/1                -> A0010:fte-3/0/13                   Ok
Device ID: BBAK8704, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-0/0/12                  -> BBAK8704:fte-0/1/0                 Ok
  A0010:fte-0/0/13                  -> BBAK8704:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8704:fte-0/1/0                -> A0010:fte-0/0/12                   Ok
  BBAK8704:fte-0/1/1                -> A0010:fte-0/0/13                   Ok
Device ID: BBAK8714, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/14                  -> BBAK8714:fte-0/1/0                 Ok
  A0010:fte-3/0/15                  -> BBAK8714:fte-0/1/1                 Ok
  Fabric: Outgoing links:
  BBAK8714:fte-0/1/0                -> A0010:fte-3/0/14                   Ok
  BBAK8714:fte-0/1/1                -> A0010:fte-3/0/15                   Ok
Device ID: A0010, Type: qfxc08-3008
```

```
Front  Card 0   : Incoming links:
ED3705:fte-0/1/2                  -> A0010:fte-0/0/0                   Ok
ED1487:fte-0/1/2                  -> A0010:fte-0/0/1                   Ok
ED3683:fte-0/1/2                  -> A0010:fte-0/0/2                   Ok
BBAK8866:fte-0/1/0                -> A0010:fte-0/0/3                   Ok
BBAK8866:fte-0/1/1                -> A0010:fte-0/0/4                   Ok
BBAK8777:fte-0/1/0                -> A0010:fte-0/0/5                   Ok
BBAK8777:fte-0/1/1                -> A0010:fte-0/0/6                   Ok
ED3707:fte-0/1/2                  -> A0010:fte-0/0/8                   Ok
ED3711:fte-0/1/2                  -> A0010:fte-0/0/9                   Ok
ED3702:fte-0/1/2                  -> A0010:fte-0/0/10                  Ok
BBAK8737:fte-0/1/1                -> A0010:fte-0/0/11                  Ok
BBAK8704:fte-0/1/0                -> A0010:fte-0/0/12                  Ok
BBAK8704:fte-0/1/1                -> A0010:fte-0/0/13                  Ok
BBAK8885:fte-0/1/0                -> A0010:fte-0/0/14                  Ok
BBAK8885:fte-0/1/1                -> A0010:fte-0/0/15                  Ok
Front  Card 0   : Outgoing links:
A0010:fte-0/0/8                   -> ED3707:fte-0/1/2                  Ok
A0010:fte-0/0/9                   -> ED3711:fte-0/1/2                  Ok
A0010:fte-0/0/10                  -> ED3702:fte-0/1/2                  Ok
A0010:fte-0/0/11                  -> BBAK8737:fte-0/1/1                Ok
A0010:fte-0/0/12                  -> BBAK8704:fte-0/1/0                Ok
A0010:fte-0/0/13                  -> BBAK8704:fte-0/1/1                Ok
A0010:fte-0/0/14                  -> BBAK8885:fte-0/1/0                Ok
A0010:fte-0/0/15                  -> BBAK8885:fte-0/1/1                Ok
A0010:fte-0/0/0                   -> ED3705:fte-0/1/2                  Ok
A0010:fte-0/0/1                   -> ED1487:fte-0/1/2                  Ok
A0010:fte-0/0/2                   -> ED3683:fte-0/1/2                  Ok
A0010:fte-0/0/3                   -> BBAK8866:fte-0/1/0                Ok
A0010:fte-0/0/4                   -> BBAK8866:fte-0/1/1                Ok
A0010:fte-0/0/5                   -> BBAK8777:fte-0/1/0                Ok
A0010:fte-0/0/6                   -> BBAK8777:fte-0/1/1                Ok
Front  Card 3   : Incoming links:
ED3705:fte-0/1/3                  -> A0010:fte-3/0/0                   Ok
ED1487:fte-0/1/3                  -> A0010:fte-3/0/1                   Ok
ED3683:fte-0/1/3                  -> A0010:fte-3/0/2                   Ok
BBAK8854:fte-0/1/0                -> A0010:fte-3/0/3                   Ok
BBAK8854:fte-0/1/1                -> A0010:fte-3/0/4                   Ok
BBAK8810:fte-0/1/0                -> A0010:fte-3/0/5                   Ok
BBAK8810:fte-0/1/1                -> A0010:fte-3/0/6                   Ok
BBAK8864:fte-0/1/0                -> A0010:fte-3/0/7                   Ok
ED3707:fte-0/1/3                  -> A0010:fte-3/0/8                   Ok
ED3711:fte-0/1/3                  -> A0010:fte-3/0/9                   Ok
ED3702:fte-0/1/3                  -> A0010:fte-3/0/10                  Ok
```

```
  BBAK8864:fte-0/1/1                -> A0010:fte-3/0/11                  Ok
  BBAK8759:fte-0/1/0                -> A0010:fte-3/0/12                  Ok
  BBAK8759:fte-0/1/1                -> A0010:fte-3/0/13                  Ok
  BBAK8714:fte-0/1/0                -> A0010:fte-3/0/14                  Ok
  BBAK8714:fte-0/1/1                -> A0010:fte-3/0/15                  Ok
  Front  Card 3   : Outgoing links:
  A0010:fte-3/0/8                   -> ED3707:fte-0/1/3                  Ok
  A0010:fte-3/0/9                   -> ED3711:fte-0/1/3                  Ok
  A0010:fte-3/0/10                  -> ED3702:fte-0/1/3                  Ok
  A0010:fte-3/0/11                  -> BBAK8864:fte-0/1/1                Ok
  A0010:fte-3/0/12                  -> BBAK8759:fte-0/1/0                Ok
  A0010:fte-3/0/13                  -> BBAK8759:fte-0/1/1                Ok
  A0010:fte-3/0/14                  -> BBAK8714:fte-0/1/0                Ok
  A0010:fte-3/0/15                  -> BBAK8714:fte-0/1/1                Ok
  A0010:fte-3/0/0                   -> ED3705:fte-0/1/3                  Ok
  A0010:fte-3/0/1                   -> ED1487:fte-0/1/3                  Ok
  A0010:fte-3/0/2                   -> ED3683:fte-0/1/3                  Ok
  A0010:fte-3/0/3                   -> BBAK8854:fte-0/1/0                Ok
  A0010:fte-3/0/4                   -> BBAK8854:fte-0/1/1                Ok
  A0010:fte-3/0/5                   -> BBAK8810:fte-0/1/0                Ok
  A0010:fte-3/0/6                   -> BBAK8810:fte-0/1/1                Ok
  A0010:fte-3/0/7                   -> BBAK8864:fte-0/1/0                Ok
```

show chassis fabric connectivity device

`user@qfabric>` **show chassis fabric connectivity device BBAK8714**

```
Device ID: BBAK8714, Type: qfx3500
  Fabric: Incoming links:
  A0010:fte-3/0/14                  -> BBAK8714:fte-0/1/0                Ok
  A0010:fte-3/0/15                  -> BBAK8714:fte-0/1/1                Ok
  Fabric: Outgoing links:
  BBAK8714:fte-0/1/0                -> A0010:fte-3/0/14                  Ok
  BBAK8714:fte-0/1/1                -> A0010:fte-3/0/15                  Ok
```

`user@qfabric>` **show chassis fabric connectivity device A0010**

```
Device ID: A0010, Type: qfxc08-3008
  Front  Card 0   : Incoming links:
  ED3705:fte-0/1/2                  -> A0010:fte-0/0/0                   Ok
  ED1487:fte-0/1/2                  -> A0010:fte-0/0/1                   Ok
  ED3683:fte-0/1/2                  -> A0010:fte-0/0/2                   Ok
```

```
BBAK8866:fte-0/1/0              -> A0010:fte-0/0/3                 Ok
BBAK8866:fte-0/1/1              -> A0010:fte-0/0/4                 Ok
BBAK8777:fte-0/1/0              -> A0010:fte-0/0/5                 Ok
BBAK8777:fte-0/1/1              -> A0010:fte-0/0/6                 Ok
ED3707:fte-0/1/2                -> A0010:fte-0/0/8                 Ok
ED3711:fte-0/1/2                -> A0010:fte-0/0/9                 Ok
ED3702:fte-0/1/2                -> A0010:fte-0/0/10                Ok
BBAK8737:fte-0/1/1              -> A0010:fte-0/0/11                Ok
BBAK8704:fte-0/1/0              -> A0010:fte-0/0/12                Ok
BBAK8704:fte-0/1/1              -> A0010:fte-0/0/13                Ok
BBAK8885:fte-0/1/0              -> A0010:fte-0/0/14                Ok
BBAK8885:fte-0/1/1              -> A0010:fte-0/0/15                Ok
Front  Card 0   : Outgoing links:
A0010:fte-0/0/8                 -> ED3707:fte-0/1/2                Ok
A0010:fte-0/0/9                 -> ED3711:fte-0/1/2                Ok
A0010:fte-0/0/10                -> ED3702:fte-0/1/2                Ok
A0010:fte-0/0/11                -> BBAK8737:fte-0/1/1              Ok
A0010:fte-0/0/12                -> BBAK8704:fte-0/1/0              Ok
A0010:fte-0/0/13                -> BBAK8704:fte-0/1/1              Ok
A0010:fte-0/0/14                -> BBAK8885:fte-0/1/0              Ok
A0010:fte-0/0/15                -> BBAK8885:fte-0/1/1              Ok
A0010:fte-0/0/0                 -> ED3705:fte-0/1/2                Ok
A0010:fte-0/0/1                 -> ED1487:fte-0/1/2                Ok
A0010:fte-0/0/2                 -> ED3683:fte-0/1/2                Ok
A0010:fte-0/0/3                 -> BBAK8866:fte-0/1/0              Ok
A0010:fte-0/0/4                 -> BBAK8866:fte-0/1/1              Ok
A0010:fte-0/0/5                 -> BBAK8777:fte-0/1/0              Ok
A0010:fte-0/0/6                 -> BBAK8777:fte-0/1/1              Ok
Front  Card 3   : Incoming links:
ED3705:fte-0/1/3                -> A0010:fte-3/0/0                 Ok
ED1487:fte-0/1/3                -> A0010:fte-3/0/1                 Ok
ED3683:fte-0/1/3                -> A0010:fte-3/0/2                 Ok
BBAK8854:fte-0/1/0              -> A0010:fte-3/0/3                 Ok
BBAK8854:fte-0/1/1              -> A0010:fte-3/0/4                 Ok
BBAK8810:fte-0/1/0              -> A0010:fte-3/0/5                 Ok
BBAK8810:fte-0/1/1              -> A0010:fte-3/0/6                 Ok
BBAK8864:fte-0/1/0              -> A0010:fte-3/0/7                 Ok
ED3707:fte-0/1/3                -> A0010:fte-3/0/8                 Ok
ED3711:fte-0/1/3                -> A0010:fte-3/0/9                 Ok
ED3702:fte-0/1/3                -> A0010:fte-3/0/10                Ok
BBAK8864:fte-0/1/1              -> A0010:fte-3/0/11                Ok
BBAK8759:fte-0/1/0              -> A0010:fte-3/0/12                Ok
BBAK8759:fte-0/1/1              -> A0010:fte-3/0/13                Ok
BBAK8714:fte-0/1/0              -> A0010:fte-3/0/14                Ok
```

```
  BBAK8714:fte-0/1/1                -> A0010:fte-3/0/15                  Ok
  Front  Card 3   : Outgoing links:
  A0010:fte-3/0/8                   -> ED3707:fte-0/1/3                  Ok
  A0010:fte-3/0/9                   -> ED3711:fte-0/1/3                  Ok
  A0010:fte-3/0/10                  -> ED3702:fte-0/1/3                  Ok
  A0010:fte-3/0/11                  -> BBAK8864:fte-0/1/1                Ok
  A0010:fte-3/0/12                  -> BBAK8759:fte-0/1/0                Ok
  A0010:fte-3/0/13                  -> BBAK8759:fte-0/1/1                Ok
  A0010:fte-3/0/14                  -> BBAK8714:fte-0/1/0                Ok
  A0010:fte-3/0/15                  -> BBAK8714:fte-0/1/1                Ok
  A0010:fte-3/0/0                   -> ED3705:fte-0/1/3                  Ok
  A0010:fte-3/0/1                   -> ED1487:fte-0/1/3                  Ok
  A0010:fte-3/0/2                   -> ED3683:fte-0/1/3                  Ok
  A0010:fte-3/0/3                   -> BBAK8854:fte-0/1/0                Ok
  A0010:fte-3/0/4                   -> BBAK8854:fte-0/1/1                Ok
  A0010:fte-3/0/5                   -> BBAK8810:fte-0/1/0                Ok
  A0010:fte-3/0/6                   -> BBAK8810:fte-0/1/1                Ok
  A0010:fte-3/0/7                   -> BBAK8864:fte-0/1/0                Ok
  Ok
  A0010:fte-3/0/3                   -> BBAK8854:fte-0/1/0                Ok
  A0010:fte-3/0/4                   -> BBAK8854:fte-0/1/1                Ok
  A0010:fte-3/0/5                   -> BBAK8810:fte-0/1/0                Ok
  A0010:fte-3/0/6                   -> BBAK8810:fte-0/1/1                Ok
  A0010:fte-3/0/7                   -> BBAK8864:fte-0/1/0                Ok
```

show chassis fabric connectivity device device-name slot

`user@qfabric>` **show chassis fabric connectivity device A0010 slot 3**

```
Device ID: A0010, Type: qfxc08-3008
  Front  Card 3   : Incoming links:
  ED3705:fte-0/1/3                  -> A0010:fte-3/0/0                   Ok
  ED1487:fte-0/1/3                  -> A0010:fte-3/0/1                   Ok
  ED3683:fte-0/1/3                  -> A0010:fte-3/0/2                   Ok
  BBAK8854:fte-0/1/0                -> A0010:fte-3/0/3                   Ok
  BBAK8854:fte-0/1/1                -> A0010:fte-3/0/4                   Ok
  BBAK8810:fte-0/1/0                -> A0010:fte-3/0/5                   Ok
  BBAK8810:fte-0/1/1                -> A0010:fte-3/0/6                   Ok
  BBAK8864:fte-0/1/0                -> A0010:fte-3/0/7                   Ok
  ED3707:fte-0/1/3                  -> A0010:fte-3/0/8                   Ok
  ED3711:fte-0/1/3                  -> A0010:fte-3/0/9                   Ok
  ED3702:fte-0/1/3                  -> A0010:fte-3/0/10                  Ok
  BBAK8864:fte-0/1/1                -> A0010:fte-3/0/11                  Ok
  BBAK8759:fte-0/1/0                -> A0010:fte-3/0/12                  Ok
```

```
BBAK8759:fte-0/1/1                -> A0010:fte-3/0/13                  Ok
BBAK8714:fte-0/1/0                -> A0010:fte-3/0/14                  Ok
BBAK8714:fte-0/1/1                -> A0010:fte-3/0/15                  Ok
Front  Card 3   : Outgoing links:
A0010:fte-3/0/8                   -> ED3707:fte-0/1/3                  Ok
A0010:fte-3/0/9                   -> ED3711:fte-0/1/3                  Ok
A0010:fte-3/0/10                  -> ED3702:fte-0/1/3                  Ok
A0010:fte-3/0/11                  -> BBAK8864:fte-0/1/1                Ok
A0010:fte-3/0/12                  -> BBAK8759:fte-0/1/0                Ok
A0010:fte-3/0/13                  -> BBAK8759:fte-0/1/1                Ok
A0010:fte-3/0/14                  -> BBAK8714:fte-0/1/0                Ok
A0010:fte-3/0/15                  -> BBAK8714:fte-0/1/1                Ok
A0010:fte-3/0/0                   -> ED3705:fte-0/1/3                  Ok
A0010:fte-3/0/1                   -> ED1487:fte-0/1/3                  Ok
A0010:fte-3/0/2                   -> ED3683:fte-0/1/3                  Ok
A0010:fte-3/0/3                   -> BBAK8854:fte-0/1/0                Ok
A0010:fte-3/0/4                   -> BBAK8854:fte-0/1/1                Ok
A0010:fte-3/0/5                   -> BBAK8810:fte-0/1/0                Ok
A0010:fte-3/0/6                   -> BBAK8810:fte-0/1/1                Ok
A0010:fte-3/0/7                   -> BBAK8864:fte-0/1/0                Ok
```

show chassis fabric device

Syntax

```
show chassis fabric device device-name
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the fabric management status of devices in your QFabric system.

Options

none—Display the fabric management status for all devices in your QFabric system.

device-name—Display the fabric management status for a specific device in your QFabric system. You can enter either the alias name or the serial number of the device.

Required Privilege Level

admin

RELATED DOCUMENTATION

request chassis fabric fpc | 662
show chassis fabric connectivity | 808
show fabric administration inventory | 839
Understanding Interconnect Devices | 27

List of Sample Output

show chassis fabric device on page 818

Output Fields

Table 109 on page 817 lists the output fields for the **show chassis fabric device** command. Output fields are listed in the approximate order in which they appear.

Table 109: show chassis fabric device Output Fields

Field Name	Field Description
Device ID	Hardware serial identifier of the QFabric system component.

Table 109: show chassis fabric device Output Fields *(continued)*

Field Name	Field Description
Type	Model number of the QFabric system component. Values include **qfxc08-3008** (QFX3008-I Interconnect device), **qfx3600-I** (QFX3600-I Interconnect device), and supported Node device names such as **qfx3500** (QFX3500 Node device) and **qfx3600-16q** (QFX3600 Node device).
Management status	Displays keepalive status for fabric management processes on a specific device. Values include **On** and **Off**.
Hardware status	Displays operational status of the device participating in fabric management (such as **Ok**).

Sample Output

show chassis fabric device

`user@qfabric>` **show chassis fabric device**

```
Device ID: node2, Type: qfx3500
Management status: On, Hardware status: Ok

Device ID: node3, Type: qfx3500
Management status: On, Hardware status: Ok

Device ID: node0, Type: qfx3500
Management status: On, Hardware status: Ok

Device ID: node1, Type: qfx3500
Management status: On, Hardware status: Ok
```

show chassis lcd

List of Syntax

show chassis lcd (EX Series) on page 819
show chassis lcd (QFX Series) on page 819
show chassis lcd (OCX Series) on page 819

show chassis lcd (EX Series)

```
show chassis lcd
<fpc-slot fpc-slot-number>
<menu <(all-members | local | member member-id)>>
```

show chassis lcd (QFX Series)

```
show chassis lcd
<fpc-slot fpc-slot-number>
<interconnect-device device-id>
<node-device device-id>
```

show chassis lcd (OCX Series)

```
show chassis lcd
<fpc-slot fpc-slot-number>
```

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.
menu option introduced in Junos OS Release 10.2 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Command introduced in Junos OS Release 13.1 for QFabric systems.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Display the information that appears on the LCD panel of EX3200, EX3300, EX4200, EX4500, EX6200, and EX8200 switches, XRE200 External Routing Engines, QFX Series standalone switches, OCX Series switches, and Interconnect devices and Node devices within a QFabric system. Display the status of the currently selected port parameter of the Status LED for each network port on the device.

Options

none—Display the information that appears on the LCD panel (for any EX Series member switch in a Virtual Chassis or for XRE200 External Routing Engines, display the information for all Virtual Chassis members). Display the status of the currently selected port parameter of the Status LED for each network port.

fpc-slot <*fpc-slot-number*>—(Optional) Display the information as follows:

- (EX3200, EX3300, EX4200, and EX4500 switches, QFX Series, or OCX Series) Display the information that appears on the LCD panel for either an FPC slot with no ***fpc-slot-number*** value specified or for the FPC slot specified by **fpc-slot 0**. **fpc-slot** refers to the switch itself and **0** is the only valid value for ***fpc-slot-number***. Output for these options is the same as for the **none** option.

  Also display the status of the currently selected port parameter of the Status LED for each network port.

- (EX Series Virtual Chassis member switches or XRE200 External Routing Engines) If no ***fpc-slot-number*** value is specified, display the information that appears on the LCD panel for all members of the Virtual Chassis. Output for this option is the same as for the **none** option. If the ***fpc-slot-number*** value is specified (it equals the ***member-id*** value), display the information for the specified member.

  Also display the status of the currently selected port parameter of the Status LED for each network port.

- (EX6200 or EX8200 switches)—Display the information that appears on the LCD panel for the line card in the line-card slot specified by the ***fpc-slot-number*** value.

  Also display the status of the currently selected port parameter of the Status LED for each network port.

interconnect-device *device-id*—(QFabric systems only) (Optional) Display the front panel contents and LED status of all the ports on the Interconnect device.

menu—(Optional) Display the names of the menus and menu options that are currently enabled on the LCD panel.

menu all-members—(EX Series Virtual Chassis member switches or XRE200 External Routing Engines) (Optional) Display the names of the menus and menu options that are currently enabled on the LCD panel for all Virtual Chassis members.

menu local—(EX Series Virtual Chassis member switches or XRE200 External Routing Engines) (Optional) Display the names of the menus and menu options that are currently enabled on the LCD panel for the Virtual Chassis member from which you issued the command.

menu member *member-id*—(EX Series Virtual Chassis member switches or XRE200 External Routing Engines) (Optional) Display the names of the menus and menu options that are currently enabled on the LCD panel for the specified Virtual Chassis member.

node-device *device-id*—(QFabric systems only) (Optional) Display the front panel contents and LED status of all the ports on the Node device.

Required Privilege Level

view

RELATED DOCUMENTATION

LCD Panel in EX3200 Switches

LCD Panel in EX4200 Switches

LCD Panel in EX4500 Switches

LCD Panel in an EX8200 Switch

LCD Panel in an XRE200 External Routing Engine

Configuring the LCD Panel on EX Series Switches (CLI Procedure)

set chassis display message | 708

List of Sample Output

Output Fields

Table 110 on page 821 lists the output fields for the **show chassis lcd** command. Output fields are listed in the approximate order in which they appear.

Table 110: show chassis lcd Output Fields

Field Name	Field Description
member*number* (XRE200 External Routing Engine)	Member ID of the device whose content is being displayed.
Front panel contents for slot **Front panel contents** (EX6200, EX8200 switch, XRE200 External Routing Engine, and QFX Series)	FPC slot number of the switch whose content is being displayed. The number is always **0**, except for EX4200 switches in a Virtual Chassis, where it is the member ID value. On EX6200 switches, EX8200 switches, and XRE200 External Routing Engines, no slot number is displayed. On XRE200 External Routing Engines, this field appears under the **member *number*** field for each member device in the EX8200 Virtual Chassis.

Table 110: show chassis lcd Output Fields *(continued)*

Field Name	Field Description
LCD screen	The first line displays the hostname (for Virtual Chassis members, displays the member ID, the current role, and hostname; for EX8200 switches, displays **RE** and the hostname). The second line displays the currently selected port parameter of the Status LED and the alarms counter. The Status LED port parameters are: • **ADM**—Administrative • **SPD**—Speed • **DPX**—Duplex • **POE**—Power over Ethernet (EX3200 and EX4200 switches only)
LEDs status	Current state of the Alarms, System, and Master LEDs (chassis status LEDs).
Interface	Names of the interfaces on the switch.
LED (ADM/SPD/DPX/POE)	State of the currently selected port parameter of the Status LED for the interface. The Status LED port parameters are: NOTE: The XRE200 External Routing Engine always displays the **NA** parameter. The QFX Series products do not have any of the port parameters listed below. • **ADM**—Administrative • **SPD**—Speed • **DPX**—Duplex • **NA**—Not applicable. • **POE**—Power over Ethernet
fpcx	On standalone EX Series and QFX Series switches, always **0**. On EX Series Virtual Chassis member switches, member ID of the Virtual Chassis member whose LCD menu is displayed.

Sample Output

show chassis lcd (Two-Member EX4200 Virtual Chassis)

`user@switch>` **show chassis lcd**

```
Front panel contents for slot: 0
---------------------------------
LCD screen:
    00:BK switch1
```

```
    LED:SPD ALARM 00
LEDs status:
    Alarms LED: Off
    System LED: Green
    Master LED: Off
Interface       LED(ADM/SPD/DPX/POE)
-------------------------------------
ge-0/0/0        Off
ge-0/0/1        Off
ge-0/0/2        Off
ge-0/0/3        Off
ge-0/0/4        Off
ge-0/0/5        Off
ge-0/0/6        Off
ge-0/0/7        Off
ge-0/0/8        Off
ge-0/0/9        Off
ge-0/0/10       Off
ge-0/0/11       Off
ge-0/0/12       Off
ge-0/0/13       Off
ge-0/0/14       Off
ge-0/0/15       Off
ge-0/0/16       Off
ge-0/0/17       Off
ge-0/0/18       Off
ge-0/0/19       Off
ge-0/0/20       Off
ge-0/0/21       Off
ge-0/0/22       Off
ge-0/0/23       Off
Front panel contents for slot: 1
---------------------------------
LCD screen:
    01:RE switch2
    LED:SPD ALARM 01
LEDs status:
    Alarms LED: Yellow
    System LED: Green
    Master LED: Green
Interface       LED(ADM/SPD/DPX/POE)
-------------------------------------
ge-1/0/0        Off
ge-1/0/1        Off
```

```
ge-1/0/2        Off
ge-1/0/3        Off
ge-1/0/4        Off
ge-1/0/5        Off
ge-1/0/6        Off
ge-1/0/7        Off
ge-1/0/8        Off
ge-1/0/9        Off
ge-1/0/10       Off
ge-1/0/11       Off
ge-1/0/12       Off
ge-1/0/13       Off
ge-1/0/14       Off
ge-1/0/15       Off
ge-1/0/16       Off
ge-1/0/17       Off
ge-1/0/18       Off
ge-1/0/19       Off
ge-1/0/20       Off
ge-1/0/21       Off
ge-1/0/22       Off
ge-1/0/23       Off
```

The output for the **show chassis lcd fpc-slot** command is the same as the output for the **show chassis lcd** command.

show chassis lcd fpc-slot 1 (EX4200 Virtual Chassis)

user@switch> **show chassis lcd fpc-slot 1**

```
Front panel contents for slot: 1
---------------------------------
LCD screen:
    01:RE switch2
    LED:SPD ALARM 01
LEDs status:
    Alarms LED: Yellow
    System LED: Green
    Master LED: Green
Interface       LED(ADM/SPD/DPX/POE)
-------------------------------------
ge-1/0/0        Off
ge-1/0/1        Off
```

```
ge-1/0/2        Off
ge-1/0/3        Off
ge-1/0/4        Off
ge-1/0/5        Off
ge-1/0/6        Off
ge-1/0/7        Off
ge-1/0/8        Off
ge-1/0/9        Off
ge-1/0/10       Off
ge-1/0/11       Off
ge-1/0/12       Off
ge-1/0/13       Off
ge-1/0/14       Off
ge-1/0/15       Off
ge-1/0/16       Off
ge-1/0/17       Off
ge-1/0/18       Off
ge-1/0/19       Off
ge-1/0/20       Off
ge-1/0/21       Off
ge-1/0/22       Off
ge-1/0/23       Off
```

show chassis lcd (EX8200 Switch)

`user@switch>` **show chassis lcd**

```
Front panel contents:
---------------------
LCD screen:
    RE st-8200-r
    LED:ADM ALARM 01
LEDs status:
    Alarms LED: Yellow
    System LED: Yellow
    Master LED: Green
Interface       LED(ADM/SPD/DPX)
------------------------------------------
ge-0/0/0        Off
ge-0/0/1        Off
ge-0/0/2        Off
ge-0/0/3        Off
ge-0/0/4        Off
ge-0/0/5        Off
```

```
ge-0/0/6        Off
ge-0/0/7        Off
ge-0/0/8        Off
ge-0/0/9        Off
ge-0/0/10       Off
ge-0/0/11       Off
ge-0/0/12       Off
ge-0/0/13       Off
ge-0/0/14       Off
ge-0/0/15       Off
ge-0/0/16       Off
ge-0/0/17       Off
ge-0/0/18       Off
ge-0/0/19       Off
ge-0/0/20       Off
ge-0/0/21       Off
ge-0/0/22       Off
ge-0/0/23       Off
ge-0/0/24       Off
ge-0/0/25       Off
ge-0/0/26       Off
ge-0/0/27       Off
ge-0/0/28       Off
ge-0/0/29       Off
ge-0/0/30       Off
ge-0/0/31       Off
ge-0/0/32       Off
ge-0/0/33       Off
ge-0/0/34       Off
ge-0/0/35       Off
ge-0/0/36       Off
ge-0/0/37       Off
ge-0/0/38       Off
ge-0/0/39       Off
ge-0/0/40       Off
ge-0/0/41       Off
ge-0/0/42       Off
ge-0/0/43       Off
ge-0/0/44       Off
ge-0/0/45       Off
ge-0/0/46       Off
ge-0/0/47       Off
xe-2/0/0        Off
xe-2/0/1        Off
```

```
xe-2/0/2        Off
xe-2/0/3        Off
xe-2/0/4        Off
xe-2/0/5        Off
xe-2/0/6        Off
xe-2/0/7        Off
xe-3/0/0        Off
xe-3/0/1        Off
xe-3/0/2        Off
xe-3/0/3        Off
xe-3/0/4        Off
xe-3/0/5        Off
xe-3/0/6        Off
xe-3/0/7        Off
xe-5/0/0        Off
xe-5/0/1        Off
xe-5/0/2        Off
xe-5/0/3        Off
xe-5/0/4        Off
xe-5/0/5        Off
xe-5/0/6        On
xe-5/0/7        On
xe-7/0/5        Off
```

show chassis lcd fpc-slot 2 (EX8200 Switch)

show chassis lcd fpc-slot 2

```

Interface       LED(ADM/SPD/DPX)
------------------------------------------
xe-2/0/0        Off
xe-2/0/1        Off
xe-2/0/2        Off
xe-2/0/3        Off
xe-2/0/4        Off
xe-2/0/5        Off
xe-2/0/6        Off
xe-2/0/7        Off
```

show chassis lcd menu (EX4200 Switch)

`user@switch>` **show chassis lcd menu**

```
fpc0:
--------------------------------------------------------------------------
status-menu
status-menu vcp-status
status-menu power-status
status-menu environ-menu
status-menu show-version
maintenance-menu
maintenance-menu halt-menu
maintenance-menu system-reboot
maintenance-menu rescue-config
maintenance-menu vc-uplink-config
maintenance-menu factory-default
```

On an EX4200 switch in a Virtual Chassis, the output for the **show chassis lcd menu all-members** command is the same as the output for the **show chassis lcd menu** command.

show chassis lcd menu (EX8200 Switch)

`user@switch>` **show chassis lcd menu**

```
status-menu
status-menu sf-status1-menu
status-menu sf-status2-menu
status-menu psu-status1-menu
status-menu psu-status2-menu
status-menu environ-menu
status-menu show-version
maintenance-menu
maintenance-menu halt-menu
maintenance-menu system-reboot
maintenance-menu rescue-config
maintenance-menu factory-default
```

show chassis lcd (QFX3500 Switches)

`user@switch>` **show chassis lcd**

```
Front panel contents for slot: 0
---------------------------------
LCD screen:
00:RE switch
ALARM 01
```

```
LEDs status:
Status/Beacon LED: Yellow Blinking
Interface STATUS LED ACTIVITY LED
-------------------------------------------
fte-0/1/0 Off Off
```

show chassis lcd (XRE200 External Routing Engine in EX8200 Virtual Chassis)

`user@external-routing-engine>` **show chassis lcd**

```
member0:
--------------------------------------------------------------------------
Front panel contents:
---------------------
LCD screen:
    RE ex8200-member0
    LED:ADM ALARM 04
LEDs status:
    Alarms LED: Red
    System LED: Yellow
    Master LED: Green

member1:
--------------------------------------------------------------------------

member8:
--------------------------------------------------------------------------
Front panel contents:
---------------------
LCD screen:
    BACKUP

member9:
--------------------------------------------------------------------------
Front panel contents:
---------------------
LCD screen:
    09:RE xre200-member9
    LED: NA ALARM 01
Interface       LED(ADM/SPD/DPX/POE)
------------------------------------------
ge-0/0/0        On
ge-0/0/1        On
ge-0/0/2        On
```

```
ge-0/0/3        On
ge-0/0/4        Off
ge-0/0/5        Off
ge-0/0/6        Off
ge-0/0/7        Off
ge-0/0/8        Off
ge-0/0/9        Off
ge-0/0/10       On
ge-0/0/11       Off
ge-0/0/12       Off
ge-0/0/13       Off
ge-0/0/14       Off
ge-0/0/15       Off
ge-0/0/16       Off
ge-0/0/17       Off
ge-0/0/18       Off
ge-0/0/19       Off
ge-0/0/20       Off
ge-0/0/21       Off
ge-0/0/22       Off
ge-0/0/23       Off
ge-0/0/24       Off
ge-0/0/25       Off
ge-0/0/26       Off
ge-0/0/27       Off
ge-0/0/28       Off
ge-0/0/29       Off
ge-0/0/30       Off
ge-0/0/31       Off
ge-0/0/32       Off
ge-0/0/33       Off
ge-0/0/34       Off
ge-0/0/35       Off
ge-0/0/36       Off
ge-0/0/37       Off
ge-0/0/38       Off
ge-0/0/39       Off
ge-0/0/40       On
ge-0/0/41       On
ge-0/0/42       On
ge-0/0/43       On
ge-0/0/44       On
ge-0/0/45       On
ge-0/0/46       On
```

```
ge-0/0/47       On
ge-16/0/0       On
ge-16/0/1       Off
ge-16/0/2       On
ge-16/0/3       Off
ge-16/0/4       On
ge-16/0/5       Off
ge-16/0/6       On
ge-16/0/7       Off
ge-16/0/8       Off
ge-16/0/9       Off
ge-16/0/10      Off
ge-16/0/11      Off
ge-16/0/12      Off
ge-16/0/13      On
ge-16/0/14      Off
ge-16/0/15      On
ge-16/0/16      Off
ge-16/0/17      On
ge-16/0/18      On
ge-16/0/19      On
ge-16/0/20      On
ge-16/0/21      Off
ge-16/0/22      On
ge-16/0/23      Off
ge-16/0/24      Off
ge-16/0/25      Off
ge-16/0/26      On
ge-16/0/27      Off
ge-16/0/28      Off
ge-16/0/29      Off
ge-16/0/30      On
ge-16/0/31      Off
ge-16/0/32      On
ge-16/0/33      On
ge-16/0/34      On
ge-16/0/35      Off
ge-16/0/36      On
ge-16/0/37      Off
ge-16/0/38      Off
ge-16/0/39      Off
ge-16/0/40      Off
ge-16/0/41      Off
ge-16/0/42      On
```

```
ge-16/0/43      Off
ge-16/0/44      Off
ge-16/0/45      Off
ge-16/0/46      Off
ge-16/0/47      Off
xe-19/0/0       Off
xe-19/0/1       On
xe-19/0/2       On
xe-19/0/3       On
xe-19/0/4       On
xe-19/0/5       On
ge-22/0/0       Off
ge-22/0/1       Off
ge-22/0/2       On
ge-22/0/3       Off
ge-22/0/4       On
ge-22/0/5       On
ge-22/0/6       On
ge-22/0/7       On
ge-22/0/8       Off
ge-22/0/9       Off
ge-22/0/10      Off
ge-22/0/11      Off
ge-22/0/12      Off
ge-22/0/13      Off
ge-22/0/14      Off
ge-22/0/15      Off
ge-22/0/16      On
ge-22/0/17      Off
ge-22/0/18      On
ge-22/0/19      Off
ge-22/0/20      On
ge-22/0/21      Off
ge-22/0/22      On
ge-22/0/23      Off
ge-22/0/24      On
ge-22/0/25      Off
ge-22/0/26      Off
ge-22/0/27      Off
ge-22/0/28      Off
ge-22/0/29      Off
ge-22/0/30      Off
ge-22/0/31      Off
ge-22/0/32      On
```

```
ge-22/0/33      Off
ge-22/0/34      On
ge-22/0/35      Off
ge-22/0/36      Off
ge-22/0/37      Off
ge-22/0/38      Off
ge-22/0/39      Off
ge-22/0/40      Off
ge-22/0/41      Off
ge-22/0/42      Off
ge-22/0/43      Off
ge-22/0/44      Off
ge-22/0/45      Off
ge-22/0/46      Off
ge-22/0/47      Off
```

show chassis lcd interconnect-device (QFabric Systems)

show chassis lcd interconnect-device IC-F1012

```
                Front Panel Module Information
                ---------------------------------
                LCD screen:
                IC-F1012        3 Alarms active
LEDs status:
    Status LED: Green
    Power LED : Green
    Major Alarm LED: off
    Minor Alarm LED: Yellow
    Fan 0 LED : Green
    Fan 1 LED : Green
    Fan 2 LED : Green
    Fan 3 LED : Green
    Fan 4 LED : Green
    Fan 5 LED : Green
    Fan 6 LED : Green
    Fan 7 LED : Green
    Fan 8 LED : Green
    Fan 9 LED : Green
    PEM 0 LED : Green
    PEM 1 LED : Green
    PEM 2 LED : Green
    PEM 3 LED : off
    PEM 4 LED : off
```

```
    PEM 5 LED : off

                LED info for: CB - 0
                --------------------------------
LEDs status:
    Status LED: Green
    Mastership LED: Green

Interface                STATUS LED      LINK/ACTIVITY LED
---------------------------------------------------------
IC-F1012:pme0 :          Green           N/A
IC-F1012:pme1 :          Green           N/A
IC-F1012:pme2 :          off             N/A
IC-F1012:pme3 :          off             N/A

                LED info for: CB - 1
                --------------------------------
LEDs status:
    Status LED: Green
    Mastership LED: Amber

Interface                STATUS LED      LINK/ACTIVITY LED
---------------------------------------------------------
IC-F1012:pme0 :          Green           N/A
IC-F1012:pme1 :          Green           N/A
IC-F1012:pme2 :          off             N/A
IC-F1012:pme3 :          off             N/A

                LED info for: FC 0 FPC - 0
                --------------------------------
LEDs status:
    Status LED: Green

Interface                STATUS LED      LINK/ACTIVITY LED
---------------------------------------------------------
IC-F1012:fte-0/0/0       Green           N/A
IC-F1012:fte-0/0/1       Green           N/A
IC-F1012:fte-0/0/2       Green           N/A
IC-F1012:fte-0/0/3       Green           N/A
IC-F1012:fte-0/0/4       Green           N/A

                LED info for: FC 1 FPC - 1
                --------------------------------
LEDs status:
```

```
    Status LED: Green

Interface                STATUS LED      LINK/ACTIVITY LED
----------------------------------------------------------
IC-F1012:fte-1/0/0      Green           N/A
IC-F1012:fte-1/0/1      Green           N/A
IC-F1012:fte-1/0/2      Green           N/A
IC-F1012:fte-1/0/3      Green           N/A
IC-F1012:fte-1/0/4      Green           N/A

                LED info for: RC 0 FPC - 8
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 1 FPC - 9
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 2 FPC - 10
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 3 FPC - 11
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 4 FPC - 12
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 5 FPC - 13
                ---------------------------------
LEDs status:
    Status LED: Green

                LED info for: RC 6 FPC - 14
                ---------------------------------
LEDs status:
    Status LED: Green
```

```
                LED info for: RC 7 FPC - 15
                ---------------------------------
LEDs status:
    Status LED: Green
```

show chassis lcd node-device (QFabric Systems)

show chassis lcd node-device P3774-C

```
                Front panel contents for: P3774-C
                -----------------------------------
                LCD screen:
                P3774-C
LEDs status:
    Status/Beacon LED: Yellow Blinking

Interface               STATUS LED      LINK/ACTIVITY LED
---------------------------------------------------------
P3774-C:xe-0/0/6        Green           Green
P3774-C:xe-0/0/7        Green           Green
P3774-C:ge-0/0/10       Green           Green
P3774-C:ge-0/0/11       Green           Green Blinking
P3774-C:ge-0/0/12       Green           Off
P3774-C:ge-0/0/13       Green           Green Blinking
P3774-C:ge-0/0/20       Green           Green
P3774-C:ge-0/0/21       Green           Green
P3774-C:ge-0/0/22       Green           Green Blinking
P3774-C:ge-0/0/23       Green           Off
P3774-C:ge-0/0/30       Green           Green
P3774-C:ge-0/0/31       Green           Green
P3774-C:ge-0/0/32       Green           Green Blinking
P3774-C:ge-0/0/33       Green           Green Blinking
P3774-C:fte-0/1/0       Green           Green
P3774-C:fte-0/1/1       Green           Green Blinking
P3774-C:fte-0/1/2       Green           Green Blinking
P3774-C:fte-0/1/3       Green           Green
```

show chassis nonstop-upgrade node-group

Syntax

```
show chassis nonstop-upgrade node-group node-group-name
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Display the status of the Node group after the most recent nonstop software upgrade (NSSU).

Required Privilege Level

view

RELATED DOCUMENTATION

Performing a Nonstop Software Upgrade on the QFabric System | 592
request system software nonstop-upgrade | 698

List of Sample Output

show chassis nonstop-upgrade node-group on page 838

Output Fields

Table 111 on page 837 lists the output fields for the **show chassis nonstop-upgrade node-group** command. Output fields are listed in the approximate order in which they appear.

Table 111: show chassis nonstop-upgrade node-group Output Fields

Field Name	Field Description
Item	Node device slot number.
Status	State of Node device: • **Error**—Node device is in an error state. • **Offline**—Node device is powered down. • **Online**—Node device is online and running.
Reason	Reason for the state (if the line card is offline).

Sample Output

show chassis nonstop-upgrade node-group

`user@qfabric>` **show chassis nonstop-upgrade node-group NW-NG-0**

```
Item           Status                  Reason
 P1550-C        Online
```

show fabric administration inventory

Syntax

```
show fabric administration inventory
<brief | detail | summary | terse>
<director-group (status)>
<infrastructure (fabric-controls | fabric-managers | diagnostic-routing-engines)>
<interconnect-devices interconnect-device-name>
<node-devices node-device-name>
<node-groups node-group-name>
<summary>
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display all devices that belong to the QFabric system. You can narrow the level of output by specifying a device type.

> NOTE: If your Node devices do not appear in the output of the **show fabric administration inventory** command, check the cabling of your system.

Options

none—Display all devices within a QFabric system.

brief | detail | summary | terse—(Optional) Display the specified level of output.

director-group (status)—(Optional) Display the status for the Director group within a QFabric system.

infrastructure (fabric-controls | fabric-managers | diagnostic-routing-engines)—(Optional) Display information for the fabric control Routing Engine, fabric manager Routing Engine, and diagnostic Routing Engine running on the Director group for the QFabric system.

interconnect-devices *interconnect-device-name*—(Optional) Display a specific Interconnect device within a QFabric system.

node-devices *node-device-name*—(Optional) Display a specific Node device within a QFabric system.

node-groups *node-group-name*—(Optional) Display a specific Node group within a QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

List of Sample Output

Output Fields

Table 112 on page 840 lists the output fields for the **show fabric administration inventory** command. Output fields are listed in the approximate order in which they appear.

Table 112: show fabric administration inventory Output Fields

Field Name	Field Description	Level of Out
Item	Type of QFabric system component being viewed. Possible values include **Node group**, **Interconnect device**, **Fabric control**, **Fabric manager**, **Diagnostic routing engine**, **Director group**, and **Ungrouped Node device**.	detail none
Identifier	Hardware serial identifier of a QFabric system component. When you configure an alias name for a component, the ID is displayed.	detail none
Connection	Status of a QFabric system component: either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the listed component.	detail none
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be **Configured**, **Failed** (with details about the failure), **Pending** (in the process of being written or retried), or **Unknown**.	detail none

Table 112: show fabric administration inventory Output Fields *(continued)*

Field Name	Field Description	Level of Out
Node group	Name of the Node groups associated with the QFabric system, and the Node devices assigned to each Node group. The group can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the devices in the group. This field also displays the serial ID for the Node group and the status for the Node group.	detail none
Interconnect device	Name of the Interconnect devices associated with the Node group. The device can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the device. This field also displays the serial ID and configuration status for the Interconnect device.	detail none
Fabric manager	Name of the primary virtual Junos Routing Engine associated with the QFabric system. The fabric manager Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the fabric manager Routing Engine.	detail none
Fabric control	Name of the virtual Junos Routing Engines responsible for route selection within a QFabric system partition. The fabric control Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the fabric control Routing Engine.	detail none
Diagnostic routing engine	Name of the virtual Junos Routing Engine responsible for troubleshooting and diagnostic utilities within a QFabric system partition. The diagnostic Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the diagnostic Routing Engine.	detail none
Director group	Identifier for the Director devices that are part of the Director group in a QFabric system. Each Director device can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the device.	detail none
Connection uptime	Length of time the component has been operational. The time is listed in days, hours, minutes, and seconds (**D+HH:MM:SS**).	detail
Network domain	Indicates whether a Node group is a network Node group (**Yes**) or a server Node group (**No**).	detail
Member id	Member identification number for a Node device within a Node group.	detail
Node group master	Indicates whether or not a Node device acts as a master device within a Node group. Values for this field are **Yes** or **No**.	detail

Table 112: show fabric administration inventory Output Fields *(continued)*

Field Name	Field Description	Level of Out
Configuration checkout failed	Provides troubleshooting details about a failed configuration on a component. This field includes the following output: • **Edit path**—Displays the configuration hierarchy level where the problem occurs. • **Statement**—Displays the configuration statement that causes the problem. • **Message**—Provides a suggested workaround to resolve the problem.	detail
Member	Name of a Routing Engine allocated to an Interconnect device.	detail
Master	Indicates whether or not a Routing Engine acts as a master device within an Interconnect device. Values are **Yes** or **No**.	detail
Total Node devices	Number of connected and disconnected Node devices in the QFabric system.	summary
Total connected Node devices	Number of available Node devices in the QFabric system.	summary
Total disconnected Node devices	Number of unavailable Node devices in the QFabric system.	summary
Total Interconnect devices	Number of Interconnect devices in the QFabric system.	summary

Sample Output

show fabric administration inventory

`user@qfabric>` **show fabric administration inventory**

```
Item                    Identifier              Connection      Configuration
Ungrouped Node device
  Node6                 BBAK8979                Disconnected
Node group
  P3359-C                                       Connected       Configured
    P3359-C                                     Connected
  P3865-C                                       Connected       Configured
    P3865-C                                     Connected
  RSNG-1                                        Connected       Configured
```

```
    Node-3              BBAK8276                Connected
    Node-4              BBAK8273                Connected
  NW-NG-0                                       Connected       Configured
    Node-0              BBAK8309                Connected
    Node-1              BBAK8283                Connected
Interconnect device
  IC-F1032                                      Connected       Configured
    F1032/RE0                                   Connected
    F1032/RE1                                   Connected
  IC-F1092                                      Connected       Configured
    F1092/RE0                                   Connected
    F1092/RE1                                   Connected
Fabric manager
  FM-0                                          Connected       Configured
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
Diagnostic routing engine
  DRE-0                                         Connected       Configured
Director group
  0281112011000023                              Connected
  0281112011000082                              Connected
```

show fabric administration inventory detail

`user@qfabric>` **show fabric administration inventory detail**

```
Node group: NW-NG-0, Connected, Configured
  Connection uptime: 2+22:40:46
  Network domain: Yes

  Node device: node01, Connected,
    Member id: 0

Node group: RSNG, Connected, Configured
  Connection uptime: 1:20:22

  Node device: node02, Connected,
    Member id: 0

  Node device: node03, Connected,
    Member id: 1
    Node group master: Yes
```

```
Node group: BBAK0423, Connected, Failed (invalid configuration)
  Connection uptime: 0:01:06

  Configuration checkout failed:
    Edit path: edit ethernet-switching-options
    Statement: analyzer
      Message: Vlan vlan1 which is configured as output vlan for analyzer session
 an1 contains untagged interface.
               The analyzer output vlan should only contain tagged interface.

  Node device: node0, Connected,
    Member id: 0
    Node group master: Yes

Interconnect device: IC-F4912, Connected, Configured
  Connection uptime: 0:08:05

  Member: F4912/RE0, Connected,
    Connection uptime: 0:08:05
    Master: Yes

Fabric manager: FM-0, Connected, Configured
  Connection uptime: 2+22:40:47

Fabric control: FC-0, Connected, Configured
  Connection uptime: 2+22:17:38

Fabric control: FC-1, Connected, Configured
  Connection uptime: 2+22:17:57

Diagnostic routing engine: DRE-0, Connected, Configured
  Connection uptime: 2+22:39:56
```

show fabric administration inventory summary

`user@qfabric>` **show fabric administration inventory summary**

```
Total Node devices: 3
Total connected Node devices: 3
Total disconnected Node devices: 0
Total Interconnect devices: 1
```

show fabric administration inventory director-group status

Syntax

```
show fabric administration inventory director-group status (target director-device-name | all)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the status of Director devices that belong to a QFabric system Director group.

Options

none—Display the status of all Director devices within a QFabric system.

all—Display the status of all Director devices within a QFabric system.

target *director-device-name*—Display the status of a specific Director device within a QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

request fabric administration director-group change-master | 667
Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428
Understanding the Director Group | 24

List of Sample Output

show fabric administration inventory director-group status on page 847
show fabric administration inventory director-group status target on page 850

Output Fields

Table 113 on page 845 lists the output fields for the **show fabric administration inventory director-group status** command. Output fields are listed in the approximate order in which they appear.

Table 113: show fabric administration inventory director-group status Output Fields

Field Name	Field Description
Director Group Status	Timestamp for the Director group status report.

Table 113: show fabric administration inventory director-group status Output Fields *(continued)*

Field Name	Field Description
Member	Name of the Director device.
Status	Current operational mode of the Director device: **online** or **offline**.
Role	High availability operational role of the Director device: **master** or **standby**.
Mgmt Address	Management IP address of the Director device.
CPU	Percentage of CPU processing memory being used by the Director device.
Free Memory	Available storage memory on the Director device.
VMs	Number of virtual machines operating on the Director device. A Routing Engine issue exists on a particular Director device when the system displays a star (*) in the **VMs** column along with the following message: **Error in retrieving VM Count in dgX**.
Up Time	Length of time the Director device has been operating.
Device Id/Alias	Name or identifier of the Director device.
Master Services	Operational status of the database server, load balancer, and QFabric partition address.
Director Group Managed Services	Operational status of the shared file system, network file system, virtual machine server, and DHCP load balancer.
Hard Drive Status	Operational status of the Director device hard drive, including information about the volume identifier, physical identifiers, and SCSI identifiers. There is also status information for the drive partitions, including directory size, available and used drive space, utilization, directory locations, and drive resynchronization progress. A hard drive issue exists when the system displays one of the following messages: **Error in retrieving Hard disk status** or **Error in retrieving Hard disk storage status**.
Director Group Processes	Operational status of the Director group processes, such as device managers, SSH, NFS, FTP, system log messages, and SNMP.
Interface Link Status	Operational status of the Director device interfaces, such as the management interface, the control plane bridge interface, the control plane LAG, the control plane links (where the first number represents the Ethernet module [0 or 1] and the second number represents the port [0 - 3]), and the inter-Director crossover LAG. The state of the interfaces can be **up** or **down**. The **Active** designation indicates that a control plane link is active.

Sample Output

show fabric administration inventory director-group status

`user@qfabric>` **show fabric administration inventory director-group status**

```
Director Group Status Thu Aug  2 17:36:34 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online master   10.94.215.38    8%  15191684k   4   6 days, 06:24 hrs
 dg1    online backup   10.94.215.39    7%  17733160k   3   6 days, 06:24 hrs

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg0    0281052011000001 online  master

  Master Services
  ---------------
  Database Server               online
  Load Balancer Director        online
  QFabric Partition Address     online

  Director Group Managed Services
  -------------------------------
  Shared File System            online
  Network File System           online
  Virtual Machine Server        online
  Load Balancer/DHCP            online

  Hard Drive Status
  ----------------
  Volume ID:0C72369323C3837B    optimal
  Physical ID:0                 online
  Physical ID:1                 online
  Resync Progress Remaining:0   0%
  Resync Progress Remaining:1   0%


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 9.4G 391G  3%   /
  99M  16M  79M   17%  /boot
  93G  11G  83G   12%  /pbdata
```

```
  Director Group Processes
  ------------------------
  Director Group Manager         online
  Partition Manager              online
  Software Mirroring             online
  Shared File System master      online
  Secure Shell Process           online
  Network File System            online
  DHCP Server master             online     master
  FTP Server                     online
  Syslog                         online
  Distributed Management         online
  SNMP Trap Forwarder            online
  SNMP Process                   online
  Platform Management            online

  Interface Link Status
  ---------------------
  Management Interface           up
  Control Plane Bridge           up
  Control Plane LAG              up
  CP Link [0/2]                  up         Active
  CP Link [0/1]                  up         Active
  CP Link [0/0]                  up         Active
  CP Link [1/2]                  down
  CP Link [1/1]                  down
  CP Link [1/0]                  down
  Crossover LAG                  up
  CP Link [0/3]                  up
  CP Link [1/3]                  up

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg1    0281052011000032 online  backup

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
```

```
Volume ID:0C9BA4D5F21511B9     optimal
Physical ID:0                  online
Physical ID:1                  online
Resync Progress Remaining:0    0%
Resync Progress Remaining:1    0%


Size  Used Avail Used% Mounted on
----  ---- ----- ----- ----------
423G 9.8G 391G  3%   /
99M  16M  79M   17%  /boot
93G  11G  83G   12%  /pbdata

Director Group Processes
------------------------
Director Group Manager         online
Partition Manager              online
Software Mirroring             online
Shared File System master      online
Secure Shell Process           online
Network File System            online
DHCP Server master             online     backup
FTP Server                     online
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   offline
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up         Active
CP Link [0/1]                  up         Active
CP Link [0/0]                  up         Active
CP Link [1/2]                  down
CP Link [1/1]                  down
CP Link [1/0]                  down
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

show fabric administration inventory director-group status target

`user@qfabric>` **show fabric administration inventory director-group status target 0281052011000004**

```
Director Group Status Thu Aug 16 02:25:37 UTC 2012

 Member Status Role     Mgmt Address    CPU Free Memory VMs Up Time
 ------ ------ -------- --------------- --- ----------- --- -------------
 dg0    online backup   10.94.195.109   7%  10009364k   3   23:44 hrs
 dg1    online master   10.94.195.110   9%  6120712k    4   1 day, 33:17 mins

 Member Device Id/Alias  Status  Role
 ------ ---------------- ------- ---------
 dg1    0281052011000004 online  master

  Master Services
  ---------------
  Database Server                online
  Load Balancer Director         online
  QFabric Partition Address      online

  Director Group Managed Services
  -------------------------------
  Shared File System             online
  Network File System            online
  Virtual Machine Server         online
  Load Balancer/DHCP             online

  Hard Drive Status
  ----------------
  Physical ID:0                  online
  Physical ID:1                  online


  Size  Used Avail Used% Mounted on
  ----  ---- ----- ----- ----------
  423G 7.2G 394G  2%   /
  99M  20M  75M   21%  /boot
  93G  8.8G 85G   10%  /pbdata

  Director Group Processes
  ------------------------
  Director Group Manager         online
  Partition Manager              online
  Software Mirroring             online
```

```
Shared File System master      online
Secure Shell Process           online
Network File System            online
DHCP Server master             online     master
FTP Server                     online
Syslog                         online
Distributed Management         online
SNMP Trap Forwarder            online
SNMP Process                   online
Platform Management            online

Interface Link Status
---------------------
Management Interface           up
Control Plane Bridge           up
Control Plane LAG              up
CP Link [0/2]                  up         Active
CP Link [0/1]                  up         Active
CP Link [0/0]                  up         Active
CP Link [1/2]                  up
CP Link [1/1]                  up
CP Link [1/0]                  up
Crossover LAG                  up
CP Link [0/3]                  up
CP Link [1/3]                  up
```

show fabric administration inventory infrastructure

Syntax

```
show administrator inventory infrastructure
<brief | detail>
(fabric-controls | fabric-managers | diagnostic-routing-engines)
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the services running on the Director group for the QFabric system. These services can include external Routing Engines that are used to support QFabric system operations, such as partitioning and fabric control.

Options

none—Display all services running on the Director group, which are used to support the QFabric system.

brief | detail—(Optional) Display the specified level of output.

fabric-managers—Display information for the fabric manager Routing Engine running on the Director group, which is used to support all partitions in the QFabric system.

fabric-controls—Display information for the fabric control Routing Engine running on the Director group, which is used to support route information in the QFabric system.

diagnostic-routing-engines—Display information for the diagnostic Routing Engine running on the Director group, which is responsible for troubleshooting and diagnostic utilities within a QFabric system partition.

Required Privilege Level

admin

RELATED DOCUMENTATION

show fabric administration inventory | 839

List of Sample Output

show fabric administration inventory infrastructure on page 854
show fabric administration inventory infrastructure fabric-controls on page 854
show fabric administration inventory infrastructure fabric-managers on page 855
show fabric administration inventory infrastructure diagnostic-routing-engines on page 855

Output Fields

Table 114 on page 853 lists the output fields for the **show fabric administration inventory infrastructure** command. Output fields are listed in the approximate order in which they appear.

Table 114: show fabric administration inventory infrastructure Output Fields

Field Name	Field Description
Routing Engine Type	Type of virtual Junos Routing Engine being viewed. Examples include the network Node group, fabric control, fabric manager, and diagnostic Routing Engines.
Hostname	Name of the QFabric system component.
PID	Process identifier for the component.
CPU-Use (%)	Percentage of CPU processing memory being used by the component.
Fabric control	Name of the virtual Junos Routing Engines responsible for route selection within a QFabric system partition. With the **fabric-controls** option, the fabric control Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. This field also displays the identifier and configuration status for the fabric control Routing Engine.
Fabric manager	Name of the virtual Junos Routing Engine that manages the QFabric system. With the **fabric-managers** option, the fabric manager Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. This field also displays the identifier and configuration status for the fabric manager Routing Engine.
Network Node group	Name of the virtual Junos Routing Engine instance that handles routing processes for a network Node group.
Diagnostic	Name of the virtual Junos Routing Engine responsible for troubleshooting and diagnostic utilities within a QFabric system partition. With the **diagnostic-routing-engines** option, the diagnostic Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the diagnostic Routing Engine.
Item	Type of QFabric system component being viewed.
Identifier	Hardware serial identifier of a QFabric system component.

Table 114: show fabric administration inventory infrastructure Output Fields *(continued)*

Field Name	Field Description
Connection	Status of a QFabric system component: either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the listed component.
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be **Configured**, **Failed** (unsuccessful), **Pending** (in the process of being written or retried), or **Unknown**.

Sample Output

show fabric administration inventory infrastructure

`user@qfabric>` **show fabric administration inventory infrastructure**

```
dg0:
Routing Engine Type     Hostname                      PID      CPU-Use(%)
-------------------------------------------------------------------------
Fabric manager          FM-0                          9832      1.0
Network Node group      QFabric_default_NW-NG-1_RE1   24633     4.2
Fabric control          QFabric_default_FC-1_RE0      25374     1.8
Diagnostic              QFabric_DRE                   6789      1.3

dg1:
Routing Engine Type     Hostname                      PID      CPU-Use(%)
-------------------------------------------------------------------------
Fabric manager          FM-1                          572       1.6
Network Node group      QFabric_default_NW-NG-0_RE0   19217     7.8
Fabric control          QFabric_default_FC-0_RE0      20071     1.9
```

show fabric administration inventory infrastructure fabric-controls

`user@qfabric>` **show fabric administration inventory infrastructure fabric-controls fabric-controls**

```
Item                    Identifier              Connection      Configuration
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
```

show fabric administration inventory infrastructure fabric-managers

`user@qfabric>` **show fabric administration inventory infrastructure fabric-managers**

```
Item                    Identifier              Connection      Configuration
Fabric manager
  FM-0                                          Connected       Configured
```

show fabric administration inventory infrastructure diagnostic-routing-engines

`user@qfabric>` **show fabric administration inventory infrastructure diagnostic-routing-engines**

```
Item                    Identifier              Connection      Configuration
Diagnostic routing engine
  DRE-0                                         Connected       Configured
```

show fabric administration inventory interconnect-devices

Syntax

```
show fabric administration inventory interconnect-devices interconnect-device-name
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the Interconnect devices that belong to a QFabric system.

Options

none—Display all Interconnect devices within a QFabric system.

interconnect-device-name—Display a specific Interconnect device within a QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

request chassis fabric fpc | 662
show chassis fabric connectivity | 808
show chassis fabric device | 817
show fabric administration inventory | 839
Understanding Interconnect Devices | 27

List of Sample Output

show fabric administration inventory interconnect-devices on page 857
show fabric administration inventory interconnect-devices device-name on page 857

Output Fields

Table 115 on page 856 lists the output fields for the **show fabric administration inventory interconnect-devices** command. Output fields are listed in the approximate order in which they appear.

Table 115: show fabric administration inventory interconnect-devices Output Fields

Field Name	Field Description
Interconnect device	Name of the Interconnect devices associated with the partition.

Table 115: show fabric administration inventory interconnect-devices Output Fields *(continued)*

Field Name	Field Description
Item	Type of QFabric system component being viewed. Interconnect devices either display the alias name (if configured) or the hardware serial identifier and Control Board Routing Engine numbers.
Identifier	Hardware serial identifier of a QFabric system component. When you configure an alias name for a component, the ID is displayed.
Connection	Status of a QFabric system component: either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the listed component.
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be **Configured**, **Failed** (unsuccessful), **Pending** (in the process of being written or retried), or **Unknown**.

Sample Output

show fabric administration inventory interconnect-devices

`user@qfabric>` **show fabric administration inventory interconnect-devices**

```
Item                    Identifier              Connection      Configuration
Interconnect device
  IC-YW3781                                     Connected       Configured
    YW3781/RE0                                  Connected
    YW3781/RE1                                  Connected
  IC-YW3798                                     Connected       Configured
    YW3798/RE0                                  Connected
    YW3798/RE1                                  Connected
```

show fabric administration inventory interconnect-devices device-name

`user@qfabric>` **show fabric administration inventory interconnect-devices IC-YW3781**

```
Item                    Identifier              Connection      Configuration
Interconnect device
  IC-YW3781                                     Connected       Configured
    YW3781/RE0                                  Connected
```

```
YW3781/RE1                              Connected
```

show fabric administration inventory node-devices

Syntax

```
show fabric administration inventory node-devices node-device-name
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the Node devices that belong to the QFabric system.

> **NOTE:** If your Node devices do not appear in the output of the **show fabric administration inventory node-devices** command, check the cabling of your system.

Options

none—Display all Node devices within the QFabric system.

node-device-name—Display a specific Node device within the QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

Configuring Aliases for the QFabric System | 452
Configuring Node Groups for the QFabric System | 476
show fabric administration inventory node-groups | 861
show fabric administration inventory | 839
Understanding Node Devices | 31

List of Sample Output

show fabric administration inventory node-devices on page 860
show fabric administration inventory node-devices device-name on page 860

Output Fields

Table 116 on page 860 lists the output fields for the **show fabric administration inventory node-devices** command. Output fields are listed in the approximate order in which they appear.

Table 116: show fabric administration inventory node-devices Output Fields

Field Name	Field Description
Item	Type of QFabric system component being viewed.
Identifier	Hardware serial identifier of a QFabric system component.
Connection	Status of a QFabric system component: either **Connected** or **Not Connected**, depending on whether or not the Director software has detected keepalive messages for the listed component.
Node device	Name of the Node devices associated with the Node group. The device can be either **Connected** or **Not Connected**, depending on whether or not the Director software has detected keepalive messages for the device. This field also displays the serial ID and configuration status for the Node device.

Sample Output

show fabric administration inventory node-devices

`user@qfabric>` **show fabric administration inventory node-devices**

```
Item                    Identifier              Connection
Node device
  node1                 P3749-C                 Connected
  node2                 P3767-C                 Connected
  node3                 P3850-C                 Connected
  node4                 P3947-C                 Connected
```

show fabric administration inventory node-devices device-name

`user@qfabric>` **show fabric administration inventory node-devices node0**

```
Item                    Identifier              Connection
Node device
  node1                 P3749-C                 Connected
```

show fabric administration inventory node-groups

Syntax

```
show fabric administration inventory node-groups node-group-name
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the Node groups and the corresponding Node devices that belong to the QFabric system.

Options

none—Display all Node groups within the QFabric system.

node-group-name—Display information for a specific Node group within the QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

Configuring Node Groups for the QFabric System | 476

show fabric administration inventory node-devices | 859

show fabric administration inventory | 839

List of Sample Output

show fabric administration inventory node-groups on page 862

show fabric administration inventory node-groups node-group-name on page 862

Output Fields

Table 117 on page 861 lists the output fields for the **show fabric administration inventory node-groups** command. Output fields are listed in the approximate order in which they appear.

Table 117: show fabric administration inventory node-groups Output Fields

Field Name	Field Description
Node group	Name of the Node groups associated with the partition.

Table 117: show fabric administration inventory node-groups Output Fields *(continued)*

Field Name	Field Description
Item	Type of QFabric system component being viewed. • Autogenerated Node groups display the hardware serial identifier for both the name of the Node group and the name of the included Node device. • User-configured Node groups either display the alias name (if configured) or the hardware serial identifier for each Node device contained in the Node group.
Identifier	Hardware serial identifier of a QFabric system component. When you configure an alias name for a component, the ID is displayed.
Connection	Status of a QFabric system component: either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the listed component.
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be **Configured**, **Failed** (unsuccessful), **Pending** (in the process of being written or retried), or **Unknown**.

Sample Output

show fabric administration inventory node-groups

`user@qfabric>` **show fabric administration inventory node-groups**

```
Item                    Identifier              Connection      Configuration
Node group
  BBAK8891                                      Connected       Configured
    BBAK8891                                    Connected
  BBAK8868                                      Connected       Configured
    BBAK8868                                    Connected
  RSNG-1                                        Connected       Configured
    Node-3              BBAK8276                Connected
    Node-4              BBAK8273                Connected
  NW-NG-0                                       Connected       Configured
    Node-0              BBAK8309                Connected
    Node-1              BBAK8283                Connected
```

show fabric administration inventory node-groups node-group-name

`user@qfabric>` **show fabric administration inventory node-groups RSNG-1**

```
Item                    Identifier              Connection      Configuration
Node group
  RSNG-1                                        Connected       Configured
    Node-3              BBAK8276                Connected
    Node-4              BBAK8273                Connected
```

show fabric administration system mac-pool

Syntax

```
show fabric administration system mac-pool
```

Release Information

Command introduced in Junos OS Release 11.3 for the QFX Series.

Description

(QFabric systems only) Display the MAC addresses that belong to a QFabric Director group.

Options

There are no options for this command.

Required Privilege Level

admin

RELATED DOCUMENTATION

request fabric administration system mac-pool add | 677
request fabric administration system mac-pool delete | 678

List of Sample Output

show fabric administration system mac-pool on page 865

Output Fields

Table 118 on page 864 lists the output fields for the **show fabric administration system mac-pool** command. Output fields are listed in the approximate order in which they appear.

Table 118: show fabric administration system mac-pool Output Fields

Field Name	Field Description
MAC Block Base	Starting MAC address for the pool assigned to the QFabric system.
Total MACs	Total number of MAC addresses assigned to the QFabric system.
Available MACs	Number of available MAC addresses from the total.

Sample Output

show fabric administration system mac-pool

`user@qfabric>` **show fabric administration system mac-pool**

```
Mac Block Base         Total MACs      Available MACs
        00:11:00:00:00:00       4096            4084
        02:00:00:11:22:00       10              10
```

show fabric inventory

Syntax

```
show fabric inventory
<brief | detail | terse>
<infrastructure fabric-controls <FC-0 | FC-1>>
<node-devices node-device-name>
<node-groups node-group-name>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Display Node devices, Node groups, and fabric control Routing Engines that belong to the QFabric system. You can narrow the level of output by specifying a device type.

NOTE:

- If you have administrator privileges, issue the **show fabric administration inventory** command to view all devices in your QFabric system (including Interconnect devices and Director devices).
- If your Node devices do not appear in the output of the **show fabric inventory** command, check the cabling of your system.

Options

none—Display all devices within a QFabric system.

brief | detail | terse—(Optional) Display the specified level of output.

infrastructure fabric-controls <FC-0 | FC-1>—(Optional) Display information for all fabric control Routing Engines running on the Director group within the QFabric system, or the individual fabric control Routing Engine you specify (either FC-0 or FC-1).

node-devices *node-device-name*—(Optional) Display a specific Node device within a QFabric system.

node-groups *node-group-name*—(Optional) Display a specific Node group within a QFabric system.

Required Privilege Level

admin

RELATED DOCUMENTATION

List of Sample Output

Output Fields

Table 119 on page 867 lists the output fields for the **show fabric inventory** command. Output fields are listed in the approximate order in which they appear.

Table 119: show fabric inventory Output Fields

Field Name	Field Description
Item	Type of QFabric system component being viewed. Possible values include **Node device**, **Node group**, **Fabric control**, and **Ungrouped Node device**.
Identifier	Hardware serial identifier of a QFabric system component.
Connection	Status of a QFabric system component: either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the listed component.
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be **Configured**, **Failed** (unsuccessful), **Pending** (in the process of being written or retried), or **Unknown**.
Node group	Name of the Node groups associated with the QFabric system, and the Node devices assigned to each Node group. The group can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the devices in the group. This field also displays the serial ID for the Node group and the status for the Node group.
Node device	Name of the Node devices associated with the Node group. The device can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for the device. This field also displays the serial ID and configuration status for the Node device.

Table 119: show fabric inventory Output Fields *(continued)*

Field Name	Field Description
Fabric control	Name of the virtual Junos Routing Engines responsible for route selection within a QFabric system partition. The fabric control Routing Engine can be either **Connected** or **Disconnected**, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the fabric control Routing Engine.

Sample Output

show fabric inventory

`user@qfabric>` **show fabric inventory**

```
Item                    Identifier              Connection      Configuration
Ungrouped Node device
  P3747-C                                       Disconnected
Node group
  NW-NG-0                                       Connected       Configured
    Node-1              P4093-C                 Connected
  RSNG-1                                        Connected       Configured
    Node-2              P4514-C                 Connected
    Node-3              P3917-C                 Connected
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
```

show fabric inventory infrastructure fabric-controls

`user@qfabric>` **show fabric inventory infrastructure fabric-controls**

```
Item                    Identifier              Connection      Configuration
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
```

show fabric inventory node-devices

`user@qfabric>` **show fabric inventory node-devices**

```
Item                    Identifier              Connection      Configuration
Node device
  Node-1                P4093-C                 Connected
  Node-2                P4514-C                 Connected
  Node-3                P3917-C                 Connected
```

show fabric inventory node-groups

`user@qfabric>` **show fabric inventory node-groups**

```
Item                    Identifier              Connection      Configuration
Node group
  NW-NG-0                                       Connected       Configured
    Node-1              P4093-C                 Connected
  RSNG-1                                        Connected       Configured
    Node-2              P4514-C                 Connected
    Node-3              P3917-C                 Connected
```

show fabric session-host

Syntax

```
show fabric session-host
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

(QFabric systems only) Display the Director device within the Director group that hosts the QFabric CLI session.

Options

none—Display the Director device hosting the QFabric CLI session.

Required Privilege Level

admin

RELATED DOCUMENTATION

Understanding the Director Group | 24
show fabric administration inventory director-group status | 845

List of Sample Output

show fabric session-host on page 871

Output Fields

Table 120 on page 870 lists the output fields for the **show fabric session-host** command. Output fields are listed in the approximate order in which they appear.

Table 120: show fabric session-host Output Fields

Field Name	Field Description
Identifier	Hardware serial identifier of the Director device that hosts the SSH QFabric CLI session.

Sample Output

show fabric session-host

`user@qfabric>` **show fabric session-host**

```
Identifier: 0281052011000032
```

show log

List of Syntax

Syntax

```
show log
<filename | user <username>>
```

Syntax (QFX Series and OCX Series)

```
show log filename
<device-type (device-id | device-alias)>
```

Syntax (TX Matrix Router)

```
show log
<all-lcc | lcc number | scc>
<filename | user <username>>
```

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Option *device-type (device-id | device-alias)* is introduced in Junos OS Release 13.1 for the QFX Series.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

List log files, display log file contents, or display information about users who have logged in to the router or switch.

NOTE: On MX Series routers, modifying a configuration to replace a service interface with another service interface is treated as a catastrophic event. When you modify a configuration, the entire configuration associated with the service interface—including NAT pools, rules, and service sets—is deleted and then re-created for the newly specified service interface. If there are active sessions associated with the service interface that is being replaced, these sessions are deleted and the NAT pools are then released, which leads to the generation of the NAT_POOL_RELEASE system log messages. However, because NAT pools are already deleted as a result of the catastrophic configuration change and no longer exist, the NAT_POOL_RELEASE system log messages are not generated for the changed configuration.

Options

none—List all log files.

<all-lcc | lcc *number* | scc>—(Routing matrix only)(Optional) Display logging information about all T640 routers (or line-card chassis) or a specific T640 router (replace ***number*** with a value from 0 through 3) connected to a TX Matrix router. Or, display logging information about the TX Matrix router (or switch-card chassis).

device-type—(QFabric system only) (Optional) Display log messages for only one of the following device types:

- **director-device**—Display logs for Director devices.
- **infrastructure-device**—Display logs for the logical components of the QFabric system infrastructure, including the diagnostic Routing Engine, fabric control Routing Engine, fabric manager Routing Engine, and the default network Node group and its backup (NW-NG-0 and NW-NG-0-backup).
- **interconnect-device**—Display logs for Interconnect devices.
- **node-device**—Display logs for Node devices.

NOTE: If you specify the **device-type** optional parameter, you must also specify either the **device-id** or **device-alias** optional parameter.

(*device-id* | *device-alias*)—If a device type is specified, display logs for a device of that type. Specify either the device ID or the device alias (if configured).

filename—(Optional) Display the log messages in the specified log file. For the routing matrix, the filename must include the chassis information.

NOTE: The *filename* parameter is mandatory for the QFabric system. If you did not configure a syslog filename, specify the default filename of **messages**.

user <*username*>—(Optional) Display logging information about users who have recently logged in to the router or switch. If you include ***username***, display logging information about the specified user.

Required Privilege Level

trace

RELATED DOCUMENTATION

syslog (System)

List of Sample Output

Sample Output

show log

user@host> **show log**

```
total 57518
-rw-r--r--  1 root  bin      211663 Oct  1 19:44 dcd
-rw-r--r--  1 root  bin      999947 Oct  1 19:41 dcd.0
-rw-r--r--  1 root  bin      999994 Oct  1 17:48 dcd.1
-rw-r--r--  1 root  bin      238815 Oct  1 19:44 rpd
-rw-r--r--  1 root  bin     1049098 Oct  1 18:00 rpd.0
-rw-r--r--  1 root  bin     1061095 Oct  1 12:13 rpd.1
-rw-r--r--  1 root  bin     1052026 Oct  1 06:08 rpd.2
-rw-r--r--  1 root  bin     1056309 Sep 30 18:21 rpd.3
-rw-r--r--  1 root  bin     1056371 Sep 30 14:36 rpd.4
-rw-r--r--  1 root  bin     1056301 Sep 30 10:50 rpd.5
-rw-r--r--  1 root  bin     1056350 Sep 30 07:04 rpd.6
```

```
-rw-r--r--  1 root  bin     1048876 Sep 30 03:21 rpd.7
-rw-rw-r--  1 root  bin       19656 Oct  1 19:37 wtmp
```

show log filename

`user@host>` **show log rpd**

```
Oct  1 18:00:18 trace_on: Tracing to ?/var/log/rpd? started
Oct  1 18:00:18 EVENT <MTU> ds-5/2/0.0 index 24 <Broadcast PointToPoint Multicast
Oct  1 18:00:18
Oct  1 18:00:19 KRT recv len 56 V9 seq 148 op add Type route/if af 2 addr 192.0.2.21
 nhop type local nhop 192.0.2.21
Oct  1 18:00:19 KRT recv len 56 V9 seq 149 op add Type route/if af 2 addr 192.0.2.22
 nhop type unicast nhop 192.0.2.22
Oct  1 18:00:19 KRT recv len 48 V9 seq 150 op add Type ifaddr index 24 devindex
43
Oct  1 18:00:19 KRT recv len 144 V9 seq 151 op chnge Type ifdev devindex 44
Oct  1 18:00:19 KRT recv len 144 V9 seq 152 op chnge Type ifdev devindex 45
Oct  1 18:00:19 KRT recv len 144 V9 seq 153 op chnge Type ifdev devindex 46
Oct  1 18:00:19 KRT recv len 1272 V9 seq 154 op chnge Type ifdev devindex 47
...
```

`user@host:LSYS1>` **show log flow_lsys1.log**

```
Nov  7 07:34:09 07:34:09.491800:CID-0:THREAD_ID-00:LSYS_ID-01:RT:got route table
lock

Nov  7 07:34:09 07:34:09.491809:CID-0:THREAD_ID-00:LSYS_ID-01:RT:released route
table lock

Nov  7 07:34:09 07:34:09.491840:CID-0:THREAD_ID-00:LSYS_ID-01:RT:got route table
lock

Nov  7 07:34:09 07:34:09.491841:CID-0:THREAD_ID-00:LSYS_ID-01:RT:released route
table lock

Nov  7 07:34:09 07:34:09.491854:CID-0:THREAD_ID-00:LSYS_ID-01:RT:cache final sw_nh
 0x0

Nov  7 07:34:09 07:34:09.491868:CID-0:THREAD_ID-00:LSYS_ID-01:RT:got route table
lock

Nov  7 07:34:09 07:34:09.491869:CID-0:THREAD_ID-00:LSYS_ID-01:RT:released route
```

```
table lock

Nov  7 07:34:09 07:34:09.491881:CID-0:THREAD_ID-00:LSYS_ID-01:RT:cache final sw_nh
 0x0
```

user@host:TSYS1> **show log flow_tsys1.log**

```
Nov  7 13:21:47
13:21:47.217744:CID-0:THREAD_ID-05:LSYS_ID-32:RT:<192.0.2.0/0->198.51.100.0/9011;1,0x0>
 :

Nov  7 13:21:47 13:21:47.217747:CID-0:THREAD_ID-05:LSYS_ID-32:RT:packet [84] ipid
 = 39281, @0x7f490ae56d52

Nov  7 13:21:47 13:21:47.217749:CID-0:THREAD_ID-05:LSYS_ID-32:RT:----
flow_process_pkt: (thd 5): flow_ctxt type 0, common flag 0x0, mbuf 0x4882b600,
rtbl7

Nov  7 13:21:47 13:21:47.217752:CID-0:THREAD_ID-05:LSYS_ID-32:RT: flow process pak
 fast ifl 88 in_ifp lt-0/0/0.101

Nov  7 13:21:47 13:21:47.217753:CID-0:THREAD_ID-05:LSYS_ID-32:RT:
lt-0/0/0.101:192.0.2.0->198.51.100.0, icmp, (0/0)

Nov  7 13:21:47 13:21:47.217756:CID-0:THREAD_ID-05:LSYS_ID-32:RT: find flow: table
 0x11d0a2680, hash 20069(0xffff), sa 192.0.2.0, da 198.51.100.0, sp 0, d0

Nov  7 13:21:47 13:21:47.217760:CID-0:THREAD_ID-05:LSYS_ID-32:RT:Found: session
id 0x12. sess tok 28685

Nov  7 13:21:47 13:21:47.217761:CID-0:THREAD_ID-05:LSYS_ID-32:RT:  flow got session.


Nov  7 13:21:47 13:21:47.217761:CID-0:THREAD_ID-05:LSYS_ID-32:RT:  flow session
id 18

Nov  7 13:21:47 13:21:47.217763:CID-0:THREAD_ID-05:LSYS_ID-32:RT: vector bits 0x200
 vector 0x84ae85f0

Nov  7 13:21:47 13:21:47.217764:CID-0:THREAD_ID-05:LSYS_ID-32:RT:set nat
0x11e463550(18) timeout const to 2

Nov  7 13:21:47 13:21:47.217765:CID-0:THREAD_ID-05:LSYS_ID-32:RT: set_nat_timeout
 2 on session 18
```

```
Nov  7 13:21:47 13:21:47.217765:CID-0:THREAD_ID-05:LSYS_ID-32:RT:refresh nat
0x11e463550(18) timeout to 2

Nov  7 13:21:47 13:21:47.217767:CID-0:THREAD_ID-05:LSYS_ID-32:RT:insert usp tag
for apps

Nov  7 13:21:47 13:21:47.217768:CID-0:THREAD_ID-05:LSYS_ID-32:RT:mbuf 0x4882b600,
 exit nh 0xfffb0006
```

show log filename (QFabric System)

`user@qfabric>` **show log messages**

```
Mar 28 18:00:06 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:06 ED1486
 chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 2159)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1486
 chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 2, jnxFruL3Index 0,
jnxFruName PIC:  @ 0/1/*, jnxFruType 11, jnxFruSlot 0, jnxFruOfflineReason 2,
jnxFruLastPowerOff 0, jnxFruLastPowerOn 2191)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1492
 chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 242726)
Mar 28 18:00:07 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:07 ED1492
 chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 2, jnxFruL3Index 0,
jnxFruName PIC:  @ 0/1/*, jnxFruType 11, jnxFruSlot 0, jnxFruOfflineReason 2,
jnxFruLastPowerOff 0, jnxFruLastPowerOn 242757)
Mar 28 18:00:16 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:16 ED1486 file:
 UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:00:27 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:27 ED1486 file:
 UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:00:50 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:50
_DCF_default___NW-INE-0_RE0_ file: UI_COMMIT: User 'root' requested 'commit'
operation (comment: none)
Mar 28 18:00:50 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:50
_DCF_default___NW-INE-0_RE0_ file: UI_COMMIT: User 'root' requested 'commit'
operation (comment: none)
```

```
Mar 28 18:00:55 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:00:55 ED1492 file:
 UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:01:10 qfabric file: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:01:10 ED1492 file:
 UI_COMMIT: User 'root' requested 'commit' operation (comment: none)
Mar 28 18:02:37 qfabric chassisd: QFABRIC_INTERNAL_SYSLOG: Mar 28 18:02:37 ED1491
 chassisd: CHASSISD_SNMP_TRAP10: SNMP trap generated: FRU power on
(jnxFruContentsIndex 8, jnxFruL1Index 1, jnxFruL2Index 1, jnxFruL3Index 0,
jnxFruName PIC: 48x 10G-SFP+ @ 0/0/*, jnxFruType 11, jnxFruSlot 0,
jnxFruOfflineReason 2, jnxFruLastPowerOff 0, jnxFruLastPowerOn 33809)
```

show log user

`user@host>` **show log user**

```
usera    mg2546                  Thu Oct  1 19:37   still logged in
usera    mg2529                  Thu Oct  1 19:08 - 19:36  (00:28)
usera    mg2518                  Thu Oct  1 18:53 - 18:58  (00:04)
root     mg1575                  Wed Sep 30 18:39 - 18:41  (00:02)
root     ttyp2    aaa.bbbb.com   Wed Sep 30 18:39 - 18:41  (00:02)
userb    ttyp1    192.0.2.0      Wed Sep 30 01:03 - 01:22  (00:19)
```

show log accepted-traffic (SRX4600, SRX5400, SRX5600, and SRX5800)

`user@host>` **show log accepted-traffic**

```
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
3.3.3.5/2->4.4.4.2/63 0x0 None 3.3.3.5/2->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2617282058 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
3.3.3.4/4->4.4.4.2/63 0x0 None 3.3.3.4/4->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2550162754 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
3.3.3.4/1->4.4.4.2/63 0x0 None 3.3.3.4/1->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2550162755 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
3.3.3.3/0->4.4.4.2/63 0x0 None 3.3.3.3/0->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2550162752 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
```

```
3.3.3.5/5->4.4.4.2/63 0x0 None 3.3.3.5/5->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2550162751 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
Jul 17 20:26:04  sourpunch RT_FLOW: RT_FLOW_SESSION_CREATE: session created
3.3.3.3/3->4.4.4.2/63 0x0 None 3.3.3.3/3->4.4.4.2/63 0x0 N/A N/A N/A N/A 17 p2
TRUST UNTRUST 2550162753 N/A(N/A) xe-7/0/0.0 UNKNOWN UNKNOWN UNKNOWN N/A N/A -1
N/A N/A N/A
```

show oam fabric flow-specification

Syntax

```
show oam fabric flow-specification
<flow-specification-name>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Display the fabric flow specifications that are configured in a QFabric system Node group.

Options

flow-specification-name—(Optional) Name of a flow specification.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500

Configuring a Fabric Maintenance Association | 502

Configuring Flow Specifications | 503

fabric (OAM) | 531

ping fabric multicast-flow | 650

ping fabric unicast-flow | 652

traceroute fabric unicast-flow | 888

List of Sample Output

show oam fabric flow-specification (All) on page 882
show oam fabric flow-specification (Flow Specification Specified) on page 882

Output Fields

Table 121 on page 881 lists the output fields for the **show oam fabric flow-specification** command. Output fields are listed in the approximate order in which they appear.

Table 121: show oam fabric flow-specification Output Fields

Field Name	Field Description
Flow specification name	Name of the flow specification.
Type	Flow specification type: • **Ethernet** • **Ethernet Unicast IPV4** • **Multicast IPV4** • **Multicast VLAN flood**
Ethernet frame size	Ethernet frame size in bytes.
Ether type	EtherType protocol.
Source-MAC	MAC address of the source FMEP interface.
Source-MAC Mask	MAC address mask of the source FMEP interface.
Destination-MAC	MAC address of the destination FMEP interface.
Destination-MAC Mask	MAC address mask of the destination FMEP interface.
Source-IP	IP address of the source FMEP interface.
Source-IP Mask	IP address mask of the source FMEP interface.
Destination-IP	IP address of the destination FMEP interface.
Destination-IP mask	IP address mask of the destination FMEP interface.
IP-Protocol	IPv4 protocol configured.
Source-L4-Port	Source TCP or UDP port.
Destination-L4-Port	Destination TCP or UDP port.
Destination multicast group IP	IP address of the destination multicast group.

Sample Output

show oam fabric flow-specification (All)

user@host> **show oam fabric flow-specification**

```
Flow specification name  : fspec1 Type  : Ethernet
    Ethernet frame size  : Unspecified
    Ether type  : Unspecified
    Source-MAC  : Unspecified
    Source-MAC Mask : Unspecified
    Destination-MAC  : Unspecified
    Destination-MAC Mask : Unspecified
Flow specification name  : fspec2 Type  : Ethernet
    Ethernet frame size  : Unspecified
    Ether type  : 1792
    Source-MAC  : 0:0:a0:f0:cc:22
    Source-MAC Mask : Unspecified
    Destination-MAC  : 0:11:22:33:a0:e2
    Destination-MAC Mask : Unspecified
Flow specification name  : fspec3 Type : Ethernet Unicast IPV4
    Ethernet frame size  : Unspecified
    Source-IP  : 121.0.0.1
    Source-IP Mask : Unspecified
    Destination-IP  : 132.1.0.1
    Destination-IP Mask : Unspecified
    Destination-mac : Unspecified
    IP-protocol : TCP
    Source-L4-port : 270
    Destination-L4-port : Unspecified
Flow specification name  : fspec4 Type  : Multicast IPV4
    Ethernet frame size  : Unspecified
    Source IP  : 100.0.0.23
    Destination multicast group IP:             225.0.0.1
Flow specification name  : fspec5 Type  : Multicast VLAN flood
    Ethernet frame size  : Unspecified
```

show oam fabric flow-specification (Flow Specification Specified)

user@host> **show oam fabric flow-specification fspec3**

```
Flow specification name  : fspec3 Type : Ethernet Unicast IPV4
```

```
Ethernet frame size  : Unspecified
Source-IP  : 121.0.0.1
Source-IP Mask : Unspecified
Destination-IP  : 132.1.0.1
Destination-IP Mask : Unspecified
Destination-mac : Unspecified
IP-protocol : TCP
Source-L4-port : 270
Destination-L4-port : Unspecified
```

show oam fabric interfaces

Syntax

```
show oam fabric interfaces
<interface-name>
<fabric-maintenance-association fma-name>
<brief>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Display the fabric maintenance associations (FMAs) and fabric maintenance endpoints (FMEPs) that are configured in a QFabric system Node group.

If you do not specify an interface, display information for an FMA (if one is specified) or all FMAs configured in the Node group.

Options

brief—(Optional) Summarized version of the output.

fabric-maintenance-association *fma-name*—(Optional) Name of a specific FMA.

interface-name—(Optional) Name of a specific interface.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

Overview of Internal Fabric Monitoring | 500
Configuring a Fabric Maintenance Association | 502
Configuring Flow Specifications | 503
fabric (OAM) | 531
ping fabric multicast-flow | 650
ping fabric unicast-flow | 652
traceroute fabric unicast-flow | 888

List of Sample Output

show oam fabric interfaces on page 885

Output Fields

Table 122 on page 885 lists the output fields for the **show oam fabric interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 122: show oam fabric interfaces Output Fields

Field Name	Field Description
Interface-name	Name of the interface.
Fabric-Maintenance Association	FMA name.
VLAN	VLAN name.
Interface state	State of the interface: Up or down.
MEP Identifier	FMEP identifier.
MEP Name	FMEP name.

Sample Output

show oam fabric interfaces

user@host> **show oam fabric interfaces**

```
Interface-name     Fabric-Maintenance     VLAN     Interface      MEP           MEP
                   Association                     state          Identifier    Name
ED1479:NULL         fma-default            *        up            32774
fmep-default-ED1479
ED1494:NULL         fma-default            *        up            32773
fmep-default-ED1494
ED1494:xe-0/0/7.0   fma1                   v100     up            1
ED1497:NULL         fma-default            *        up            32775
fmep-default-ED1497
ED1497:xe-0/0/8.0   fma1                   v100     up            2
P3613-C:NULL        fma-default            *        up            32777
fmep-default-P3613-C
```

show system software upgrade status

Syntax

```
show system software upgrade status
```

Release Information

Command introduced in Junos OS Release 13.1 for the QFX Series.

Description

(QFabric systems only) Display the status of a software upgrade, including details for both nonstop software upgrades and *component all* style upgrades.

Required Privilege Level

view

RELATED DOCUMENTATION

Performing a Nonstop Software Upgrade on the QFabric System | 592
Verifying Nonstop Software Upgrade for QFabric Systems | 599
Upgrading Software on a QFabric System | 625
request system software nonstop-upgrade | 698

List of Sample Output

show system software upgrade status (Nonstop Software Upgrade) on page 887
show system software upgrade status (Component All Upgrade) on page 887

Output Fields

Table 123 on page 886 lists the output fields for the **show system software upgrade status** command. Output fields are listed in the approximate order in which they appear.

Table 123: show system software upgrade status Output Fields

Field Name	Field Description
Timestamp	Displays the day of the week, month, date, hour, minute, second, and year when you issue the **show system software upgrade status** command. An example of the timestamp format is as follows: Wed Jan 16 22:06:02 2013.

Table 123: show system software upgrade status Output Fields *(continued)*

Field Name	Field Description
Software nonstop upgrade on:	Status of the upgrade: • **FM-0 in progress**—A Director group nonstop software upgrade is in process for the fabric manager Routing Engine. • **NW-NG-0 in progress**—A Node group nonstop software upgrade is in process for the network Node group. • **RSNG in progress**—A Node group nonstop software upgrade is in process for the redundant server Node group. • **all in progress**—A *component all* style upgrade is in process for the entire QFabric system.

Sample Output

show system software upgrade status (Nonstop Software Upgrade)

`user@qfabric>` **show system software upgrade status**

```
Wed Jan 16 22:06:02 2013 Software nonstop upgrade on:
                         NW-NG-0 in progress
                         RSNG in progress
```

show system software upgrade status (Component All Upgrade)

`user@qfabric>` **show system software upgrade status**

```
Wed Jan 16 22:37:48 2013 Software component upgrade on:
                         all in progress
```

traceroute fabric unicast-flow

Syntax

```
traceroute fabric unicast-flow flow-spec-name flow-specification-name fma fma-name
<source-fmep fmep-name>
<dest-fmep fmep-name>
<forced-fte-interface fte-interface>
<count count>
<verbose>
```

Release Information

Command introduced in Junos OS Release 12.2 for the QFX Series.

Description

Trace the path taken by a specific unicast flow (ping) operation across a VLAN on the QFabric system from a source maintenance endpoint (FMEP) to a destination FMEP. The source and destination FMEPs may be on the same Node device, different Node devices connected to the same Interconnect device, or different Node devices connected to different Interconnect devices.

The flow path is the sequence of Packet Forwarding Engine forwarding hops along which the protocol data unit (PDU) travels. The hop-by-hop sequence and number of hops are reported in terms of fabric maintenance intermediate points (FMIPs), which are interfaces on the Packet Forwarding Engine of the Interconnect device. An FMIP sends a response to the source FMEP when the traceroute PDU is received.

Options

dest-fmep-id *source-fmep-id*—(Optional) ID of the destination FMEP of the traceroute operation.

flow-spec-name *flow-specification-name*—Name of the flow specification that defines the parameters of the traceroute operation.

fma-name *fma-name*—Name of the FMA that associates a VLAN with the FMEPs.

forced-fte-interface *fte-interface*—(Optional) Option to force the fabric ping operation to use the specified FTE interface to inject the PDU into the fabric instead of using the internal forwarding path lookup table to determine the FTE interface.

source-fmep-id *source-fmep-id*—(Optional) ID of the FMEP that is the source of the traceroute operation.

verbose—(Optional) Detailed version of the output display.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

RELATED DOCUMENTATION

List of Sample Output

traceroute fabric unicast-flow on page 890
traceroute fabric unicast-flow (Verbose) on page 890

Output Fields

Table 124 on page 889 lists the output fields for the **traceroute fabric-unicast-flow** command. Output fields are listed in the approximate order in which they appear.

Table 124: traceroute fabric unicast-flow Output Fields

Field Name	Field Description
Fabric flow traceroute between source *source-fmep-name* destination *destination-fmep-name*	Source and destination FMEP names.
Using fabric flow-specification	Name of the flow specification.
Ethernet frame-size	Ethernet frame size.
Source-MAC	MAC address of the source FMEP interface.
Destination-MAC	MAC address of the destination FMEP interface.
Ethertype	EtherType protocol.
Received response from fmip-id, interface	FMIP identifier and interface name of the FMIP that received the PDU and responded to the source FMEP.
Received total *number* responses	Number of responses that are received after the traceroute operation has finished.

Sample Output

traceroute fabric unicast-flow

`user@host>` **traceroute fabric unicast-flow fma-name fma1 source-fmep-id 1 dest-fmep-id 2 flow-spec-name fspec1**

```
Received response from fmip-id 128.40.0.8, interface A0003:0/1/2
Received response from fmip-id 128.128.0.8, interface A0003:0/0/8
Received response from fmep-id 2
Received total 3 responses
```

Sample Output

traceroute fabric unicast-flow (Verbose)

`user@host>` **traceroute fabric unicast-flow fma-name fma1 source-fmep-id 1 dest-fmep-id 2 flow-spec-name fspec1 verbose**

```
Fabric flow traceroute between source ED1494 destination ED1497
Using fabric flow-specification: fspec1
Ethernet frame-size: 256
Source-MAC: 0:EF:7:99:85:10
Destination-MAC: 0:D3:A6:11:39:21
Ethertype: 11564
Received response from fmip-id 128.40.0.8, interface A0003:0/1/2
Received response from fmip-id 128.128.0.8, interface A0003:0/0/8
Received response from fmep-id 2
Received total 3 responses
```

5

PART

Troubleshooting

CHAPTER 23

QFabric System Troubleshooting

IN THIS CHAPTER

Performing System Backup and Recovery for a QFabric System

Many routers and switches require an administrator to recover the software package and the configuration file for the device separately. In the case of a device failure, this means the administrator might need to perform two separate tasks (if neither the software package nor the configuration file can be recovered).

In contrast, the QFabric system uses a unique mechanism that saves the backup and recovery files for both the Junos OS software and the system configuration into a single collection. The following QFabric system backup and recovery mechanism simplifies and streamlines the recovery process so you can return to normal operations as quickly as possible.

To backup and recover your QFabric system:

1. (First time only) Implement the following one-time procedure to prepare your QFabric system to use the system backup and recovery feature:

   - Insert a Juniper Networks software installation USB flash drive into the master Director device. (This drive was provided to you as one of the components of your QFabric system shipment.)
   - Issue the **request system software format-qfabric-backup** command. The contents and format of the USB flash drive are copied to the Director group shared directory and are used as the basis for all future backup and recovery operations.

   `user@qfabric>` **request system software format-qfabric-backup**

   ```
   Copying QFabric USB template image from /dev/sdb(Unigen,PQS4000,4009 MB)......
   ```

- Remove the Juniper Networks software installation USB drive from the master Director device.

2. Issue the **request system software system-backup** command to backup the software package and configuration file. This command saves the current files necessary to recover the QFabric system. The files are saved to a shared memory directory in the Director group.

   > **NOTE:** As you upgrade your system with new software and change the system configuration over time, remember to reissue this command periodically to save the newest files for recovery purposes.

   user@qfabric> **request system software system-backup**

   ```
   user@qfabric>
   ```

3. Insert a 4 GB or larger USB flash drive into the master Director device for your Director group, and issue the **request system software system-backup usb-create** command. This command copies the recovery files that have been backed up in the Director group and transfers them to the USB flash drive to create a recovery USB drive.

   > **NOTE:** Issuing this command overwrites the contents of the USB flash drive with the QFabric system recovery files.

   user@qfabric> **request system software system-backup usb-create /dev/sdb**

   ```
   Issuing this command will overwrite the contents of the USB drive.
   Continue? [yes,no] (no) yes

   This operation will access the USB drive on 0281042010000013.
   Are you sure you want to continue? [yes,no] (no) yes

   Copying QFabric recovery media to /dev/sdb...
   Successfully copied QFabric recovery media to /dev/sdb
   ```

4. Remove the recovery USB drive from the Director device, and store it securely in a known location that you will remember when you need to use the recovery USB drive.

5. If the QFabric system fails, power off the Director group, insert the recovery USB drive into the master Director device of your Director group, turn on power to the Director device, and follow the prompts

to recover your system. This step restores the software package and the configuration file for your QFabric system.

RELATED DOCUMENTATION

request system software format-qfabric-backup | 697
request system software system-backup | 706

Performing a QFabric System Recovery Installation on the Director Group

IN THIS SECTION

If the software on your QFabric system is damaged in some way that prevents the software from loading correctly, or you need to upgrade the software on your QFabric system, you may need to perform a recovery installation on the Director group.

If possible, perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device (for example, an external USB flash drive) for each of your Director devices to use during the recovery installation.

   You can either use the external USB flash drive containing the software supplied by Juniper Networks, or you can use an external USB flash drive supplied by Juniper Networks on which you install the QFabric system install media.

2. Because the recovery installation process completely overwrites the entire contents of the Director device, make sure you back up any configuration files and initial setup information on a different external USB flash drive before you begin a recovery installation. You will need to restore this information as part of recovery process.

   Use the **request system software configuration-backup** command to back up your configuration files and initial setup information:

```
user@switch> request system software configuration-backup path
```

NOTE: To recover the Director group, you must upgrade both Director devices in parallel. If you are recovering only one Director device in a Director group, and the software version will remain the same between the two Director devices, make sure that the other Director device is powered on and operational. If the software version of the Director device you are recovering will be different, make sure that the other Director device is powered off and is not operational.

(Optional) Creating an Emergency Boot Device Using a Juniper Networks External Blank USB Flash Drive

If you do not have an external USB flash drive preloaded with the software from Juniper Networks to use as an emergency boot device, you can create your own, using a blank external USB flash drive provided by Juniper Networks. Download the install media from the Juniper Networks Support website onto your UNIX workstation, uncompress and untar the software, and then burn the software image onto your Juniper Networks external USB (4-gigabyte) flash drive. Make sure you create two emergency boot devices, one for each Director device, so you can perform a recovery installation in parallel.

1. Using a Web browser, navigate to the https://www.juniper.net/support .

2. Click **Download Software**.

3. In the *Switching*box, click *Junos OS Platforms*.

4. In the *QFX Series* section, click the name of the platform for which you want to download software.

5. Click the *Software* tab and select the release number from the *Release* drop-down list.

6. Select the complete install media you want to download in the *QFabric System Install Media* section.

   A login screen appears.

7. Enter your name and password and press **Enter**.

8. Read the End User License Agreement, click the **I agree** radio button, and then click **Proceed**.

9. Log in and save the install media file to your UNIX workstation.

10. Use FTP to access the UNIX workstation where the install media resides.

ftp ftp://*hostname*/*pathname* *install-media-qfabric-<version>*.img.tgz

11. When prompted, enter your username and password.

12. Make sure you are in binary mode by entering **binary** at the prompt.

    binary

13. Use the **get** command to transfer the installation package from the FTP host to your UNIX workstation.

    get *install-media-qfabric-<version>*.img.tgz

14. Close the FTP session:

    bye

15. Untar the *install-media-qfabric-<version>* .img.tgz file on your UNIX workstation.

    ```
    tar -xvzf install-media-qfabric-11.3X30.6.img.tgz
    ```

16. Insert a blank external USB (4-gigabyte) flash drive supplied by Juniper Networks into your UNIX workstation.

17. Erase the bootable partition in the external USB flash drive by issuing the following **dd** command.

    dd if=/dev/zero of=/dev/sdb count=20

18. Burn the software image you just downloaded to your UNIX workstation onto your external USB flash drive by issuing the following **dd** command:

    dd if=install-media-qfabric-11.3X30.6.img of=/dev/sdb bs=16k

    ```
    250880+0 records in
    250880+0 records out
    4110417920 bytes (4.1 GB) copied, 5.10768 seconds, 805 MB/s
    ```

19. Perform the steps in “Performing a Recovery Installation Using a Juniper Networks External USB Flash Drive with Preloaded Software” on page 634 to continue with the recovery installation.

Performing a Recovery Installation Using a Juniper Networks External USB Flash Drive with Preloaded Software

This procedure describes how to perform a recovery installation using an external USB flash drive that contains Junos OS software.

> **NOTE:** Since the recovery installation process completely overwrites the entire contents of the Director device, you will need to restore the required configuration files and initial setup information. The following procedure assumes you previously saved these backup files with the **request system software configuration-backup** command. Ensure that you have these backup files available on an external USB flash drive before you perform the following steps.

1. Insert the external USB flash drive into the Director device.

2. Perform one of the following tasks:

   - If you have access to the default partition, reboot the Director device by issuing the **request system reboot director-group** command.
   - If you do not have access to the default partition, power cycle the Director device.

   The following menu appears on the Director device console when the Director device boots up:

   ```
   Juniper Networks QFabric Director Install/Recovery Media
   -  To boot from the local disk, wait 10 seconds or press the Enter key.
   -  To reinstall the QFabric software on this Director device, type: install
   ```

3. Type **install** and then press **Enter** to install the software on the Director device.

   Once the installation process is complete, the Director device reboots, and the following menu appears on the Director device console:

   ```
   Juniper Networks QFabric Director Install/Recovery Media
   -  To boot from the local disk, wait 10 seconds or press the Enter key.
   -  To reinstall the QFabric software on this Director device, type: install
   ```

4. Press **Enter** twice.

   The Director device reboots a second time from the local disk that contains the newly installed software.

5. When you see the following prompts, press **Enter**.

```
Starting xinetd: [  OK  ]
Starting atop:  [  OK  ]
```

6. Log in as root on the Director device. Type **root** and press **Enter**.

   `dg0 login:` **root**

7. Because the root password has been removed as part of the recovery process, press **Enter** a second time to skip the password entry step.

   NOTE: Do not enter a root password at this time.

8. The following menu appears on the Director device console:

```
Before you can access the QFabric system, you must complete the initial setup
of the Director group by using the steps that follow.
If the initial setup procedure does not complete successfully, log out of the
Director device and then log back in to restart
 this setup menu.

Continue?[y/n]
```

9. Enter **n** to bypass the initial setup script and enter the Director device root directory, where you can mount the external USB flash drive containing the configuration files and initial setup information.

10. Issue the **ls /mnt** command to list the *mount* directory.

    `root@dg0 ~]#` **ls /mnt**

11. Issue the **mkdir** command to create a directory within the mount directory.

    `root@dg0 ~]#` **mkdir /mnt/myusb**

12. Issue the **mount /dev/sdb2 /mnt/myusb/** command to mount the external USB flash drive to the local drive of the Director device.

    `root@dg0 ~]#` **mount /dev/sdb2 /mnt/myusb/**

13. Issue the **ls -la /mnt/myusb/** command to verify the contents of your mounted external USB flashdrive.

    `root@dg0 ~]#` **ls -la /mnt/myusb/**

```
total 1770884
drwxr-xr-x 2 root root       4096 Sep  7 05:16 .
drwxr-xr-x 3 root root       4096 Sep  7 10:15 ..
-rw-r--r-- 1 root root       4249 Sep  7 03:52 mybackup-20110907
```

14. Exit the Director device and log back in as root on the Director device.

    The following menu appears:

```
Before you can access the QFabric system, you must complete the initial setup
of the Director group by using the steps that follow.
If the initial setup procedure does not complete successfully, log out of the
Director device and then log back in to restart
 this setup menu.

Continue?[y/n] y
Initial Configuration

You may enter the configuration manually or restore from a backup.

Specify a backup file? [y/n] : y
Please specify the full path of the configuration backup file. :
/mnt/myusb/mybackup-20110907
```

15. Enter **y** to continue.

16. Enter **y** and specify the path to the backup configuration file located on the external USB flash drive.

    `/mnt/myusb/mybackup-20110907`

    The following messages appear:

```
Saving temporary configuration...
Configuring peer...
connect error for 1.1.1.2:9001
Configuring local interfaces...
Configuring interface eth0 with [10.49.213.163/24:10.49.213.254]
Configured interface eth0 with [10.49.213.163/24:10.49.213.254]
Configuring QFabric software with initial pool of 4000 MAC addresses
[00:10:00:00:00:00 - 00:10:00:00:0f:3b]
Configuring QFabric address [10.49.213.50]
Reconfiguring QFabric software static configuration
Applying the new Director Device password
```

```
Applying the QFabric component password
First install initial configuration, generating and sharing SSH keys.
First install initial configuration, generating SSH keys.
connect error for 1.1.1.2:9001
Shared SSH keys.
Configuration complete. Director Group services will auto start within 30 seconds.
```

The Director device reboots from the local disk on which the software was just installed. Exit the Director device session and log in to the QFabric default partition CLI.

17. Issue the **request system software configuration-restore** command and specify the path to the backup configuration file located on the external USB flash drive to load the previously saved QFabric system configuration.

18. From the default partition, issue the **request system reboot node-group all** command to reboot all of the Node groups in the QFabric system to ensure that all Node devices are running the same version of software as the Director-group.

    `user@switch>` **request system reboot node-group all**

19. From the default partition, issue the **request system reboot fabric** command to reboot the Interconnect devices and the other components in the fabric in the QFabric system to ensure that Interconnect devices are running the same version of software as the Director group.

    `user@switch>` **request system reboot fabric**

20. Log in to the default partition and issue the **show version component all** command to verify that all components are running the same version of software.

    `user@switch>` **show version component all**

```
dg1:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]

dg0:
-
Hostname: qfabric
Model: qfx3100
JUNOS Base Version [11.3X30.6]
```

```
NW-NG-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FC-1:
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

DRE-0:
-
Hostname: dre-0
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
```

```
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

FM-0:
-
Hostname: qfabric
Model: qfx-jvre
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

nodedevice1:
-
Hostname: qfabric
Model: QFX3500
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
JUNOS Routing Software Suite [11.3X30.6]

interconnectdevice1:
-
Hostname: qfabric
Model: QFX3108
JUNOS Base OS boot [11.3X30.6]
JUNOS Base OS Software Suite [11.3X30.6]
JUNOS Kernel Software Suite [11.3X30.6]
JUNOS Crypto Software Suite [11.3X30.6]
JUNOS Online Documentation [11.3X30.6]
JUNOS Enterprise Software Suite [11.3X30.6]
JUNOS Packet Forwarding Engine Support (QFX RE) [11.3X30.6]
```

```
JUNOS Routing Software Suite [11.3X30.6]
warning:  from interconnectdevice0: Disconnected
```

RELATED DOCUMENTATION

Performing the QFabric System Initial Setup on a QFX3100 Director Group | 428

Upgrading Software on a QFabric System | 625

request system software configuration-backup

request system software configuration-restore

Performing a Recovery Installation

If Junos OS on your device is damaged in some way that prevents the software from loading correctly, you may need to perform a recovery installation using an emergency boot device (for example, a USB flash drive) to restore the default factory installation. Once you have recovered the software, you need to restore the device configuration. You can either create a new configuration as you did when the device was shipped from the factory, or if you saved the previous configuration, you can simply restore that file to the device.

Starting in Junos OS Release 14.1, you can also use a system snapshot as a bootup option when your Junos OS or configuration is damaged. The system snapshot feature takes a "snapshot" of the files currently used to run the device—the complete contents of the **/config** directories, which include the running Juniper Networks Junos OS, the active configuration, and the rescue configuration, as well as the host OS—and copies all of these files into an external USB flash drive. See *Understanding How to Back Up an Installation on Switches*.

NOTE: System snapshot is not supported on QFX10002 switches.

If at all possible, you should try to perform the following steps before you perform the recovery installation:

1. Ensure that you have an emergency boot device to use during the installation. See "Creating an Emergency Boot Device for QFX Series Switches" on page 906 for information on how to create an emergency boot device.
2. Copy the existing configuration in the file **/config/juniper.conf.gz** from the device to a remote system, such as a server, or to an emergency boot device. For extra safety, you can also copy the backup configurations (the files named **/config/juniper.conf.*n***, where *n* is a number from 0 through 9) to a remote system or to an emergency boot device.

   WARNING: The recovery installation process completely overwrites the entire contents of the internal flash storage.

3. Copy any other stored files to a remote system as desired.

To reinstall Junos OS:

1. Insert the emergency boot device into the QFX Series device.
2. Reboot the QFX Series device.

NOTE: Do not power off the device if it is already on.

```
[edit system]
user@device> request system reboot
```

If you do not have access to the CLI, power cycle the QFX Series device.

The emergency boot device (external USB install media) is detected. At this time, you can load the Junos OS from the emergency boot device onto the internal flash storage.

3. The software prompts you with the following options:

```
External USB install media detected.
You can load Junos from this media onto an internal drive.
Press 'y' to proceed, 'f' to format and install, or 'n' to abort.
Do you wish to continue ([y]/f/n)? f
```

4. Type **f** to format the internal flash storage and install the Junos OS on the emergency boot device onto the internal flash storage.

   If you do no want to format the internal flash storage, type **y**.

   The following messages are displayed:

```
Installing packages from external USB drive da1
Packages will be installed to da0, media size: 8G

Processing format options
Fri September  4 01:18:44 UTC 2012

-- IMPORTANT INFORMATION --
Installer has detected settings to format system boot media.
This operation will erase all data from your system.

Formatting installation disk .. this will take a while, please wait
Disabling platform watchdog - threshold 12 mins

Determining installation slice
Fri September  4 01:27:07 UTC 2012
```

5. The device copies the software from the emergency boot device, occasionally displaying status messages. Copying the software can take up to 12 minutes.

When the device is finished copying the software, you are presented with the following prompt:

```
*** Fri September  4 01:19:00 UTC 2012***
Installation successful..
Please select one of the following options:
Reboot to installed Junos after removing install media (default) ... 1
Reboot to installed Junos by disabling install media ............... 2
Exit to installer debug shell ...................................... 3
Install Junos to alternate slice ................................... 4
Your choice: 4
NOTE: System installer will now install Junos to alternate slice
Do not power off or remove the external installer media or
interrupt the installation mechanism.
```

6. Select **4** to install Junos OS to the alternate slice of the partition, and then press Enter.
7. Remove the emergency boot device when prompted and then press Enter. The device then reboots from the internal flash storage on which the software was just installed. When the reboot is complete, the device displays the login prompt.
8. Create a new configuration as you did when the device was shipped from the factory, or restore the previously saved configuration file to the device.

Release History Table

Release	Description
14.1	Starting in Junos OS Release 14.1, you can also use a system snapshot as a bootup option when your Junos OS or configuration is damaged.

RELATED DOCUMENTATION

Creating an Emergency Boot Device for QFX Series Switches | 906

Creating an Emergency Boot Device for QFX Series Switches

If Junos OS on the device is damaged in some way that prevents the software from loading properly, you can use an emergency boot device to repartition the primary disk and load a fresh installation of Junos OS. Use the following procedure to create an emergency boot device.

Before you begin, you need to the installation media image for your device and Junos OS release from https://www.juniper.net/customers/support/ .

NOTE: You can create the emergency boot device on another Juniper Networks switch or router, or any PC or laptop that supports Linux. The steps you take to create the emergency boot device vary, depending on the device.

To create an emergency boot device:

1. Use FTP to copy the installation media image into the **/var/tmp** directory on the device.

2. Use gunzip to unzip the image file.

3. Insert a USB device into the USB port.

4. From the Junos OS command-line interface (CLI), start the shell:

   ```
   user@device> start shell
   %
   ```

5. Switch to the root account using the **su** command:

   ```
   % su
   Password: password
   ```

   NOTE: The password is the root password for the device. If you logged in to the device as root, you do not need to perform this step.

6. Enter the following command on the device:

   `root@device%` **dd if=/var/tmp/*filename* of=/dev/da1 bs=1m**

   The device writes the installation media image to the USB device:

   ```
   root@device% dd if=install-media-qfx-5e-15.1X53-D30.5-domestic.img of=/dev/da0
    bs=1m
   1399+0 records in
   ```

```
1399+0 records out
1466957824 bytes transferred in 394.081902 secs (3722469 bytes/sec)
```

7. Log out of the shell:

```
root@device% exit
% exit
user@device>
```