Interfaces on the QFX Series

Release
13.2

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

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

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About the Documentation

Documentation and Release Notes

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If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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Supported Platforms

For the features described in this document, the following platforms are supported:

- QFX Series standalone switches

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 the *CLI User Guide*.

Documentation Conventions

Table 1 on page xv 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 xv 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**

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

Convention	Description	Examples
`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*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• 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**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric *metric*>;**
| (pipe symbol)	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.	**broadcast | multicast** **(*string1* | *string2* | *string3*)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [*community-ids*]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		    route default {
		      nexthop *address*;
		      retain;
		    }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
GUI Conventions		
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**.

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

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

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- 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).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or JNASC support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
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- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/

- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: http://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: http://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: http://www.juniper.net/cm/

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

Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- 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 http://www.juniper.net/support/requesting-support.html.

PART 1

Overview

CHAPTER 1

Interfaces Overview

Interfaces Overview

Juniper Networks devices have two types of interfaces: network interfaces and special interfaces. This topic provides brief information about these interfaces. For additional information, see the *Junos OS Network Interfaces Library for Routing Devices*.

Network Interfaces

Network interfaces connect to the network and carry network traffic. Table 3 on page 3 lists the types of network interfaces supported.

Table 3: Network Interface Types and Purposes

Type	Purpose
Aggregated Ethernet interfaces	You can group Ethernet interfaces at the physical layer to form a single link-layer interface, also known as a *link aggregation group (LAG)* or *bundle*. These aggregated Ethernet interfaces help to balance traffic and increase the uplink bandwidth.

Table 3: Network Interface Types and Purposes *(continued)*

Type	Purpose
Channelized Interfaces	Depending on the device and software package, 40-Gbps QSFP+ ports can be configured to operate as the following types of interfaces: • 10-Gigabit Ethernet interfaces (*xe*) • 40-Gigabit Ethernet interfaces (*et* and *xle*) • 40-Gigabit data plane uplink interfaces (*fte*) When an *et* port is channelized to four *xe* ports, a colon is used to signify the four separate channels. For example, on a QFX3500 standalone switch with port 2 on PIC 1 configured as four 10-Gigabit Ethernet ports, the interface names are *xe-0/1/2:0*, *xe-0/1/2:1*, *xe-0/1/2:2*, and *xe-0/1/2:3* NOTE: You cannot configure channelized interfaces to operate as Virtual Chassis ports.
Ethernet Interfaces	You can configure Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet interfaces to connect to other servers, storage, and switches. You can configure 40-Gigabit data plane uplink ports to connect a Node device to an Interconnect devices as well as for Virtual Chassis ports (VCPs).
Fibre Channel interfaces	You can use Fibre Channel interfaces to connect the switch to a Fibre Channel over Ethernet (FCoE) forwarder or a Fibre Channel switch in a storage area network (SAN). You can configure Fibre Channel interfaces only on ports 0 through 5 and 42 through 47 on QFX3500 devices. Fibre Channel interfaces do not forward Ethernet traffic.
LAN access interfaces	You can use these interfaces to connect to other servers, storage, and switches. When you power on a QFX Series product and use the factory-default configuration, the software automatically configures interfaces in access mode for each of the network ports.
Multichassis aggregated Ethernet (MC-AE) interfaces	You can group a LAG on one standalone switch with a LAG on another standalone switch to create a MC-AE. The MC-AE provides load balancing and redundancy across the two standalone switches.
Tagged-access mode interfaces	You can used tagged-access interfaces to connect a switch to an access layer device. Tagged-access interfaces can accept VLAN-tagged packets from multiple VLANs.
Trunk interfaces	You can use trunk interfaces to connect to other switches or routers. To use a port for this type of connection, you must explicitly configure the port interface for trunk mode. The interfaces from the switches or routers must also be configured for trunk mode. In this mode, the interface can be in multiple VLANs and accept tagged packets from multiple devices. Trunk interfaces typically connect to other switches and to routers on the LAN.
Virtual Chassis ports (VCPs)	You can use Virtual Chassis ports to send and receive Virtual Chassis Control Protocol (VCCP) traffic, and to create, monitor, and maintain the Virtual Chassis. On QFX3500, QFX3600, QFX5100, and EX4600 standalone switches, you can configure 40-Gigabit Ethernet QSFP+ uplink ports (non-channelized) or fixed SFP+ 10-Gigabit Ethernet ports as VCPs by issuing the **request virtual-chassis-vc-port-set** CLI command.

Special Interfaces

Table 4 on page 5 lists the types of special interfaces supported on the QFX Series.

Table 4: Special Interface Types and Purposes

Type	Purpose
Console port	Each QFX Series product has a serial port, labeled **CON** or **CONSOLE**, for connecting tty-type terminals to the switch using standard PC-type tty cables. The console port does not have a physical address or IP address associated with it. However, it is an interface in the sense that it provides access to the switch.
Loopback interface	All QFX Series products have this software-only virtual interface that is always up. The loopback interface provides a stable and consistent interface and IP address on the switch.
Management interface	The Juniper Networks Junos OS for the QFX Series includes management Ethernet interfaces. The management Ethernet interface provides an out-of-band method for connecting to a standalone switch and QFabric system.
Routed VLAN interfaces (RVI and IRB interfaces)	QFX Series products use a Layer 3 routed VLAN interface (called RVI in the original CLI, and called IRB in Enhanced Layer 2 Software) **vlan** to route traffic from one broadcast domain to another and to perform other Layer 3 functions such as traffic engineering. These functions are typically performed by a router interface in a traditional network. The RVI or IRB functions as a logical router, eliminating the need for having both a switch and a router. The RVI or IRB must be configured as part of a broadcast domain or virtual private LAN service (VPLS) routing instance for Layer 3 traffic to be routed out of it.

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- Understanding Interface Naming Conventions on page 15
- Understanding Layer 3 Logical Interfaces on page 22
- Understanding Management Interfaces on page 24

- *Understanding Integrated Routing and Bridging*
- *Overview of Fibre Channel*

Overview of Uplink Failure Detection

Uplink failure detection allows a switch to detect link failure on uplink interfaces and to propagate this information to the downlink interfaces, so that servers connected to those downlinks can switch over to secondary interfaces.

Uplink failure detection supports network adapter teaming and provides network redundancy. In network adapter teaming, all of the network interface cards (NICs) on a server are configured in a primary or secondary relationship and share the same IP address. When the primary link goes down, the server transparently shifts the connection to the secondary link. With uplink failure detection, the switch monitors uplink interfaces for link failures. When it detects a failure, it disables the downlink interfaces. When the server detects disabled downlink interfaces, it switches over to the secondary link to help ensure that the traffic of the failed link is not dropped.

This topic describes:

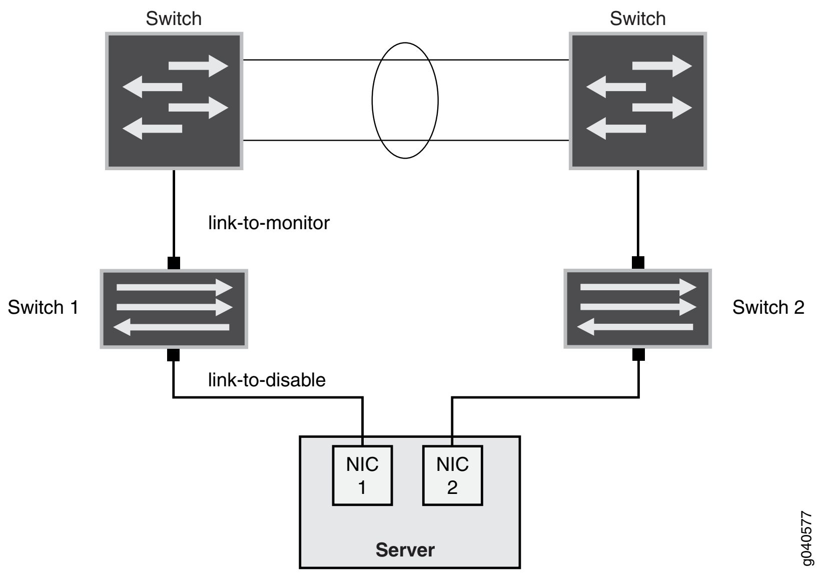
- Uplink Failure Detection Configuration on page 6
- Failure Detection Pair on page 7

Uplink Failure Detection Configuration

Uplink failure detection allows switches to monitor uplink interfaces to spot link failures. When a switch detects a link failure, it automatically disables the downlink interfaces bound to the uplink interface. A server that is connected to the disabled downlink interface triggers a network adapter failover to a secondary link to avoid any traffic loss.

Figure 1 on page 6 illustrates a typical setup for uplink failure detection.

Figure 1: Uplink Failure Detection Configuration on Switches



For uplink failure detection, you specify a group of uplink interfaces to be monitored and downlink interfaces to be brought down when an uplink fails. The downlink interfaces are bound to the uplink interfaces within the group. If all uplink interfaces in a group go down, then the switch brings down all downlink interfaces within that group. If any uplink interface returns to service, then the switch brings all downlink interfaces in that group back to service.

The switch can monitor both physical interface links and logical interface links for uplink failures, but you must put the two types of interfaces into separate groups.

NOTE: For logical interfaces, the server must send keepalives between the switch and the server to detect failure of logical links.

Failure Detection Pair

Uplink failure detection requires that you create pairs of uplink and downlink interfaces in a group. Each pair includes one of each of the following:

- A link-to-monitor interface—The link-to-monitor interfaces specify the uplinks the switch monitors. You can configure a maximum of eight uplink interfaces as link-to-monitor interfaces for a group.
- A link-to-disable interface—The link-to-disable interfaces specify the downlinks the switch disables when the switch detects an uplink failure. You can configure a maximum of 48 downlinks to disable in the group.

The link-to-disable interfaces are bound to the link-to-monitor interfaces within the group. When a link-to-monitor interface returns to service, the switch automatically enables all link-to-disable interfaces in the group.

Related Documentation

- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

Understanding Aggregated Ethernet Interfaces and LACP

IEEE 802.3ad link aggregation enables you to group Ethernet interfaces to form a single, aggregated Ethernet interface, also known as a *link aggregation group (LAG)* or *bundle*.

Link aggregation is used to aggregate Ethernet interfaces between two devices. You can create a LAG between a Juniper Networks device and a router, switch, aggregation switch, server, or other devices. The aggregated Ethernet interfaces that participate in a LAG are called member links. Because a LAG is composed of multiple member links, even if one member link fails, the LAG continues to carry traffic over the remaining links.

NOTE: On QFX5100 and EX4600 standalone switches and on a QFX5100 Virtual Chassis and EX4600 Virtual Chassis, you can configure a mixed rate of link speeds for the aggregated Ethernet bundle. Only link speeds of 40G and 10G are supported. Load balancing will not work if you configure link speeds that are not supported.

Link Aggregation Contol Protocol (LACP) is a subcomponent of the IEEE 802.3ad standard and is used as a discovery protocol.

NOTE: To ensure load balancing across the aggregated Ethernet (AE) interfaces on a redundant server Node group, the members of the AE must be equally distributed across the redundant server Node group.

- Link Aggregation Group on page 8
- Link Aggregation Control Protocol (LACP) on page 9

Link Aggregation Group

To create a LAG:

1. Create a logical aggregated Ethernet interface.
2. Define the parameters associated with the logical aggregated Ethernet interface, such as a logical unit, interface properties, and Link Aggregation Control Protocol (LACP).
3. Define the member links to be contained within the aggregated Ethernet interface—for example, two 10-Gigabit Ethernet interfaces.
4. Configure LACP for link detection.

Keep in mind these hardware and software guidelines:

- Up to 32 Ethernet interfaces can be grouped to form a LAG on a redundant server Node group, a server Node group, and a network Node group on a QFabric system. Up to 48 LAGs are supported on redundant server Node groups and server Node groups on a QFabric system, and up to 128 LAGs are supported on network Node groups on a QFabric system. You can configure LAGs across Node devices in redundant server Node groups, server Node groups, and network Node groups.

  NOTE: If you try to commit a configuration containing more than 32 Ethernet interfaces in a LAG, you will receive an error message saying that the group limit of 32 has been exceeded, and the configuration checkout has failed.

- Up to 64 Ethernet interfaces can be grouped to form a LAG, and up to 448 LAGs are supported on QFX3500, QFX3600, QFX5100, and EX4600 switches.

NOTE: If you try to commit a configuration containing more than 64 Ethernet interfaces in a LAG, you will receive an error message saying that the group limit of 64 has been exceeded, and the configuration checkout has failed.

- The LAG must be configured on both sides of the link.
- The interfaces on either side of the link must be set to the same speed and be in full-duplex mode.

NOTE: On a QFX5100 and EX4600 standalone switch or QFX5100 Virtual Chassis and EX4600 Virtual Chassis, you can configure mixed rate aggregated Ethernet bundles (LAGs with different link speeds).

NOTE: Junos OS assigns a unique ID and port priority to each port. The ID and priority are not configurable.

- QFabric systems support a special LAG called an FCoE LAG, which enables you to transport FCoE traffic and regular Ethernet traffic (traffic that is not FCoE traffic) across the same link aggregation bundle. Standard LAGs use a hashing algorithm to determine which physical link in the LAG is used for a transmission, so communication between two devices might use different physical links in the LAG for different transmissions. An FCoE LAG ensures that FCoE traffic uses the same physical link in the LAG for requests and replies in order to preserve the virtual point-to-point link between the FCoE device converged network adapter (CNA) and the FC SAN switch across a QFabric system Node device. An FCoE LAG does not provide load balancing or link redundancy for FCoE traffic. However, regular Ethernet traffic uses the standard hashing algorithm and receives the usual LAG benefits of load balancing and link redundancy in an FCoE LAG. See *Understanding FCoE LAGs* for more information.

Link Aggregation Control Protocol (LACP)

LACP is one method of bundling several physical interfaces to form one logical aggregated Ethernet interface. The LACP mode can be active or passive. The transmitting link is known as the *actor*, and the receiving link is known as the *partner*. If the actor and partner are both in passive mode, they do not exchange LACP packets, and the aggregated Ethernet links do not come up. If either the actor or partner is active, they do exchange LACP packets. By default, LACP is in passive mode on aggregated Ethernet interfaces. To initiate transmission of LACP packets and response to LACP packets, you must enable LACP active mode. You can configure Ethernet links to actively transmit protocol data units (PDUs), or you can configure the links to passively transmit them, sending out LACP PDUs only when they receive them from another link. You can configure both VLAN-tagged and untagged aggregated Ethernet interfaces without LACP enabled. LACP is defined in IEEE 802.3ad, *Aggregation of Multiple Link Segments*.

LACP was designed to achieve the following:

- Automatic addition and deletion of individual links to the LAG without user intervention.
- Link monitoring to check whether both ends of the bundle are connected to the correct group.

When a dual-homed server is deployed with a switch, the network interface cards form a LAG with the switch. During a server upgrade, the server may not be able to exchange LACP PDUs. In such a situation you can configure an interface to be in the **up** state even if no PDUs are exchanged. Use the **force-up** statement to configure an interface when the peer has limited LACP capability. The interface selects the associated LAG by default, whether the switch and peer are both in active or passive mode. When there are no received PDUs, the partner is considered to be working in the passive mode. Therefore, LACP PDU transmissions are controlled by the transmitting link.

If the remote end of the LAG link is a security device, LACP might not be supported because security devices require a deterministic configuration. In this case, do not configure LACP. All links in the LAG are permanently operational unless the switch detects a link failure within the Ethernet physical layer or data link layers.

Related Documentation

- Configuring Link Aggregation on page 85
- *Configuring an FCoE LAG*
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- *Example: Configuring an FCoE LAG on a Redundant Server Node Group*
- Verifying the Status of a LAG Interface on page 200
- *Junos OS Network Interfaces Library for Routing Devices*

Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic

Juniper Networks EX Series and QFX Series use a hashing algorithm to determine how to forward traffic over a link aggregation group (LAG) bundle or to the next-hop device when equal-cost multipath (ECMP) is enabled.

The hashing algorithm makes hashing decisions based on values in various packet fields, as well as on some internal values like source port ID and source device ID. You can configure some of the fields that are used by the hashing algorithm.

This topic contains the following sections:

Understanding the Hashing Algorithm

The hashing algorithm is used to make traffic-forwarding decisions for traffic entering a LAG bundle or for traffic exiting a switch when ECMP is enabled.

For LAG bundles, the hashing algorithm determines how traffic entering a LAG bundle is placed onto the bundle's member links. The hashing algorithm tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

For ECMP, the hashing algorithm determines how incoming traffic is forwarded to the next-hop device.

The hashing algorithm makes hashing decisions based on values in various packet fields, as well as on some internal values like source port ID and source device ID. The packet fields used by the hashing algorithm varies by the packet's EtherType and, in some instances, by the configuration on the switch. The hashing algorithm recognizes the following EtherTypes:

- IP (IPv4 and IPv6)
- MPLS
- MAC-in-MAC

Traffic that is not recognized as belonging to any of these EtherTypes is hashed based on the Layer 2 header. IP and MPLS traffic are also hashed based on the Layer 2 header when a user configures the hash mode as Layer 2 header.

You can configure some fields that are used by the hashing algorithm to make traffic forwarding decisions. You cannot, however, configure how certain values within a header are used by the hashing algorithm.

Note the following points regarding the hashing algorithm:

- The fields selected for hashing are based on the packet type only. The fields are not based on any other parameters, including forwarding decision (bridged or routed) or egress LAG bundle configuration (Layer 2 or Layer 3).
- The same fields are used for hashing unicast and multicast packets. Unicast and multicast packets are, however, hashed differently.
- The same fields are used by the hashing algorithm to hash ECMP and LAG traffic, but the hashing algorithm hashes ECMP and LAG traffic differently. The different hashing ensures that traffic is not polarized when a LAG bundle is part of the ECMP next-hop path.
- The same fields are used for hashing regardless of whether the switch is or is not participating in a mixed or non-mixed Virtual Chassis or Virtual Chassis Fabric (VCF).

The fields used for hashing by each EtherType as well as the fields used by the Layer 2 header are discussed in the following sections.

IP (IPv4 and IPv6)

Payload fields in IPv4 and IPv6 packets are used by the hashing algorithm when IPv4 or IPv6 packets need to be placed onto a member link in a LAG bundle or sent to the next-hop device when ECMP is enabled.

The hash mode is set to Layer 2 payload field, by default. IPv4 and IPv6 payload fields are used for hashing when the hash mode is set to Layer 2 payload.

If the hash mode is configured to Layer 2 header, IPv4, IPv6, and MPLS packets are hashed using the Layer 2 header fields. If you want incoming IPv4, IPv6, and MPLS packets hashed by the source MAC address, destination MAC address, or EtherType fields, you must set the hash mode to Layer 2 header.

Table 5 on page 12 displays the IPv4 and IPv6 payload fields that are used by the hashing algorithm, by default.

- ✓—Field is used by the hashing algorithm, by default.
- X—Field is not used by the hashing algorithm, by default.
- (configurable)—Field can be configured to be used or not used by the hashing algorithm.

Table 5: IPv4 and IPv6 Hashing Fields

Fields	EX4300		QFX5100	
	LAG	**ECMP**	**LAG**	**ECMP**
Source MAC	X	X	X	X
Destination MAC	X	X	X	X
EtherType	X	X	X	X
VLAN ID	X (configurable)	X (configurable)	X (configurable)	X (configurable)
Source IP or IPv6	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Destination IP or IPv6	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Protocol (IPv4 only)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Next header (IPv6 only)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)

Table 5: IPv4 and IPv6 Hashing Fields *(continued)*

Fields	EX4300		QFX5100	
Layer 4 Source Port	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Layer 4 Destination Port	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
IPv6 Flow label (IPv6 only)	X	X	X	X

MPLS

The hashing algorithm hashes MPLS packets using the source IP, destination IP, MPLS label 0, MPLS label 1, and MPLS label 2 fields. See Table 6 on page 13.

The fields used by the hashing algorithm for MPLS packet hashing are not user-configurable.

- ✓—Field is used by the hashing algorithm, by default.
- X—Field is not used by the hashing algorithm, by default.

The source IP and destination IP fields are not always used for hashing. For non-terminated MPLS packets, the payload is checked if the packet has a single MPLS label. If the payload is IPv4 or IPv6, then the IP source address and IP destination address fields are used for hashing along with the MPLS labels. If the packet has more than one MPLS label, only the MPLS labels are used for hashing.

Table 6: MPLS Hashing Fields

Field	EX4300	QFX5100
Source MAC	X	X
Destination MAC	X	X
EtherType	X	X
VLAN ID	X	X
Source IP	✓	✓
Destination IP	✓	✓
Protocol (for IPv4 packets)	X	X
Next header (for IPv6 packets)	X	X

Table 6: MPLS Hashing Fields *(continued)*

Field	EX4300	QFX5100
Layer 4 Source Port	X	X
Layer 4 Destination Port	X	X
IPv6 Flow lab	X	X
MPLS label 0	✓	✓
MPLS label 1	✓	✓
MPLS label 2	✓	✓

MAC-in-MAC Packet Hashing

Packets using the MAC-in-MAC EtherType are hashed by the hashing algorithm using the Layer 2 payload source MAC, Layer 2 payload destination MAC, and Layer 2 payload EtherType fields. See Table 7 on page 14.

Hashing using the fields in the MAC-in-MAC EtherType packet is first supported on EX4300 switches in Release 13.2X51-D20. Hashing using the fields in the MAC-in-MAC EtherType is not supported on earlier releases.

The fields used by the hashing algorithm for MAC-in-MAC hashing are not user-configurable.

- ✓—Field is used by the hashing algorithm, by default.
- X—Field is not used by the hashing algorithm, by default.

Table 7: MAC-in-MAC Hashing Fields

Field	EX4300	QFX5100
Layer 2 Payload Source MAC	✓	✓
Layer 2 Payload Destination MAC	✓	✓
Layer 2 Payload EtherType	✓	✓
Layer 2 Payload Outer VLAN	X	X

Layer 2 Header Hashing

Layer 2 header fields are used by the hashing algorithm when a packet's EtherType is not recognized as IP (IPv4 or IPv6), MPLS, or MAC-in-MAC. The Layer 2 header fields are also used for hashing IPv4, IPv6, and MPLS traffic instead of the payload fields when the hash mode is set to Layer 2 header.

- ✓—Field is used by the hashing algorithm, by default.
- X—Field is not used by the hashing algorithm, by default.
- (configurable)—Field can be configured to be used or not used by the hashing algorithm.

Table 8: Layer 2 Header Hashing Fields

Field	EX4300	QFX5100
Source MAC	✓ (configurable)	✓ (configurable)
Destination MAC	✓ (configurable)	✓ (configurable)
EtherType	✓ (configurable)	✓ (configurable)
VLAN ID	X (configurable)	X (configurable)

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82

Understanding Interface Naming Conventions

The QFX Series and the EX4600 device uses a naming convention for defining the interfaces that is similar to that of other platforms running under Juniper Networks Junos OS. This topic provides brief information about the naming conventions used for interfaces on the QFX Series and on EX4600 switches.

This topic describes:

Physical Part of an Interface Name

Interfaces in Junos OS are specified as follows:

device-name:*type-fpc*/*pic*/*port*

The convention is as follows:

- *device-name*—(QFabric systems only) The *device-name* is either the serial number or the alias of the QFabric system component, such as a Node device, Interconnect device, or QFabric infrastructure. The name can contain a maximum of 128 characters and cannot contain any colons.
- *type*—The QFX Series and EX4600 device interfaces use the following media types:
  - **fc**—Fibre Channel interface
  - **ge**—Gigabit Ethernet interface
  - **xe**—10-Gigabit Ethernet interface
  - **xle**—40-Gigabit Ethernet interface (QFX3500, QFX3600, and QFX5100 switches running a QFabric software package)
  - **et**—40-Gigabit Ethernet interface (QFX3500, QFX3600, QFX5100, and EX4600 switches running Enhanced Layer 2 Software)
  - **fte**—40-Gigabit data plane uplink interface (QFX3500, QFX3600, and QFX5100 switches running a QFabric software package)
  - **me**—Management interface
  - **em**—Management interface on QFX5100 and EX4600 switches.
- *fpc*—Flexible PIC Concentrator. QFX Series interfaces use the following convention for the FPC number in interface names:
  - On QFX3500, QFX3600, and QFX5100 devices running a QFabric software package, the FPC number is always **0**.

    The FPC number indicates the slot number of the line card that contains the physical interface.
  - On QFX3500, QFX3600, QFX5100, and EX4600 switches running Enhanced Layer 2 Software, the member ID of a member in a Virtual Chassis determines the FPC number.

    NOTE: **Every member in a Virtual Chassis must have a unique member ID, otherwise the Virtual Chassis will not be created.**
  - On standalone QFX5100 and EX4600 switches, the FPC number is always **0**.
- *pic*—QFX Series and EX4600 device interfaces use the following convention for the PIC (Physical Interface Card) number in interface names:
  - On a QFX3500 switch running a QFabric software package, PIC **0** can support 48 ports, PIC **1** can support 16 10-Gigabit Ethernet ports, and PIC **2** can support 4 40-Gigabit Ethernet ports.
  - On a QFX3500 switch running Enhanced Layer 2 software, PIC **0** can support 48 ports, and PIC **1** can support 16 10-Gigabit Ethernet ports, and 4 40-Gigabit Ethernet ports.

  - On a QFX3500 Node device running a QFabric software package, PIC **0** can support 48 ports and PIC **1** can support four 40-Gigabit data plane uplink ports.
  - On a QFX3600 switch running a QFabric software package, PIC **0** can support 64 10-Gigabit Ethernet ports, and PIC **1** can support 16 40-Gigabit Ethernet ports.
  - On a QFX3600 switch running Enhanced Layer 2 software, PIC **0** can support 64 10-Gigabit Ethernet ports and can also support 16 40-Gigabit Ethernet ports.
  - On a QFX3600 Node device running a QFabric software package, PIC **0** can support 56 10-Gigabit Ethernet ports, and PIC **1** can support 8 40-Gigabit data plane uplink ports, and up to 14 40-Gigabit Ethernet ports.
  - On a QFX5100-48S switch running Enhanced Layer 2 software, PIC **0** provides six 40-Gbps QSFP+ ports and 48 10-Gigabit Ethernet interfaces.
  - On an EX4600 device running Enhanced Layer 2 software, PIC 0 provides 4 40-Gbps QSFP+ ports and 24 10-Gigabit Ethernet interfaces. There are two expansion bays (PIC 1 and PIC 2), and you can insert QFX-EM-4Q expansion modules and EX4600-EM-8F expansion modules. The QFX-EM-4Q expansion module provide 4 40-Gbps QSFP+ ports. The EX4600-EM-8F expansion module provides 8 40-Gbps QSFP+ ports. You can insert any combination of expansion modules. For example, you can insert two EX4600-EM-8F expansion modules, two QFX-EM-4Q expansion modules, or one of each.
  - On a QFX5100-48S switch running a QFabric software package, PIC **1** provides six 40-Gbps QSFP+ ports, and PIC **0** provides 48 10-Gigabit Ethernet interfaces.
  - On a QFX5100-24Q switch running Enhanced Layer 2 software, PIC **0** provides 24 40-Gbps QSFP+ ports. PIC 1 and PIC 2 can each contain a QFX-EM-4Q expansion module, and each expansion module provides 4 40-Gbps QSFP+ ports
  - On a QFX5100-96S switch running Enhanced Layer 2 software, PIC **0** provides 96 10-Gigabit Ethernet interfaces and 8 40-Gbps QSFP+ ports .

- *port*—Interfaces use the following convention for port numbers:
  - On a QFX3500 switch running a QFabric software package, there are 48 network access ports (10-Gigabit Ethernet) labeled 0 through 47 on PIC 0 and, 16 network access ports labeled 0 through 15 on PIC 1, and four 40-Gbps QSFP+ ports labeled Q0 through Q3 on PIC 2. You can use the QSFP+ ports to connect the Node device to Interconnect devices.

    By default, the 40-Gbps QSFP+ ports are configured to operate as 10-Gigabit Ethernet ports. You can use QSFP+ to four SFP+ copper breakout cables to connect the 10-Gigabit Ethernet ports to other servers, storage, and switches. Optionally, you can choose to configure the QSFP+ ports as 40-Gigabit Ethernet ports (see *Configuring the QSFP+ Port Type on QFX3500 Standalone Switches*).
  - On a QFX3500 switch running Enhanced Layer 2 software, there are 48 network access ports labeled 0 through 47 on PIC 0 and 4 40-Gbps QSFP+ ports labeled Q0 through Q3 on PIC 1. See "Channelizing Interfaces" on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

- On a QFX3600 switch running a QFabric software package, there are 64 network access ports (10-Gigabit Ethernet) labeled Q0 through Q15 on PIC 0, and there are 16 network access ports (40-Gigabit Ethernet) labeled Q0 through Q15 on PIC **1**.

  By default, all the QSFP+ ports are configured to operate as 40-Gigabit Ethernet ports. Optionally, you can choose to configure the QSFP+ ports as 10-Gigabit Ethernet ports (see *Configuring the Port Type on QFX3600 Standalone Switches*) and use QSFP+ to four SFP+ copper breakout cables to connect the 10-Gigabit Ethernet ports to other servers, storage, and switches.

- On a QFX3600 Node device running a QFabric software package, PIC **0** can support up to 56 10-Gigabit Ethernet ports labeled Q2 through Q15, and PIC **1** can support up to 8 40-Gigabit data plane uplink ports labeled Q0 through Q7, and up to 14 40-Gigabit Ethernet ports labeled Q2 through Q15. See *Configuring the Port Type on QFX3600 Node Devices* for information on how to configure the 40-Gbps QSFP+ ports.

  On a QFX3600 Node device, by default, four 40-Gbps QSFP+ ports (labeled Q0 through Q3) are configured for uplink connections between your Node device and your Interconnect devices, and twelve 40-Gbps QSFP+ ports (labeled Q4 through Q15) use QSFP+ to four SFP+ copper breakout cables to support up to 48 10-Gigabit Ethernet ports 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 devices, and ports 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 a QFX3600 switch running Enhanced Layer 2 software, PIC **0** can support 64 network access ports (10-Gigabit Ethernet ports) labeled Q0 through Q15 and 16 40-Gigabit Ethernet ports labeled Q0 through Q15. See "Channelizing Interfaces" on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

- On a QFX5100-48S switch running Enhanced Layer 2 software, PIC **0** can support 48 network access ports (10-Gigabit Ethernet ports) labeled 0 through 47 and 6 40-Gbps QSFP+ ports labeled 48 through 53. See "Channelizing Interfaces" on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

- On an EX4600 switch running Enhanced Layer 2 software, PIC **0** can support 24 network access ports (10-Gigabit Ethernet ports) labeled 0 through 23 and 4 40-Gbps QSFP+ ports labeled 24 through 27. There are two expansion bays (PIC 1 and PIC 2), and you can insert QFX-EM-4Q expansion modules and EX4600-EM-8F expansion modules. The QFX-EM-4Q expansion module provide 4 40-Gbps QSFP+ ports. The EX4600-EM-8F expansion module provides 8 40-Gbps QSFP+ ports. You can insert any combination of expansion modules. For example, you can insert two EX4600-EM-8F expansion modules, two QFX-EM-4Q expansion modules, or one of each. See "Channelizing Interfaces" on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

- On a QFX5100-48S switch running a QFabric software package, PIC **0** can support 48 network access ports (10-Gigabit Ethernet ports) labeled 0 through 47, and PIC 1 can support 6 40-Gbps QSFP+ ports labeled 0 through 5. See *Configuring the QSFP+ Port Type on QFX5100 Switches* for information on how to configure the port mode of 40-Gbps QSFP+ ports.
- On a QFX5100-24Q switch running Enhanced Layer 2 software, PIC **0** can support 24 40-Gbps QSFP+ ports labeled 0 through 23. PIC 1 and PIC 2 each support 4 40-Gbps QSFP+ port, for a total of eight 40-Gbps QSFP+ ports. See “Channelizing Interfaces” on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

  NOTE: **You cannot channelize the 40-Gbps QSFP+ ports provided in the two QFX-EM-4Q expansion modules. Also, even though there is a total of 128 physical ports, only 104 logical ports can be channelized.**

  You can configure different system modes to achieve varying levels of port density on the QFX5100-24Q and QFX5100-96S switches. Depending on the system mode you configure, there are restrictions on which ports you can channelize. If you channelize ports that are restricted, the configuration is ignored. See “Configuring the System Mode” on page 96 for information on how to configure the system mode.
- On a QFX5100-96S switch running Enhanced Layer 2 software, PIC **0** can support 96 10-Gigabit Ethernet ports labeled 0 through 95, and 8 40-Gbps QSFP+ ports labeled 96 through 103. See “Channelizing Interfaces” on page 94 for information on how to configure and channelize the 40-Gbps QSFP+ ports.

  NOTE: **You can only channelize the 40-Gbps QSFP+ ports provided in ports 96 and 100, because only 104 logical ports can be channelized.**

  You can configure different system modes to achieve varying levels of port density on the QFX5100-24Q and QFX5100-96S switches. Depending on the system mode you configure, there are restrictions on which ports you can channelize. If you channelize ports that are restricted, the configuration is ignored. See “Configuring the System Mode” on page 96 for information on how to configure the system mode.

Logical Part of an Interface Name on a Switch Running QFabric Software Package

The logical unit part of the interface name corresponds to the logical unit number, which can be a number from 0 through 16384. In the virtual part of the name, a period (.) separates the port and logical unit numbers: *device-name* (QFabric systems only): *type-fpc/pic/port.logical-unit-number*. For example, if you issue the **show ethernet-switching interfaces** command on a system with a default VLAN, the resulting display shows the logical interfaces associated with the VLAN:

```
Interface                State    VLAN members         Blocking
node-device1:xe-0/0/1.0  down      remote-analyzer      unblocked
node-device1:xe-0/0/2.0  down      default              unblocked
node-device1:xe-0/0/3.0  down      default              unblocked
```


When you configure aggregated Ethernet interfaces, you configure a logical interface, which is called a *bundle* or a *LAG*. Each LAG can include up to eight Ethernet interfaces, depending on the switch model.

Logical Part of a Channelized Interface Name on a Switch Running Enhanced Layer 2 Software

Channelizing enables you to configure four 10-Gigabit Ethernet interfaces from a 40-Gigabit Ethernet QSFP+ interface. By default, a 40-Gigabit Ethernet QSFP+ interface is named *et-fpc/pic/port*. The resulting 10-Gigabit Ethernet interfaces appear in the following format: *xe-fpc/pic/port:channel*, where channel can be a value of 0 through 3.

For example, if an *et* interface named **et-0/0/3** is channelized to four 10-Gigabit Ethernet interfaces, the resulting 10-Gigabit Ethernet interface names will be **xe-0/0/3:0**, **xe-0/0/3:1**, **xe-0/0/3:2**, and **xe-0/0/3:3**:

```
Interface               Admin Link Proto    Local        Remote
xe-0/0/3:0               up    down
xe-0/0/3:1               up    down
xe-0/0/3:2               up    down
xe-0/0/3:3               up    down
```

Wildcard Characters in Interface Names

In the **show interfaces** and **clear interfaces** commands, you can use wildcard characters in the ***interface-name*** option to specify groups of interface names without having to type each name individually. You must enclose all wildcard characters except the asterisk (*) in quotation marks (" ").

Related Documentation

- Interfaces Overview on page 3
- Channelizing Interfaces on page 94
- Configuring the System Mode on page 96
- Understanding Management Interfaces on page 24
- Understanding Port Ranges and System Modes on page 25

- *Rear Panel of a QFX3500 Device*
- *Front Panel of a QFX3600 Device*
- *Junos OS Network Interfaces Library for Routing Devices*

Understanding Interface Ranges

You can use the interface ranges to group interfaces of the same type that share a common configuration profile. This helps reduce the time and effort in configuring interfaces. The configurations common to all the interfaces can be included in the interface range definition.

The interface range definition contains the name of the interface range defined, the names of the individual member interfaces that do not fall in a series of interfaces, a range of interfaces defined in the member range, and the configuration statements common to all the interfaces. An interface range defined with member ranges and individual members but without any common configurations is also a valid definition.

NOTE: The interface range definition is supported only for Gigabit Ethernet, 10-Gigabit Ethernet, and Fibre Channel interfaces.

The common configurations defined in the interface range will be overridden by the local configuration.

The defined interface ranges can be used at places where the **interface** statement is used in the following configuration hierarchies:

- **ethernet-switching-options analyzer *name* input egress interface**
- **ethernet-switching-options analyzer *name* input ingress interface**
- **ethernet-switching-options analyzer output interface**
- **ethernet-switching-options bpdu-block interface**
- **ethernet-switching-options interfaces**
- **ethernet-switching-options redundant-trunk-group group-name interface**
- **ethernet-switching-options secure-access-port interface**
- **ethernet-switching-options voip interface**
- **protocols igmp-snooping vlan *vlan-name* interface**
- **protocols isis interface**
- **protocols link-management peer lmp-control-channel interface**
- **protocols link-management te-link *name* interface**
- **protocols lldp interface**
- **protocols mstp interface**
- **protocols mstp msti-*id* interface**
- **protocols mstp msti-*id* vlan *vlan-id* interface**
- **protocols sflow interfaces**
- **protocols stp interface**
- **protocols vstp vlan *vlan-id* interface**
- **vlans *vlan-name* interface**

Related Documentation

- Interfaces Overview on page 3
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Configuring Link Aggregation on page 85
- Configuring a Layer 3 Logical Interface on page 85

- *Junos OS Network Interfaces Library for Routing Devices*
- interface-range on page 153

Understanding Layer 3 Logical Interfaces

A Layer 3 logical interface is a logical division of a physical interface that operates at the network level and therefore can receive and forward 802.1Q VLAN tags. You can use Layer 3 logical interfaces to route traffic among multiple VLANs along a single trunk line that connects a Juniper Networks switch to a Layer 2 switch. Only one physical connection is required between the switches.

To create Layer 3 logical interfaces on a switch, enable VLAN tagging, partition the physical interface into logical partitions, and bind the VLAN ID to the logical interface.

We recommend that you use the VLAN ID as the logical interface number when you configure the logical interface. QFX Series and EX4600 switches support a maximum of 4089 VLANs, which includes the default VLAN. You can, however, assign a VLAN ID in the range of 1 to 4094, but five of these VLAN IDs are reserved for internal use.

VLAN tagging places the VLAN ID in the frame header, allowing each physical interface to handle multiple VLANs. When you configure multiple VLANs on an interface, you must also enable tagging on that interface. Junos OS on switches supports a subset of the 802.1Q standard for receiving and forwarding routed or bridged Ethernet frames with single VLAN tags and running Virtual Router Redundancy Protocol (VRRP) over 802.1Q-tagged interfaces.

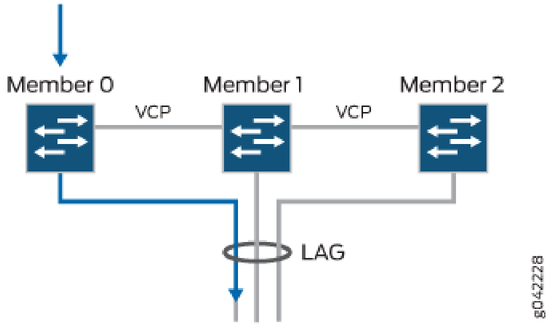
Related Documentation

- Interfaces Overview on page 3
- Configuring a Layer 3 Logical Interface on page 85
- *Configuring DHCP and BOOTP Relay*
- *Junos OS Network Interfaces Library for Routing Devices*

Understanding Local Link Bias

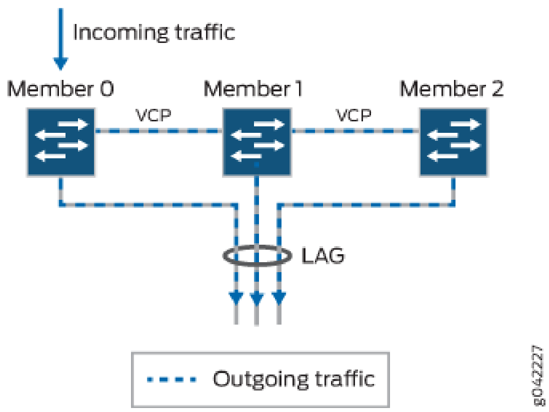
Local link bias conserves bandwidth on Virtual Chassis ports (VCPs) by using local links to forward unicast traffic exiting a Virtual Chassis or Virtual Chassis Fabric (VCF) that has a Link Aggregation group (LAG) bundle composed of member links on different member switches in the same Virtual Chassis or VCF. A local link is a member link in the LAG bundle that is on the member switch that received the traffic. Because traffic is received and forwarded on the same member switch when local link bias is enabled, no VCP bandwidth is consumed by traffic traversing the VCPs to exit the Virtual Chassis or VCF using a different member link in the LAG bundle. The traffic flow of traffic exiting a Virtual Chassis or VCF over a LAG bundle when local link bias is enabled is illustrated in Figure 2 on page 23.

Figure 2: Egress Traffic Flow with Local Link Bias



When local link bias is disabled, egress traffic exiting a Virtual Chassis or VCF on a LAG bundle can be forwarded out of any member link in the LAG bundle. Traffic forwarding decisions are made by an internal algorithm that attempts to load-balance traffic between the member links in the bundle. VCP bandwidth is frequently consumed by egress traffic when local link bias is disabled because the egress traffic traverses the VCPs to reach the destination egress member link in the LAG bundle. The traffic flow of traffic exiting a Virtual Chassis or VCF over a LAG bundle when local link bias is disabled is illustrated in Figure 3 on page 23.

Figure 3: Egress Traffic Flow without Local Link Bias



Local link bias is configured in a LAG bundle. A Virtual Chassis or VCF that has multiple LAG bundles can contain bundles that have and have not enabled local link bias. Local link bias only impacts the forwarding of unicast traffic exiting a Virtual Chassis or VCF; ingress traffic handling is not impacted by the local link bias setting. Egress multicast, unknown unicast, and broadcast traffic exiting a Virtual Chassis or VCF over a LAG bundle is not impacted by the local link bias setting and is always load-balanced among the member links. Local link bias is disabled, by default.

You should enable local link bias if you want to conserve VCP bandwidth by always forwarding egress unicast traffic on a LAG bundle out of a local link. You should not enable local link bias if you want egress traffic load-balanced across the member links in the LAG bundle as it exits the Virtual Chassis or VCF.

Related Documentation

- Configuring Local Link Bias (CLI Procedure) on page 88

Understanding Management Interfaces

You use management interfaces to access devices remotely. Typically, a management interface is not connected to the in-band network, but is connected to a device in the internal network. Through a management interface, you can access the device over the network using utilities such as **ssh** and **telnet** and configure it from anywhere, regardless of its physical location. As a security feature, users cannot log in as **root** through a management interface. To access the device as **root**, you must use the console port. You can also use **root** to log in using SSH.

NOTE: **Before you can use the management interfaces on the QFX3500, QFX3600, QFX5100, and EX4600 devices, you must configure the logical interfaces with valid IP addresses. Juniper Networks does not support configuring two management interfaces in the same subnet.**

Management interface port ranges vary based on device type:

- QFX3500 devices:

  The valid port range for a management interface (**me**) on a QFX3500 device is between 0 and 6, with a total of seven available ports. On a QFX3500 standalone switch, however, you can only configure me0 and me1 as management interfaces. The management interfaces are labeled **C0** and **C1**, and they correspond to me0 and me1. On a QFX3500 Node device, the RJ-45 management interfaces and SFP management interfaces correspond to **me5** and **me6**

- QFX3600 devices:

  There are two RJ-45 management interfaces (labeled **C0** and **C1**) and two SFP management interfaces (labeled **C0S** and **C1S**). On a QFX3600 standalone switch, the RJ-45 management interfaces and SFP management interfaces correspond to **me0** and **me1**. On a QFX3600 Node device, the RJ-45 management interfaces and SFP management interfaces correspond to **me5** and **me6**. Each pair of management interfaces correspond to one Ethernet interface—for example, both RJ-45 management interfaces (labeled **C0** and **C0s**) can correspond to me0, and both SFP management interfaces (labeled **C1** and **C1S**) can correspond to me1. By default, both RJ-45 management interfaces are active. If you insert an SFP interface into the SFP management port (**C0S**, for example), the SFP interface would become the active management interface, and the corresponding RJ-45 management interface (**C0**) is disabled.

  NOTE: **On a QFX3600 device, you can use either the RJ-45 or the SFP management interfaces, but not both at the same time.**

- On QFX5100 and EX4600 switches, there is one RJ-45 management interface (labeled **C0** and one SFP management interface (labeled **C1**), and they correspond to em0 and em1. You can use both management interfaces simultaneously.
- QFabric system:

  On a QFabric system, there are management interfaces on the Node devices, Interconnect devices, and Director devices. However, you cannot access the management interfaces on the Node devices or Interconnect devices directly. You can only manage and configure these devices using the Director device. You can connect to the management interface over the network using utilities such as SSH.

  For information on how to use management interfaces on a QFabric system, see *Performing the QFabric System Initial Setup on a QFX3100 Director Group* and *Gaining Access to the QFabric System Through the Default Partition*.

Related Documentation

- Interfaces Overview on page 3

Understanding Port Ranges and System Modes

QFX Series devices and EX4600 switches can support different port ranges depending on the device, media type of the interface, the software that is running on the device, and the system mode.

This topic describes:

Port Ranges for Different Media Types

The following media types support the following port ranges:

- On a QFX3500 device:
  - The valid port range for a Fibre Channel (fc) interface is **0** through **5** and **42** through **47** on PIC **0**, with a total of 12 available Fibre Channel ports.

    NOTE: **Fibre Channel ports are not supported on QFX3500, QFX3600, and QFX5100 switches running Enhanced Layer 2 software.**

  - The valid port range for a Gigabit Ethernet (ge) interface is **6** through **41** on PIC **0** because the ports between **0** and **5** and **42** and **47** are reserved as Fibre Channel ports. The total number of available Gigabit Ethernet ports is 36, because 12 of the remaining 48 ports are reserved for Fibre Channel and 10-Gigabit Ethernet interfaces. Fibre Channel ports cannot be configured as Gigabit Ethernet ports.
  - The valid port range for a 10-Gigabit Ethernet (xe) interface is **0** through **47** on PIC **0**. The valid port range for a 10-Gigabit Ethernet (xe) interface is **0** through **15** on PIC **1**. The total number of available 10-Gigabit Ethernet ports is 64.

  - The valid port range for a 40-Gigabit data plane uplink interface is **0** through **3** on PIC **1**
  - The valid port range for a 40-Gigabit Ethernet interface is **0** through **3** on PIC **2**. There are four available ports.

- On a QFX3600 Node device:
  - The valid port range for a 10-Gigabit Ethernet interface is **8** through **63** on PIC **0**. There are 56 available ports.
  - The valid port range for a 40-Gigabit Ethernet interface is **2** through **15** on PIC **1**. There are 14 available ports.
  - The valid port range for a 40-Gigabit data plane uplink interface is **0** through **7** on PIC **1**. There are eight available ports.

  See Table 11 on page 34 for physical port to logical port mappings.
- On a QFX3600 switch running Enhanced Layer 2 Software:
  - The valid port range for a 10-Gigabit Ethernet interface is **0** through **63** on PIC **0**. There are 64 available ports.
  - The valid port range for a 40-Gigabit Ethernet interface is **0** through **15** on PIC **0**. There are 16 available ports.

  See Table 12 on page 37 for physical port to logical port mappings.
- On QFX5100-48S and QFX5100-48T switches running Enhanced Layer 2 Software:
  - The valid port range for a 10-Gigabit Ethernet interface is **0** through **47** on PIC **0**. There are 48 available ports. When you channelize the 6 40-Gbps QSFP+ ports on **0** through **5** on PIC **1**, there are 72 available ports.

    NOTE: **On PIC 1, ports 0 and 1 are reserved for fte ports. You cannot convert these fte ports to xe or xle ports.**

  - The valid port range for a 40-Gbps QSFP+ port is **0** through **5** on PIC **1**. There are six available ports.

  See Table 14 on page 42 for physical port to logical port mappings.
- On EX4600 switches running Enhanced Layer 2 Software:
  - The valid port range for a 10-Gigabit Ethernet interface is **0** through **23** on PIC **0**. There are 24 available ports. When you channelize the 4 40-Gbps QSFP+ ports on **24** through **27** on PIC **0**. There are 40 available ports.

  See Table 14 on page 42 for physical port to logical port mappings.
- On QFX5100-48S and QFX5100-48T switches running a QFabric software package:
  - The valid port range for a 10-Gigabit Ethernet interface is **0** through **47** on PIC **0**. There are 48 available ports.

- The valid port range for a 40-Gbps QSFP+ port is **0** through **5** on PIC **1**. There are six available ports.

  NOTE: **On PIC 1, ports 0 and 1 are reserved for fte ports. You cannot convert these fte ports to xe or xle ports.**

  See Table 15 on page 46 for physical port to logical port mappings.

- For QFX5100-24Q and QFX5100-96S switches running Enhanced Layer 2 Software, see Table 16 on page 49 for physical port to logical port mappings for different system modes.

Table 9: Valid Port Ranges on QFX3500 Switches Running QFabric Software Package

Port Number	Fibre Channel Interfaces (On PIC 0)	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 2)
0	fc-0/0/0	Not supported on this port	xe-0/0/0	Not supported on this port	Not supported on this port
1	fc-0/0/1	Not supported on this port	xe-0/0/1	Not supported on this port	Not supported on this port
2	fc-0/0/2	Not supported on this port	xe-0/0/2	Not supported on this port	Not supported on this port
3	fc-0/0/3	Not supported on this port	xe-0/0/3	Not supported on this port	Not supported on this port
4	fc-0/0/4	Not supported on this port	xe-0/0/4	Not supported on this port	Not supported on this port
5	fc-0/0/5	Not supported on this port	xe-0/0/5	Not supported on this port	Not supported on this port
6	Not supported on this port	ge-0/0/6	xe-0/0/6	Not supported on this port	Not supported on this port
7	Not supported on this port	ge-0/0/7	xe-0/0/7	Not supported on this port	Not supported on this port
8	Not supported on this port	ge-0/0/8	xe-0/0/8	Not supported on this port	Not supported on this port
9	Not supported on this port	ge-0/0/9	xe-0/0/9	Not supported on this port	Not supported on this port
10	Not supported on this port	ge-0/0/10	xe-0/0/10	Not supported on this port	Not supported on this port

Table 9: Valid Port Ranges on QFX3500 Switches Running QFabric Software Package *(continued)*

Port Number	Fibre Channel Interfaces (On PIC 0)	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 2)
11	Not supported on this port	ge-0/0/11	xe-0/0/11	Not supported on this port	Not supported on this port
12	Not supported on this port	ge-0/0/12	xe-0/0/12	Not supported on this port	Not supported on this port
13	Not supported on this port	ge-0/0/13	xe-0/0/13	Not supported on this port	Not supported on this port
14	Not supported on this port	ge-0/0/14	xe-0/0/14	Not supported on this port	Not supported on this port
15	Not supported on this port	ge-0/0/15	xe-0/0/15	Not supported on this port	Not supported on this port
16	Not supported on this port	ge-0/0/16	xe-0/0/16	Not supported on this port	Not supported on this port
17	Not supported on this port	ge-0/0/17	xe-0/0/17	Not supported on this port	Not supported on this port
18	Not supported on this port	ge-0/0/18	xe-0/0/18	Not supported on this port	Not supported on this port
19	Not supported on this port	ge-0/0/19	xe-0/0/19	Not supported on this port	Not supported on this port
20	Not supported on this port	ge-0/0/20	xe-0/0/20	Not supported on this port	Not supported on this port
21	Not supported on this port	ge-0/0/21	xe-0/0/21	Not supported on this port	Not supported on this port
22	Not supported on this port	ge-0/0/22	xe-0/0/22	Not supported on this port	Not supported on this port
23	Not supported on this port	ge-0/0/23	xe-0/0/23	Not supported on this port	Not supported on this port
24	Not supported on this port	ge-0/0/24	xe-0/0/24	Not supported on this port	Not supported on this port
25	Not supported on this port	ge-0/0/25	xe-0/0/25	Not supported on this port	Not supported on this port

Table 9: Valid Port Ranges on QFX3500 Switches Running QFabric Software Package *(continued)*

Port Number	Fibre Channel Interfaces (On PIC 0)	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 2)
26	Not supported on this port	ge-0/0/26	xe-0/0/26	Not supported on this port	Not supported on this port
27	Not supported on this port	ge-0/0/27	xe-0/0/27	Not supported on this port	Not supported on this port
28	Not supported on this port	ge-0/0/28	xe-0/0/28	Not supported on this port	Not supported on this port
29	Not supported on this port	ge-0/0/29	xe-0/0/29	Not supported on this port	Not supported on this port
30	Not supported on this port	ge-0/0/30	xe-0/0/30	Not supported on this port	Not supported on this port
31	Not supported on this port	ge-0/0/31	xe-0/0/31	Not supported on this port	Not supported on this port
32	Not supported on this port	ge-0/0/32	xe-0/0/32	Not supported on this port	Not supported on this port
33	Not supported on this port	ge-0/0/33	xe-0/0/33	Not supported on this port	Not supported on this port
34	Not supported on this port	ge-0/0/34	xe-0/0/34	Not supported on this port	Not supported on this port
35	Not supported on this port	ge-0/0/35	xe-0/0/35	Not supported on this port	Not supported on this port
36	Not supported on this port	ge-0/0/36	xe-0/0/36	Not supported on this port	Not supported on this port
37	Not supported on this port	ge-0/0/37	xe-0/0/37	Not supported on this port	Not supported on this port
38	Not supported on this port	ge-0/0/38	xe-0/0/38	Not supported on this port	Not supported on this port
39	Not supported on this port	ge-0/0/39	xe-0/0/39	Not supported on this port	Not supported on this port
40	Not supported on this port	ge-0/0/40	xe-0/0/40	Not supported on this port	Not supported on this port

Table 9: Valid Port Ranges on QFX3500 Switches Running QFabric Software Package *(continued)*

Port Number	Fibre Channel Interfaces (On PIC 0)	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 2)
41	Not supported on this port	ge-0/0/41	xe-0/0/41	Not supported on this port	Not supported on this port
42	fc-0/0/42	Not supported on this port	xe-0/0/42	Not supported on this port	Not supported on this port
43	fc-0/0/43	Not supported on this port	xe-0/0/43	Not supported on this port	Not supported on this port
44	fc-0/0/44	Not supported on this port	xe-0/0/44	Not supported on this port	Not supported on this port
45	fc-0/0/45	Not supported on this port	xe-0/0/45	Not supported on this port	Not supported on this port
46	fc-0/0/46	Not supported on this port	xe-0/0/46	Not supported on this port	Not supported on this port
47	fc-0/0/47	Not supported on this port	xe-0/0/47	Not supported on this port	Not supported on this port
Q0	Not supported on this port	Not supported on this port	xe-0/1/0 xe-0/1/1 xe-0/1/2 xe-0/1/3 NOTE: Supported on QFX3500 standalone switch only.	fte-0/1/0	xle-0/2/0
Q1	Not supported on this port	Not supported on this port	xe-0/1/4 xe-0/1/5 xe-0/1/6 xe-0/1/7 NOTE: Supported on QFX3500 standalone switch only.	fte-0/1/1	xle-0/2/1

Table 9: Valid Port Ranges on QFX3500 Switches Running QFabric Software Package *(continued)*

Port Number	Fibre Channel Interfaces (On PIC 0)	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 2)
Q2	Not supported on this port	Not supported on this port	xe-0/1/8 xe-0/1/9 xe-0/1/10 xe-0/1/11 NOTE: Supported on QFX3500 standalone switch only.	fte-0/1/2	xle-0/2/2
Q3	Not supported on this port	Not supported on this port	xe-0/1/12 xe-0/1/13 xe-0/1/14 xe-0/1/15 NOTE: Supported on QFX3500 standalone switch only.	fte-0/1/3	xle-0/2/3

Table 10: Valid Port Ranges on QFX3500 Switches Running Enhanced Layer 2 Software

Port Number	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Ethernet Interfaces (On PIC 1)
0	Not supported on this port	xe-0/0/0	Not supported on this port
1	Not supported on this port	xe-0/0/1	Not supported on this port
2	Not supported on this port	xe-0/0/2	Not supported on this port
3	Not supported on this port	xe-0/0/3	Not supported on this port
4	Not supported on this port	xe-0/0/4	Not supported on this port
5	Not supported on this port	xe-0/0/5	Not supported on this port
6	ge-0/0/6	xe-0/0/6	Not supported on this port
7	ge-0/0/7	xe-0/0/7	Not supported on this port

Table 10: Valid Port Ranges on QFX3500 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Ethernet Interfaces (On PIC 1)
8	ge-0/0/8	xe-0/0/8	Not supported on this port
9	ge-0/0/9	xe-0/0/9	Not supported on this port
10	ge-0/0/10	xe-0/0/10	Not supported on this port
11	ge-0/0/11	xe-0/0/11	Not supported on this port
12	ge-0/0/12	xe-0/0/12	Not supported on this port
13	ge-0/0/13	xe-0/0/13	Not supported on this port
14	ge-0/0/14	xe-0/0/14	Not supported on this port
15	ge-0/0/15	xe-0/0/15	Not supported on this port
16	ge-0/0/16	xe-0/0/16	Not supported on this port
17	ge-0/0/17	xe-0/0/17	Not supported on this port
18	ge-0/0/18	xe-0/0/18	Not supported on this port
19	ge-0/0/19	xe-0/0/19	Not supported on this port
20	ge-0/0/20	xe-0/0/20	Not supported on this port
21	ge-0/0/21	xe-0/0/21	Not supported on this port
22	ge-0/0/22	xe-0/0/22	Not supported on this port
23	ge-0/0/23	xe-0/0/23	Not supported on this port
24	ge-0/0/24	xe-0/0/24	Not supported on this port
25	ge-0/0/25	xe-0/0/25	Not supported on this port
26	ge-0/0/26	xe-0/0/26	Not supported on this port
27	ge-0/0/27	xe-0/0/27	Not supported on this port
28	ge-0/0/28	xe-0/0/28	Not supported on this port
29	ge-0/0/29	xe-0/0/29	Not supported on this port

Table 10: Valid Port Ranges on QFX3500 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Ethernet Interfaces (On PIC 1)
30	ge-0/0/30	xe-0/0/30	Not supported on this port
31	ge-0/0/31	xe-0/0/31	Not supported on this port
32	ge-0/0/32	xe-0/0/32	Not supported on this port
33	ge-0/0/33	xe-0/0/33	Not supported on this port
34	ge-0/0/34	xe-0/0/34	Not supported on this port
35	ge-0/0/35	xe-0/0/35	Not supported on this port
36	ge-0/0/36	xe-0/0/36	Not supported on this port
37	ge-0/0/37	xe-0/0/37	Not supported on this port
38	ge-0/0/38	xe-0/0/38	Not supported on this port
39	ge-0/0/39	xe-0/0/39	Not supported on this port
40	ge-0/0/40	xe-0/0/40	Not supported on this port
41	ge-0/0/41	xe-0/0/41	Not supported on this port
42	Not supported on this port	xe-0/0/42	Not supported on this port
43	Not supported on this port	xe-0/0/43	Not supported on this port
44	Not supported on this port	xe-0/0/44	Not supported on this port
45	Not supported on this port	xe-0/0/45	Not supported on this port
46	Not supported on this port	xe-0/0/46	Not supported on this port
47	Not supported on this port	xe-0/0/47	Not supported on this port
Q0	Not supported on this port	xe-0/1/0:0 xe-0/1/0:1 xe-0/1/0:2 xe-0/1/0:3	et-0/1/0

Table 10: Valid Port Ranges on QFX3500 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	Gigabit Ethernet Interfaces (On PIC 0)	10-Gigabit Ethernet Interfaces (On PIC 0 and 1)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q1	Not supported on this port	xe-0/1/1:0 xe-0/1/1:1 xe-0/1/1:2 xe-0/1/1:3	et-0/1/1
Q2	Not supported on this port	xe-0/1/2:0 xe-0/1/2:1 xe-0/1/2:2 xe-0/1/2:3	et-0/1/2
Q3	Not supported on this port	xe-0/1/3:0 xe-0/1/3:1 xe-0/1/3:2 xe-0/1/3:3	et-0/1/3

Table 11: Valid Port Ranges on QFX3600 Switches Running QFabric Software Package

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q0	xe-0/0/0 xe-0/0/1 xe-0/0/2 xe-0/0/3	xle-0/1/0
Q1	xe-0/0/4 xe-0/0/5 xe-0/0/6 xe-0/0/7	xle-0/1/1

Table 11: Valid Port Ranges on QFX3600 Switches Running QFabric Software Package *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q2	xe-0/0/8 xe-0/0/9 xe-0/0/10 xe-0/0/11	xle-0/1/2
Q3	xe-0/0/12 xe-0/0/13 xe-0/0/14 xe-0/0/15	xle-0/1/3
Q4	xe-0/0/16 xe-0/0/17 xe-0/0/18 xe-0/0/19	xle-0/1/4
Q5	xe-0/0/20 xe-0/0/21 xe-0/0/22 xe-0/0/23	xle-0/1/5
Q6	xe-0/0/24 xe-0/0/25 xe-0/0/26 xe-0/0/27	xle-0/1/6
Q7	xe-0/0/28 xe-0/0/29 xe-0/0/30 xe-0/0/31	xle-0/1/7

Table 11: Valid Port Ranges on QFX3600 Switches Running QFabric Software Package *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q8	xe-0/0/32 xe-0/0/33 xe-0/0/34 xe-0/0/35	xle-0/1/8
Q9	xe-0/0/36 xe-0/0/37 xe-0/0/38 xe-0/0/39	xle-0/1/9
Q10	xe-0/0/40 xe-0/0/41 xe-0/0/42 xe-0/0/43	xle-0/1/10
Q11	xe-0/0/44 xe-0/0/45 xe-0/0/46 xe-0/0/47	xle-0/1/11
Q12	xe-0/0/48 xe-0/0/49 xe-0/0/50 xe-0/0/51	xle-0/1/12
Q13	xe-0/0/52 xe-0/0/53 xe-0/0/54 xe-0/0/55	xle-0/1/13

Table 11: Valid Port Ranges on QFX3600 Switches Running QFabric Software Package *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q14	xe-0/0/56 xe-0/0/57 xe-0/0/58 xe-0/0/59	xle-0/1/14
Q15	xe-0/0/60 xe-0/0/61 xe-0/0/62 xe-0/0/63	xle-0/1/15

Table 12: Valid Port Ranges on QFX3600 Switches Running Enhanced Layer 2 Software

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
Q0	xe-0/0/0:0 xe-0/0/0:1 xe-0/0/0:2 xe-0/0/0:3	et-0/0/0
Q1	xe-0/0/1:0 xe-0/0/1:1 xe-0/0/1:2 xe-0/0/1:3	et-0/0/1
Q2	xe-0/0/2:0 xe-0/0/2:1 xe-0/0/2:2 xe-0/0/2:3	et-0/0/2

Table 12: Valid Port Ranges on QFX3600 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
Q3	xe-0/0/3:0 xe-0/0/3:1 xe-0/0/3:2 xe-0/0/3:3	et-0/0/3
Q4	xe-0/0/4:0 xe-0/0/4:1 xe-0/0/4:2 xe-0/0/4:3	et-0/0/4
Q5	xe-0/0/5:0 xe-0/0/5:1 xe-0/0/5:2 xe-0/0/5:3	et-0/0/5
Q6	xe-0/0/6:0 xe-0/0/6:1 xe-0/0/6:2 xe-0/0/6:3	et-0/0/6
Q7	xe-0/0/7:0 xe-0/0/7:1 xe-0/0/7:2 xe-0/0/7:3	et-0/0/7
Q8	xe-0/0/8:0 xe-0/0/8:1 xe-0/0/8:2 xe-0/0/8:3	et-0/0/8

Table 12: Valid Port Ranges on QFX3600 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
Q9	xe-0/0/9:0 xe-0/0/9:1 xe-0/0/9:2 xe-0/0/9:3	et-0/0/9
Q10	xe-0/0/10:0 xe-0/0/10:1 xe-0/0/10:2 xe-0/0/10:3	et-0/0/10
Q11	xe-0/0/11:0 xe-0/0/11:1 xe-0/0/11:2 xe-0/0/11:3	et-0/0/11
Q12	xe-0/0/12:0 xe-0/0/12:1 xe-0/0/12:2 xe-0/0/12:3	et-0/0/12
Q13	xe-0/0/13:0 xe-0/0/13:1 xe-0/0/13:2 xe-0/0/13:3	et-0/0/13
Q14	xe-0/0/14:0 xe-0/0/14:1 xe-0/0/14:2 xe-0/0/14:3	et-0/0/14

Table 12: Valid Port Ranges on QFX3600 Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
Q15	xe-0/0/15:0 xe-0/0/15:1 xe-0/0/15:2 xe-0/0/15:3	et-0/0/15

Table 13: Valid Port Ranges on QFX3600 Node Devices Running QFabric Software Package

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

Table 13: Valid Port Ranges on QFX3600 Node Devices Running QFabric Software Package *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Data Plane Uplink Interfaces (On PIC 1)	40-Gigabit Ethernet Interfaces (On PIC 1)
Q6	xe-0/0/24 xe-0/0/25 xe-0/0/26 xe-0/0/27	fte-0/1/6	xle-0/1/6
Q7	xe-0/0/28 xe-0/0/29 xe-0/0/30 xe-0/0/31	fte-0/1/7	xle-0/1/7
Q8	xe-0/0/32 xe-0/0/33 xe-0/0/34 xe-0/0/35	Not supported on this port	xle-0/1/8
Q9	xe-0/0/36 xe-0/0/37 xe-0/0/38 xe-0/0/39	Not supported on this port	xle-0/1/9
Q10	xe-0/0/40 xe-0/0/41 xe-0/0/42 xe-0/0/43	Not supported on this port	xle-0/1/10
Q11	xe-0/0/44 xe-0/0/45 xe-0/0/46 xe-0/0/47	Not supported on this port	xle-0/1/11

Table 13: Valid Port Ranges on QFX3600 Node Devices Running QFabric Software Package *(continued)*

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

Table 14: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running Enhanced Layer 2 Software

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
0	xe-0/0/0	Not supported on this port
1	xe-0/0/1	Not supported on this port
2	xe-0/0/2	Not supported on this port
3	xe-0/0/3	Not supported on this port
4	xe-0/0/4	Not supported on this port

Table 14: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
5	xe-0/0/5	Not supported on this port
6	xe-0/0/6	Not supported on this port
7	xe-0/0/7	Not supported on this port
8	xe-0/0/8	Not supported on this port
9	xe-0/0/9	Not supported on this port
10	xe-0/0/10	Not supported on this port
11	xe-0/0/11	Not supported on this port
12	xe-0/0/12	Not supported on this port
13	xe-0/0/13	Not supported on this port
14	xe-0/0/14	Not supported on this port
15	xe-0/0/15	Not supported on this port
16	xe-0/0/16	Not supported on this port
17	xe-0/0/17	Not supported on this port
18	xe-0/0/18	Not supported on this port
19	xe-0/0/19	Not supported on this port
20	xe-0/0/20	Not supported on this port
21	xe-0/0/21	Not supported on this port
22	xe-0/0/22	Not supported on this port
23	xe-0/0/23	Not supported on this port
24	xe-0/0/24	Not supported on this port
25	xe-0/0/25	Not supported on this port
26	xe-0/0/26	Not supported on this port

Table 14: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
27	xe-0/0/27	Not supported on this port
28	xe-0/0/28	Not supported on this port
29	xe-0/0/29	Not supported on this port
30	xe-0/0/30	Not supported on this port
31	xe-0/0/31	Not supported on this port
32	xe-0/0/32	Not supported on this port
33	xe-0/0/33	Not supported on this port
34	xe-0/0/34	Not supported on this port
35	xe-0/0/35	Not supported on this port
36	xe-0/0/36	Not supported on this port
37	xe-0/0/37	Not supported on this port
38	xe-0/0/38	Not supported on this port
39	xe-0/0/39	Not supported on this port
40	xe-0/0/40	Not supported on this port
41	xe-0/0/41	Not supported on this port
42	xe-0/0/42	Not supported on this port
43	xe-0/0/43	Not supported on this port
44	xe-0/0/44	Not supported on this port
45	xe-0/0/45	Not supported on this port
46	xe-0/0/46	Not supported on this port
47	xe-0/0/47	Not supported on this port

Table 14: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running Enhanced Layer 2 Software *(continued)*

Port Number	10-Gigabit Ethernet Interfaces (On PIC 0)	40-Gigabit Ethernet Interfaces (On PIC 0)
48	xe-0/0/48:0 xe-0/0/48:1 xe-0/0/48:2 xe-0/0/48:3	et-0/1/0
49	xe-0/0/49:0 xe-0/0/49:1 xe-0/0/49:2 xe-0/0/49:3	et-0/1/1
50	xe-0/0/50:0 xe-0/0/50:1 xe-0/0/50:2 xe-0/0/50:3	et-0/1/2
51	xe-0/0/51:0 xe-0/0/51:1 xe-0/0/51:2 xe-0/0/51:3	et-0/1/3
52	xe-0/0/52:0 xe-0/0/52:1 xe-0/0/52:2 xe-0/0/52:3	et-0/1/4
53	xe-0/0/53:0 xe-0/0/53:1 xe-0/0/53:2 xe-0/0/53:3	et-0/1/5

Table 15: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running QFabric Software Package

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)
0	xe-0/0/0	Not supported on this port	Not supported on this port
1	xe-0/0/1	Not supported on this port	Not supported on this port
2	xe-0/0/2	Not supported on this port	Not supported on this port
3	xe-0/0/3	Not supported on this port	Not supported on this port
4	xe-0/0/4	Not supported on this port	Not supported on this port
5	xe-0/0/5	Not supported on this port	Not supported on this port
6	xe-0/0/6	Not supported on this port	Not supported on this port
7	xe-0/0/7	Not supported on this port	Not supported on this port
8	xe-0/0/8	Not supported on this port	Not supported on this port
9	xe-0/0/9	Not supported on this port	Not supported on this port
10	xe-0/0/10	Not supported on this port	Not supported on this port
11	xe-0/0/11	Not supported on this port	Not supported on this port
12	xe-0/0/12	Not supported on this port	Not supported on this port
13	xe-0/0/13	Not supported on this port	Not supported on this port
14	xe-0/0/14	Not supported on this port	Not supported on this port
15	xe-0/0/15	Not supported on this port	Not supported on this port
16	xe-0/0/16	Not supported on this port	Not supported on this port
17	xe-0/0/17	Not supported on this port	Not supported on this port
18	xe-0/0/18	Not supported on this port	Not supported on this port
19	xe-0/0/19	Not supported on this port	Not supported on this port
20	xe-0/0/20	Not supported on this port	Not supported on this port
21	xe-0/0/21	Not supported on this port	Not supported on this port

Table 15: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running QFabric Software Package *(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)
22	xe-0/0/22	Not supported on this port	Not supported on this port
23	xe-0/0/23	Not supported on this port	Not supported on this port
24	xe-0/0/24	Not supported on this port	Not supported on this port
25	xe-0/0/25	Not supported on this port	Not supported on this port
26	xe-0/0/26	Not supported on this port	Not supported on this port
27	xe-0/0/27	Not supported on this port	Not supported on this port
28	xe-0/0/28	Not supported on this port	Not supported on this port
29	xe-0/0/29	Not supported on this port	Not supported on this port
30	xe-0/0/30	Not supported on this port	Not supported on this port
31	xe-0/0/31	Not supported on this port	Not supported on this port
32	xe-0/0/32	Not supported on this port	Not supported on this port
33	xe-0/0/33	Not supported on this port	Not supported on this port
34	xe-0/0/34	Not supported on this port	Not supported on this port
35	xe-0/0/35	Not supported on this port	Not supported on this port
36	xe-0/0/36	Not supported on this port	Not supported on this port
37	xe-0/0/37	Not supported on this port	Not supported on this port
38	xe-0/0/38	Not supported on this port	Not supported on this port
39	xe-0/0/39	Not supported on this port	Not supported on this port
40	xe-0/0/40	Not supported on this port	Not supported on this port
41	xe-0/0/41	Not supported on this port	Not supported on this port
42	xe-0/0/42	Not supported on this port	Not supported on this port
43	xe-0/0/43	Not supported on this port	Not supported on this port

Table 15: Valid Port Ranges on QFX5100-48S and QFX5100-48T Switches Running QFabric Software Package *(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)
44	xe-0/0/44	Not supported on this port	Not supported on this port
45	xe-0/0/45	Not supported on this port	Not supported on this port
46	xe-0/0/46	Not supported on this port	Not supported on this port
47	xe-0/0/47	Not supported on this port	Not supported on this port
48	Not supported on this port	Not supported on this PIC	fte-0/1/0 NOTE: This interface is a fixed fte interface and cannot be changed to xle.
49	Not supported on this port	Not supported on this PIC	fte-0/1/1 NOTE: This interface is a fixed fte interface and cannot be changed to xle.
50	Not supported on this port	xle-0/1/2	fte-0/1/2 NOTE: By default, this interface is an fte interface but can be configured as an xle interface.
51	Not supported on this port	xle-0/1/3	fte-0/1/3 NOTE: By default, this interface is an fte interface but can be configured as an xle interface.
52	Not supported on this port	xle-0/1/4 NOTE: By default, this interface is an xle interface but can be configured as an fte interface.	fte-0/1/4
53	Not supported on this port	xle-0/1/5 NOTE: By default, this interface is an xle interface but can be configured as an fte interface.	fte-0/1/5

Supported System Modes

NOTE: There are restrictions on the ports you can channelize on the QFX5100-24Q and QFX5100-96S switches depending on the system mode you configure. If you try to channelize ports that are restricted, the configuration is ignored.

The following system modes are available on the QFX5100-24Q switch:

- Default mode
- Mode-104-port
- Flexi-PIC mode
- Non-oversubscribed mode

See Table 16 on page 49 for more information regarding the supported system modes for your switch.

The following system modes are available on the QFX5100-96S switch:

- Default-mode
- Non-oversubscribed mode

See Table 16 on page 49 for more information regarding the supported system modes for your switch.

Table 16: System Modes Supported on QFX5100 Switches Running Enhanced Layer 2 Software

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5100-48S and QFX5100-48T	Not supported	Not supported	Not supported	Not supported

Table 16: System Modes Supported on QFX5100 Switches Running Enhanced Layer 2 Software *(continued)*

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5100-24Q	Supported You do not need to configure the switch to be in this mode. On PIC 0, you can channelize all 24 40-Gbps QSFP+ ports. On PIC 1 and PIC 2, the 40-Gbps QSFP+ ports in the expansion modules are supported but cannot be channelized. In this mode, you can have one of two port combinations: 32 40-Gbps QSFP+ ports, or 96 10-Gigabit Ethernet ports plus 8 40-Gbps QSFP+ ports.	Supported On PIC 0, all 24 40-Gbps QSFP+ ports are channelized by default, which provides 96 10-Gigabit Ethernet ports. 40-Gbps QSFP+ ports contained in an expansion module on PIC 1 are supported. On PIC 1, ports 0 and 2 are channelized by default, and ports 1 and 3 are disabled. If 40-Gbps QSFP+ ports contained in an expansion module are detected on PIC 2, they are ignored.	Supported On PIC 0, the first four ports (ports 0 through 3) cannot be channelized. 40-Gbps QSFP+ ports contained in expansion modules on PIC 1 and PIC 2 are supported but cannot be channelized.	Supported All 24 40-Gbps QSFP+ ports on PIC 0 can be channelized to 96 10-Gigabit Ethernet ports. 40-Gbps QSFP+ ports contained in the expansion modules on PIC 1 and PIC 2 are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.
QFX5100-96S	Supported You do not need to configure the switch to be in this mode. On PIC 0, all 96 10-Gigabit Ethernet ports are supported. You can only channelize the 40-GbpsQSFP+ interfaces to 10-Gibabit Ethernet interfaces on ports 96 and 100. When you channelize the interfaces on ports 96 and 100, ports 97, 98, 99, 101, 102 and 103 are disabled.	Not supported	Not supported	Supported On PIC 0, all 96 10-Gigabit Ethernet ports are supported. However, the eight 40-Gbps QSFP+ ports are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.

Related Documentation

- Interfaces Overview on page 3
- Channelizing Interfaces on page 94
- Configuring the System Mode on page 96
- Understanding Interface Naming Conventions on page 15

- *Rear Panel of a QFX3500 Device*
- *Front Panel of a QFX3600 Device*

Understanding Redundant Trunk Links

In a typical enterprise network composed of distribution and access layers, a redundant trunk link provides a simple solution for network recovery when a trunk port on a switch goes down. In that case, traffic is routed to another trunk port, keeping network convergence time to a minimum.

To configure a redundant trunk link, create a redundant trunk group. The redundant trunk group is configured on the access switch and contains two links: a primary or active link, and a secondary link. If the active link fails, the secondary link automatically starts forwarding data traffic without waiting for normal spanning-tree protocol convergence.

Data traffic is forwarded only on the active link. Data traffic on the secondary link is dropped and shown as dropped packets when you issue the operational mode command **show interfaces *interface-name* extensive**.

While data traffic is blocked on the secondary link, Layer 2 control traffic is still permitted. For example, an LLDP session can be run between two switches on the secondary link.

Rapid Spanning Tree Protocol (RSTP) is enabled by default on the switches to create a loop-free topology, but an interface is not allowed to be in both a redundant trunk group and in a spanning-tree protocol topology at the same time. You must disable RSTP on an interface if a redundant trunk group is configured on that interface. For example, in Figure 4 on page 52, in addition to disabling RSTP on the Switch 3 interfaces, you must also disable RSTP on the Switch 1 and Switch 2 interfaces connected to Switch 3. Spanning-tree protocols can, however, continue operating on other interfaces on those switches—for example on the link between Switch 1 and Switch 2.

Figure 4 on page 52 shows three switches in a basic topology for redundant trunk links. Switch 1 and Switch 2 make up the distribution layer, and Switch 3 makes up the access layer. Switch 3 is connected to the distribution layer through trunk ports ge-0/0/9.0 (Link 1) and ge-0/0/10.0 (Link 2). Link 1 and Link 2 are in a redundant trunk group called group1. Link 1 is designated as the primary link. Traffic flows between Switch 3 in the access layer and Switch 1 in the distribution layer through Link 1. While Link 1 is active, Link 2 blocks traffic.

Figure 4: Redundant Trunk Group, Link 1 Active

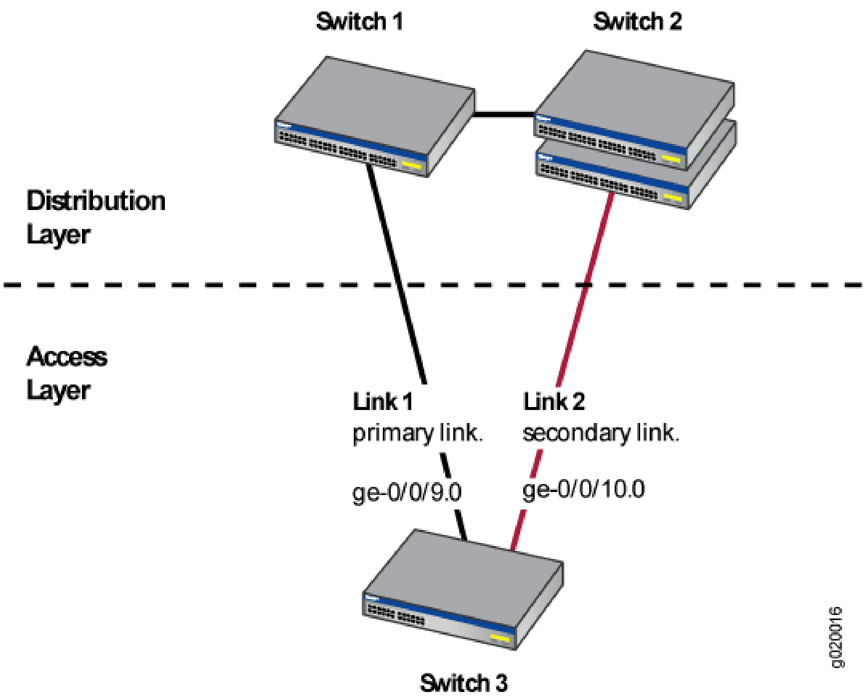
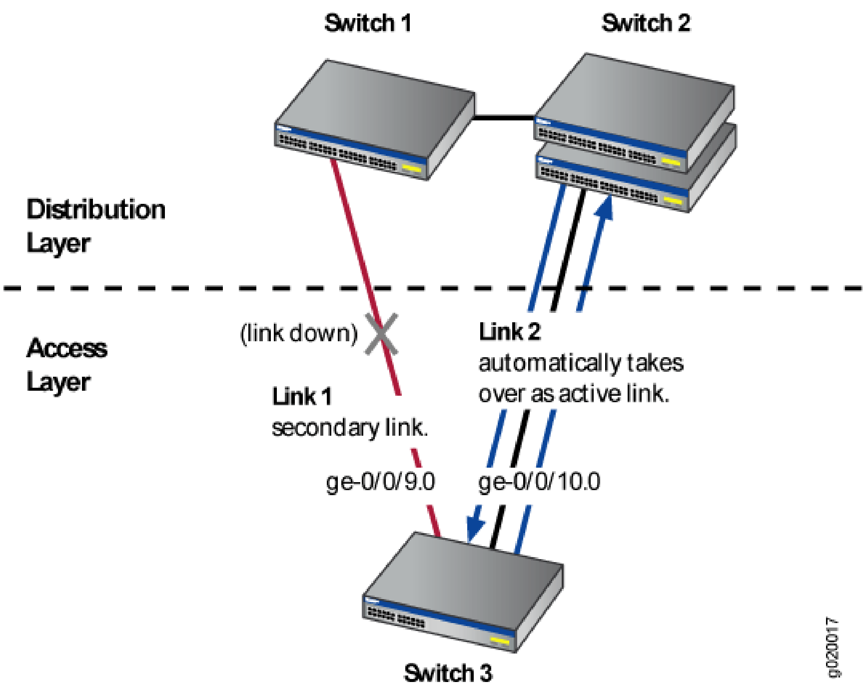


Figure 5 on page 52 illustrates how the redundant trunk link topology works when the primary link goes down.

Figure 5: Redundant Trunk Group, Link 2 Active



When Link 1 between Switch 1 and Switch 3 goes down, Link 2 takes over as the active link. Traffic between the access layer and the distribution layer is then automatically switched to Link 2 between Switch 1 and Switch 2.

Related Documentation

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72

Understanding Generic Routing Encapsulation

Generic routing encapsulation (GRE) provides a private, secure path for transporting packets through an otherwise public network by encapsulating (or tunneling) the packets.

This topic describes:

Overview of GRE

GRE encapsulates data packets and redirects them to a device that de-encapsulates them and routes them to their final destination. This allows the source and destination switches to operate as if they have a virtual point-to-point connection with each other (because the outer header applied by GRE is transparent to the encapsulated payload packet). For example, GRE tunnels allow routing protocols such as RIP and OSPF to forward data packets from one switch to another switch across the Internet. In addition, GRE tunnels can encapsulate multicast data streams for transmission over the Internet.

GRE is described in RFC 2784 (obsoletes earlier RFCs 1701 and 1702). The switches support RFC 2784, but not completely. (For a list of limitations, see “Configuration Limitations” on page 56.)

As a *tunnel source router*, the switch encapsulates a payload packet for transport through the tunnel to a destination network. The payload packet is first encapsulated in a GRE packet, and then the GRE packet is encapsulated in a delivery protocol. The switch performing the role of a *tunnel remote router* extracts the tunneled packet and forwards the packet to its destination. Note that you can use one firewall term to terminate many GRE tunnels on a QFX5100 switch.

GRE Tunneling

Data is routed by the system to the GRE endpoint over routes established in the route table. (These routes can be statically configured or dynamically learned by routing protocols such as RIP or OSPF.) When a data packet is received by the GRE endpoint, it is de-encapsulated and routed again to its destination address.

GRE tunnels are *stateless*-–that is, the endpoint of the tunnel contains no information about the state or availability of the remote tunnel endpoint. Therefore, the switch operating as a tunnel source router cannot change the state of the GRE tunnel interface to down if the remote endpoint is unreachable.

For details about GRE tunneling, see:

- Encapsulation and De-Encapsulation on the Switch on page 54
- Number of Source and Destination Tunnels Allowed on a Switch on page 54
- Class of Service on GRE Tunnels on page 54
- Applying Firewall Filters to GRE Traffic on page 55

Encapsulation and De-Encapsulation on the Switch

Encapsulation—A switch operating as a tunnel source router encapsulates and forwards GRE packets as follows:

1. When a switch receives a data packet (payload) to be tunneled, it sends the packet to the tunnel interface.
2. The tunnel interface encapsulates the data in a GRE packet and adds an outer IP header.
3. The IP packet is forwarded on the basis of the destination address in the outer IP header.

De-encapsulation—A switch operating as a tunnel remote router handles GRE packets as follows:

1. When the destination switch receives the IP packet from the tunnel interface, the outer IP header and GRE header are removed.
2. The packet is routed based on the inner IP header.

Number of Source and Destination Tunnels Allowed on a Switch

QFX5100 switches support as many as 512 GRE tunnels, including tunnels created with a firewall filter. That is, you can create a total of 512 GRE tunnels, regardless of which method you use.

EX switches support as many as 500 GRE tunnels between switches transmitting IPv4 or IPv6 payload packets over GRE. If a passenger protocol in addition to IPv4 and IPv6 is used, you can configure up to 333 GRE tunnels between the switches.

An EX switch can have a maximum of 20 tunnel source IP addresses configured, and each tunnel source IP can be configured with up to 20 destination IP addresses on a second switch. As a result, the two connected switches can have a maximum of 400 GRE tunnels. If the first switch is also connected to a third switch, the possible maximum number of tunnels is 500.

Class of Service on GRE Tunnels

When a network experiences congestion and delay, some packets might be dropped. Junos OS class of service (CoS) divides traffic into classes to which you can apply different levels of throughput and packet loss when congestion occurs and thereby set rules for packet loss. For details about CoS, see Junos OS CoS for EX Series Switches Overview.

The following CoS components are available on a switch operating as a GRE tunnel source router or GRE tunnel remote router:

- At the GRE tunnel source—On a switch operating as a tunnel source router, you can apply CoS classifiers on an *ingress port* or on a *GRE port*, with the following results on CoS component support on tunneled packets:
  - Schedulers only—Based on the CoS classification on the ingress port, you can apply CoS schedulers on a GRE port of the switch to define output queues and control the transmission of packets through the tunnel after GRE encapsulation. However, you cannot apply CoS rewrite rules to these packets.
  - Schedulers and rewrite rules—Depending on the CoS classification on the GRE port, you can apply both schedulers and rewrite rules to the encapsulated packets transmitted through the tunnel.
- At the GRE tunnel endpoint—When the switch is a tunnel remote router, you can apply CoS classifiers on the GRE port and schedulers and rewrite rules on the egress port to control the transmission of a de-encapsulated GRE packet out from the egress port.

Applying Firewall Filters to GRE Traffic

Firewall filters provide rules that define whether to permit, deny, or forward packets that are transiting an interface on a switch. (For details, see Firewall Filters for EX Series Switches Overview.) Because of the encapsulation and de-encapsulation performed by GRE, you are constrained as to where you can apply a firewall filter to filter tunneled packets and which header will be affected. Table 17 on page 55 identifies these constraints.

Table 17: Firewall Filter Application Points for Tunneled Packets

Endpoint Type	Ingress Interface	Egress Interface
Source (encapsulating)	inner header	outer header
Remote (de-encapsulating)	Cannot filter packets on ingress interface	inner header

Using a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100 Switch

You can also use a firewall filter to de-encapsulate GRE traffic on a QFX5100 switch. This feature provides significant benefits in terms of scalability, performance, and flexibility because you don't need to create a tunnel interface to perform the de-encapsulation. For example, you can terminate many tunnels from multiple source IP addresses with one firewall term. See *Configuring a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100 Switch* for information about how to configure a firewall filter for this purpose.

Configuration Limitations

Table 18 on page 56 lists features that are not supported with GRE.

Table 18: Features Not Supported with GRE

EX Switches	QFX Switches
MPLS over GRE tunnels	MPLS over GRE tunnels
GRE keepalives	GRE keepalives
GRE keys, payload packet fragmentation, and sequence numbers for fragmented packets	GRE keys, payload packet fragmentation, and sequence numbers for fragmented packets
BGP dynamic tunnels	BGP dynamic tunnels
Outer IP address must be IPv4	Outer IP address must be IPv4
Virtual routing instances	
Bidirectional Forwarding Detection (BFD) protocol over GRE distributed mode	
OSPF limitation—Enabling OSPF on a GRE interface creates two equal-cost routes to the destination: one through the Ethernet network or uplink interface and the other through the tunnel interface. If data is routed through the tunnel interface, the tunnel might fail. To keep the interface operational, we recommend that you use a static route, disable OSPF on the tunnel interface, or configure the peer not to advertise the tunnel destination over the tunnel interface.	

Related Documentation

- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*
- Configuring Generic Routing Encapsulation Tunneling on page 88
- *Configuring a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100 Switch*

PART 2

Configuration

CHAPTER 2

Configuration Examples

Example: Configuring Interfaces for Uplink Failure Detection

Uplink failure detection allows a switch to detect link failure on uplink interfaces and to propagate the failure information to the downlink interfaces. All of the network interface cards (NICs) on a server are configured as being either the primary link or the secondary link and share the same IP address. When the primary link goes down, the server transparently shifts the connection to the secondary link to ensure that the traffic on the failed link is not dropped.

This example describes:

Requirements

This example uses the following software and hardware components:

- Junos OS Release 12.1 or later for the QFX Series
- Two QFX3500 switches
- Two aggregation switches
- One dual-homed server

Overview and Topology

The topology in this example illustrates how to configure uplink failure detection on Switch A and Switch B. Switch A and Switch B are both configured with a link-to-monitor interface (the uplink interface to the aggregation switch) and a link-to-disable interface (the downlink interface to the server). For simplicity, only one group of link-to-monitor interfaces and link-to-disable interfaces is configured for each switch. The server is dual-homed to both Switch A and Switch B. In this scenario, if the link-to-monitor interface to Switch A is disabled, the server uses the link-to-monitor interface to Switch B instead.

NOTE: This example does not describe how to configure the dual-homed server or the aggregation switches. Please refer to the documentation for each of these devices for more information.

Figure 1 on page 6 illustrates a typical setup for uplink failure detection.

Figure 6: Uplink Failure Detection Configuration on Switches

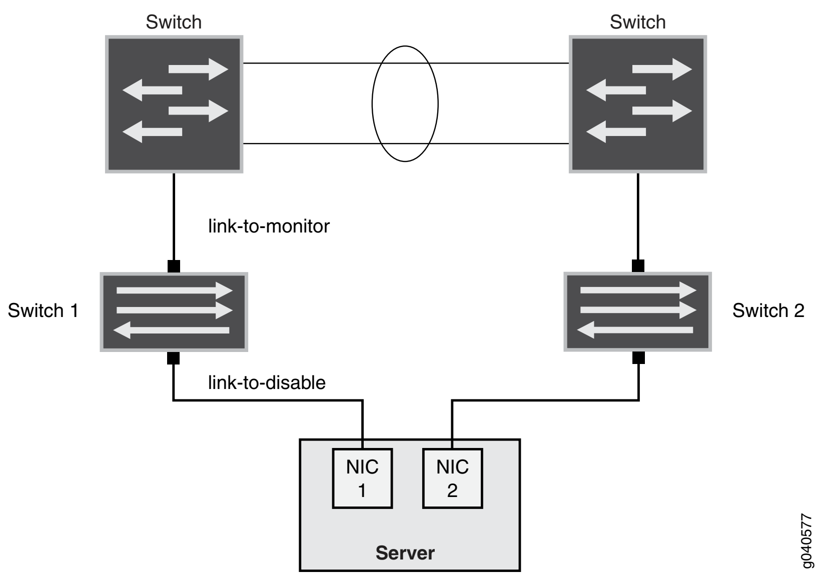


Table 19 on page 60 lists uplink failure settings for each QFX3500 switch.

Table 19: Settings for Uplink Failure Protection Example

Switch A	Switch B
• Group name: Group1 • Link-to-monitor interface: **xe-0/0/0** • Link-to-disable interface: **xe-0/0/1**	• Group name: Group2 • Link-to-monitor interface: **xe-0/0/0** • Link-to-disable interface: **xe-0/0/1**

Configuring Uplink Failure Detection on Both Switches

To configure uplink failure detection on both switches, perform these tasks:

CLI Quick Configuration

To quickly configure uplink failure protection on Switch A and Switch B, copy the following commands and paste them into the switch terminal window:

```
[edit protocols]
set uplink-failure-detection group group1
set uplink-failure-detection group group2
set uplink-failure-detection group group1 link-to-monitor xe-0/0/0
set uplink-failure-detection group group2 link-to-monitor xe-0/0/0
set uplink-failure-detection group group1 link-to-disable xe-0/0/1
set uplink-failure-detection group group2 link-to-disable xe-0/0/1
```

Step-by-Step Procedure

To configure uplink failure protection on both switches:

1. Specify a name for the uplink failure detection group on Switch A:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group1
   ```
2. Add an uplink interface to the group on Switch A:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group1 link-to-monitor xe-0/0/0
   ```
3. Add a downlink interface to the group on Switch A:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group1 link-to-disable xe-0/0/1
   ```
4. Specify a name for the uplink failure detection group on Switch B:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group2
   ```
5. Add an uplink interface to the group on Switch B:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group2 link-to-monitor xe-0/0/0
   ```
6. Add a downlink interface to the group on Switch B:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group2 link-to-disable xe-0/0/1
   ```

Results

Display the results of the configuration:

```
uplink-failure-detection {
  group {
    group1 {
      link-to-monitor {
        xe-0/0/0;
      }
      link-to-disable {
        xe-0/0/1;
      }
    }
    group2 {
      link-to-monitor {
        xe-0/0/0;
      }
      link-to-disable {
        xe-0/0/1;
      }
    }
  }
}
```

Verification

To verify that uplink failure detection is working correctly, perform the following tasks on Switch A and Switch B:

- Verifying That Uplink Failure Detection is Working Correctly on page 62

Verifying That Uplink Failure Detection is Working Correctly

Purpose Verify that the switch disables the downlink interface when it detects an uplink failure.

Action

1. View the current uplink failure detection status:

```
user@switch> show uplink-failure-detection
Group                         : group1
Uplink                        :  xe-0/0/0*
Downlink                      :  xe-0/0/1*
Failure Action                :  Inactive
```

NOTE: The asterisk (*) indicates that the link is up.

2. Disable the uplink interface:

```
[edit]
user@switch# set interface xe-0/0/0 disable
```

3. Save the configuration on the switch.
4. View the current uplink failure detection status:

```
user@switch> show uplink-failure-detection
Group                         : group1
Uplink                        :  xe-0/0/0
Downlink                      :  xe-0/0/1
Failure Action                :  Active
```

Meaning The output in Step 1 shows that the uplink interface is up, and hence that the downlink interface is also up, and that the status of **Failure Action** is **Inactive**.

The output in Step 4 shows that both the uplink and downlink interfaces are down (there are no asterisks after the interface name) and that the status of **Failure Action** is changed to **Active**. This output shows that uplink failure detection is working.

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- *Verifying That Uplink Failure Detection Is Working Correctly*

Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch

A QFX Series product allows you to combine multiple Ethernet links into one logical interface for higher bandwidth and redundancy. The ports that are combined in this manner are referred to as a link aggregation group (LAG) or bundle. The number of Ethernet links you can combine into a LAG depends on your QFX Series product model. You can configure LAGs to connect a QFX Series product to other switches, like aggregation switches, servers, or routers. This example describes how to configure LAGs to connect a QFX3500, QFX3600, or QFX5100 switch to an aggregation switch.

Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.1 or later for the QFX3500 and QFX3600 switches, and Junos OS 13.2 or later for the QFX5100 switch.
- One QFX3500, QFX3600, or QFX5100 switch.

Overview and Topology

In this example, the switch has one LAG comprising two 10-Gigabit Ethernet interfaces. This LAG is configured in port mode trunk so that the switch and the VLAN to which it has been assigned can send and receive traffic.

Configuring the Ethernet interfaces as LAGs has the following advantages:

- If one physical port is lost for any reason (a cable is unplugged or a switch port fails), the logical port transparently continues to function over the remaining physical port.
- Link Aggregation Control Protocol (LACP) can optionally be configured for link monitoring and automatic addition and deletion of individual links without user intervention.

NOTE: If the remote end of the LAG link is a security device, LACP might not be supported because security devices require a deterministic configuration. In this case, do not configure LACP. All links in the LAG are permanently operational unless the switch detects a link failure within the Ethernet physical layer or data link layers.

The topology used in this example consists of one switch with a LAG configured between two of its 10-Gigabit Ethernet interfaces. The switch is connected to an aggregation switch.

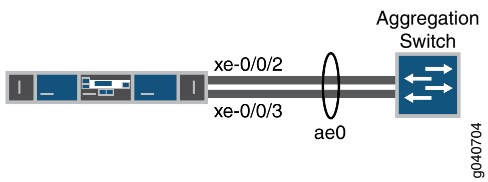


Table 20 on page 64 details the topology used in this configuration example.

Table 20: Components of the Topology for Configuring a LAG Between a QFX3500 Switch and Aggregation Switch

Hostname	Base Hardware	Trunk Port
switch	QFX3500, QFX3600, or QFX5100 switch	**ae0** is configured as a trunk port and combines the following two interfaces: **xe-0/0/2** and **xe-0/0/3** .

Configuration

To configure a LAG between two 10-Gigabit Ethernet interfaces:

CLI Quick Configuration

To quickly configure a LAG between two 10-Gigabit Ethernet interfaces on a switch, copy the following commands and paste them into the switch terminal window:

NOTE: If you are configuring a LAG on the QFX5100 switch, use the **interface-mode** statement instead of the **port-mode** statement. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

```
[edit]
set chassis aggregated-devices ethernet device-count 1
set interfaces ae0 aggregated-ether-options minimum-links 1
set interfaces ae0 aggregated-ether-options link-speed 10g
set interfaces ae0 unit 0 family ethernet-switching vlan members green
set interfaces xe-0/0/2 ether-options 802.ad ae0
set interfaces xe-0/0/3 ether-options 802.ad ae0
set interfaces ae0 unit 0 family ethernet-switching port-mode trunk
set interfaces ae0 aggregated-ether-options lacp active
set interfaces ae0 aggregated-ether-options lacp periodic fast
```

Step-by-Step Procedure

To configure a LAG between a QFX Series switch and an aggregation switch:

1. Specify the number of LAGs to be created on the switch:

```
[edit chassis]
user@switch# set aggregated-devices ethernet device-count 1
```

2. Specify the number of links that need to be present for the **ae0** LAG interface to be **up**:

```
[edit interfaces]
user@switch# set ae0 aggregated-ether-options minimum-links 1
```

3. Specify the media speed of the **ae0** link:

```
[edit interfaces]
user@switch# set ae0 aggregated-ether-options link-speed 10g
```

4. Specify the members to be included within the aggregated Ethernet bundle:

```
[edit interfaces]
user@switch# set interfaces xe-0/0/2 ether-options 802.ad ae0
[edit interfaces]
user@switch# set interfaces xe-0/0/3 ether-options 802.ad ae0
```

5. Assign a port mode of trunk to the **ae0** link:

NOTE: If you are configuring a LAG on the QFX5100 switch, use the interface-mode statement instead of the port-mode statement. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

```
[edit interfaces]
user@switch# set ae0 unit 0 family ethernet-switching port-mode trunk
```

or

```
[edit interfaces]
user@switch# set ae0 unit 0 family ethernet-switching interface-mode trunk
```

6. Assign the LAG to a VLAN:

```
[edit interfaces]
user@switch# set ae0 unit 0 family ethernet-switching vlan members green vlan-id 200
```

7. (Optional): Designate one side of the LAG as active for LACP:

```
[edit interfaces]
user@switch# set ae0 aggregated-ether-options lacp active
```

8. (Optional): Designate the interval and speed at which the interfaces send LACP packets:

```
[edit interfaces]
user@switch# set ae0 aggregated-ether-options lacp periodic fast
```

Results

Display the results of the configuration on a QFX3500 or QFX3600 switch:

```
[edit]
chassis {
  aggregated-devices {
    ethernet {
      device-count 1;
    }
  }
}
green {
  vlan-id 200;
  }
}
interfaces {
  ae0 {
```

```
      aggregated-ether-options {
        link-speed 10g;
        minimum-links 1;
      }
      unit 0 {
        family ethernet-switching {
          port-mode trunk;
            vlan {
            members green;
          }
      }
    }
    xe-0/0/2 {
      ether-options {
        802.ad ae0;
      }
    }
    xe-0/0/3 {
      ether-options {
        802.ad ae0;
      }
    }
  }
```

Verification

To verify that switching is operational and one LAG has been created, perform these tasks:

- Verifying That LAG ae0.0 Has Been Created on page 66
- Verifying That LAG ae0 Has Been Created on page 66

Verifying That LAG ae0.0 Has Been Created

Purpose Verify that LAG **ae0.0** has been created on the switch.

Action **show interfaces ae0 terse**

```
Interface               Admin Link Proto    Local                 Remote
ae0                     up    up
ae0.0                   up    up eth-switch
```

Meaning The output confirms that the **ae0.0** link is up and shows the **family** and IP address assigned to this link.

Verifying That LAG ae0 Has Been Created

Purpose Verify that LAG **ae0** has been created on the switch

Action **show interfaces ae0 terse**

```
Interface               Admin Link Proto    Local                 Remote
ae0                     up    down
ae0.0                   up    down eth-switch
```


Meaning The output shows that the **ae0.0** link is down.

Troubleshooting

Troubleshooting a LAG That Is Down

Problem The **show interfaces terse** command shows that the LAG is **down**.

Solution Check the following:

- Verify that there is no configuration mismatch.
- Verify that all member ports are up.
- Verify that a LAG is part of family ethernet switching (Layer 2 LAG) or family inet (Layer 3 LAG).
- Verify that the LAG member is connected to the correct LAG at the other end.

Related Documentation

- Configuring Link Aggregation on page 85
- Verifying the Status of a LAG Interface on page 200
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 201
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67
- *Example: Configuring an FCoE LAG on a Redundant Server Node Group*
- **show lacp statistics interfaces (View) on page 320**

Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch

QFX Series products allow you to combine multiple Ethernet links into one logical interface for higher bandwidth and redundancy. The ports that are combined in this manner are referred to as a link aggregation group (LAG) or bundle. The number of Ethernet links you can combine into a LAG depends on your QFX Series product model. On a standalone switch, you can group up to 32 Ethernet interfaces to form a LAG. On a QFabric system, you can group up to 8 Ethernet interfaces to form a LAG. QFX Series products allow you to further enhance these links by configuring Link Aggregation Control Protocol (LACP).

This example describes how to overlay LACP on the LAG configurations that were created in "Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch" on page 63:

- Requirements on page 68
- Overview and Topology on page 68
- Configuring LACP for the LAG on the QFX Series on page 68

- Verification on page 69
- Troubleshooting on page 70

Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.1 or later for the QFX3500 switch, Junos OS Release 12.1 or later for the QFX3600 switch, and Junos OS 13.2 or later for the QFX5100 switch.
- One QFX3500, QFX3600, or QFX5100 switch.

Before you configure LACP, be sure you have:

- Configured the ports on the switches as trunk ports.
- Configured the LAG.

Overview and Topology

The topology in this example is exactly the same as the topology used in the Configuring a LAG Between a QFX Switch and an Aggregation Switch example. This example shows how to use LACP to enhance the LAG functionality.

LACP exchanges are made between *actors* (the transmitting link) and *partners* (the receiving link). The LACP mode can be either active or passive.

NOTE: **If the actor and partner are both in passive mode, they do not exchange LACP packets, which results in the aggregated Ethernet links not coming up. By default, LACP is in passive mode. To initiate transmission of LACP packets and responses to LACP packets, you must enable LACP in active mode.**

By default, the actor and partner send LACP packets every second. You can configure the interval at which the interfaces send LACP packets by including the **periodic** statement at the **[edit interfaces *interface-name* aggregated-ether-options lacp]** hierarchy level.

The interval can be fast (every second) or slow (every 30 seconds).

Configuring LACP for the LAG on the QFX Series

To configure LACP for a QFX Series LAG, perform these tasks:

CLI Quick Configuration

To quickly configure LACP for the access switch LAGs, copy the following commands and paste them into the switch terminal window:

```
[edit]
set interfaces ae0 aggregated-ether-options lacp active periodic fast
```


Step-by-Step Procedure

To configure LACP for LAG **ae0** :

1. Specify the aggregated Ethernet options for the LAG:

```
[edit interfaces]
user@switch# set ae0 aggregated-ether-options lacp active periodic fast
```

Results

Display the results of the configuration:

```
[edit interfaces]
user@switch# show
ae0 {
  aggregated-ether-options {
    lacp {
      active;
      periodic fast;
    }
  }
}
```

Verification

To verify that LACP packets are being exchanged, perform the following tasks:

- Verifying the LACP Settings on page 69
- Verifying That the LACP Packets Are Being Exchanged on page 69

Verifying the LACP Settings

Purpose

Verify that LACP has been set up correctly.

Action

Use the **show lacp interfaces** ***interface-name*** command to check that LACP has been enabled as active on one end.

```
user@switch> show lacp interfaces xe-0/02

Aggregated interface: ae0

    LACP state:       Role    Exp    Def  Dist  Col   Syn  Aggr  Timeout  Activity

      xe-0/0/2      Actor     No    Yes    No    No    No   Yes     Fast    Active

      xe-0/0/2    Partner     No    Yes    No    No    No   Yes     Fast   Passive

    LACP protocol:   Receive State    Transmit State          Mux State

      xe-0/0/2          Defaulted     Fast periodic           Detached
```

Meaning

The output indicates that LACP has been set up correctly and is active at one end.

Verifying That the LACP Packets Are Being Exchanged

Purpose

Verify that LACP packets are being exchanged.

Action Use the **show interfaces ae*x* statistics** command to display LACP information.

```
user@switch> show interfaces ae0 statistics

Physical interface: ae0, Enabled, Physical link is Down
  Interface index: 153, SNMP ifIndex: 30
  Link-level type: Ethernet, MTU: 1514, Speed: Unspecified, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Disabled, Minimum links needed: 1,
  Minimum bandwidth needed: 0
  Device flags   : Present Running
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  Current address: 02:19:e2:50:45:e0, Hardware address: 02:19:e2:50:45:e0
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

  Logical interface ae0.0 (Index 71) (SNMP ifIndex 34)
    Flags: Hardware-Down Device-Down SNMP-Traps Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :             0          0             0            0
        Output:             0          0             0            0
    Protocol inet
      Flags: None
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255
```

Meaning The output here shows that the link is down and that no PDUs are being exchanged.

Troubleshooting

To troubleshoot a nonworking LACP link, perform these tasks:

- Troubleshooting a Nonworking LACP Link on page 70

Troubleshooting a Nonworking LACP Link

Problem The LACP link is not working.

Solution Check the following:

- Remove the LACP configuration and verify whether the static LAG is up.
- Verify that LACP is configured at both ends.
- Verify that LACP is not passive at both ends.
- Verify whether LACP protocol data units (PDUs) are being exchanged by running the **monitor traffic-interface *lag-member* detail** command.

Related Documentation

- Configuring Link Aggregation on page 85
- Verifying the Status of a LAG Interface on page 200

- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 201
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- *Example: Configuring an FCoE LAG on a Redundant Server Node Group*
- **show lacp statistics interfaces (View) on page 320**

Example: Configuring Redundant Trunk Links for Faster Recovery

NOTE: This example uses Junos OS for EX Series switches or QFX Series with support for the Enhanced Layer 2 Software (ELS) configuration style. If your EX Series switch runs software that does not support ELS, see *Example: Configuring Redundant Trunk Links for Faster Recovery*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

You can manage network convergence by configuring both a primary link and a secondary link on a switch; this is called a redundant trunk group (RTG). If the primary link in a redundant trunk group fails, it passes its known MAC address locations to the secondary link, which automatically takes over after one minute.

This example describes how to create a redundant trunk group with a primary and a secondary link:

Requirements

This example uses the following hardware and software components:

- Two EX Series or QFX Series distribution switches
- One EX Series or QFX Series access switch
- The appropriate software release for your platform:
  - For EX Series switches: Junos OS Release 13.2X50-D10 or later
  - For the QFX Series: Junos OS Release 13.2X50-D15 or later

Before you configure the redundant trunk links network on the access and distribution switches, be sure you have:

- Configured interfaces ge-0/0/9 and ge-0/0/10 on the access switch, Switch 3, as trunk interfaces. .
- Configured one trunk interface on each distribution switch, Switch 1 and Switch 2.
- Connected the three switches as shown in the topology for this example (see Figure 7 on page 74).

Overview and Topology

In a typical enterprise network composed of distribution and access layers, a redundant trunk link provides a simple solution for trunk interface network recovery. When a trunk interface fails, data traffic is routed to another trunk interface after one minute, thereby keeping network convergence time to a minimum.

This example shows the configuration of a redundant trunk group that includes one primary link (and its interface) and one unspecified link (and its interface) that serves as the secondary link.

A second type of redundant trunk group, not illustrated in the example, consists of two unspecified links (and their interfaces); in this case, neither of the links is primary. The software selects an active link by comparing the port numbers of the two links and activating the link with the higher port number. For example, if the two link interfaces use interfaces ge-0/1/0 and ge-0/1/1, the software activates ge-0/1/1. (In the interface names, the final number is the port number.)

The two links in a redundant trunk group generally operate the same way, whether they are configured as primary/unspecified or unspecified/unspecified. Data traffic initially passes through the active link but is blocked on the inactive link. While data traffic is blocked on the secondary link, note that Layer 2 control traffic is still permitted if the link is active. For example, an LLDP session can be run between two switches on the secondary link. If the active link either goes down or is disabled administratively, it broadcasts a list of its known MAC addresses for data traffic; the other link immediately picks up and adds the MAC addresses to its address table, becomes active, and begins forwarding traffic.

The one difference in operation between the two types of redundant trunk groups occurs when a primary link is active, goes down, is replaced by the secondary link, and then reactivates. When a primary link is re-enabled like this while the secondary link is active, the primary link waits 2 minutes (you can change the time interval by using the preempt cutover timer to accommodate your network) and then takes over as the active link. In other words, the primary link has priority and is always activated if it is available. This differs from the behavior of two unspecified links, both of which act as equals. Because the unspecified links are equal, the active link remains active until it either goes down or is disabled administratively; this is the only time that the other unspecified link learns the MAC addresses and immediately becomes active.

The example given here illustrates a primary/unspecified configuration for a redundant trunk group because that configuration gives you more control and is more commonly used.

NOTE: Rapid Spanning Tree Protocol (RSTP) is enabled by default on the switches to create a loop-free topology, but an interface is not allowed to be in both a redundant trunk group and in a spanning-tree protocol topology at the same time. You will need to disable RSTP on the two distribution switches in the example, Switch 1 and Switch 2. Spanning-tree protocols can, however, continue operating in other parts of the network—for example, between the distribution switches and also in links between distribution switches and the enterprise core.

Figure 7 on page 74 displays an example topology containing three switches. Switch 1 and Switch 2 make up the distribution layer, and Switch 3 makes up the access layer. Switch 3 is connected to the distribution layer through trunk interfaces ge-0/0/9.0 (Link 1) and ge-0/0/10.0 (Link 2).

Table 21 on page 75 lists the components used in this redundant trunk group.

Because RSTP and RTGs cannot operate simultaneously on a switch, you disable RSTP on Switch 1 and Switch 2 in the first configuration task, and you disable RSTP on Switch 3 in the second task.

The second configuration task creates a redundant trunk group called example 1 on Switch 3. The trunk interfaces ge-0/0/9.0 and ge-0/0/10.0 are the two links configured in the second configuration task. You configure the trunk interface ge-0/0/9.0 as the primary link. You configure the trunk interface ge-0/0/10.0 as an unspecified link, which becomes the secondary link by default.

Figure 7: Topology for Configuring the Redundant Trunk Links

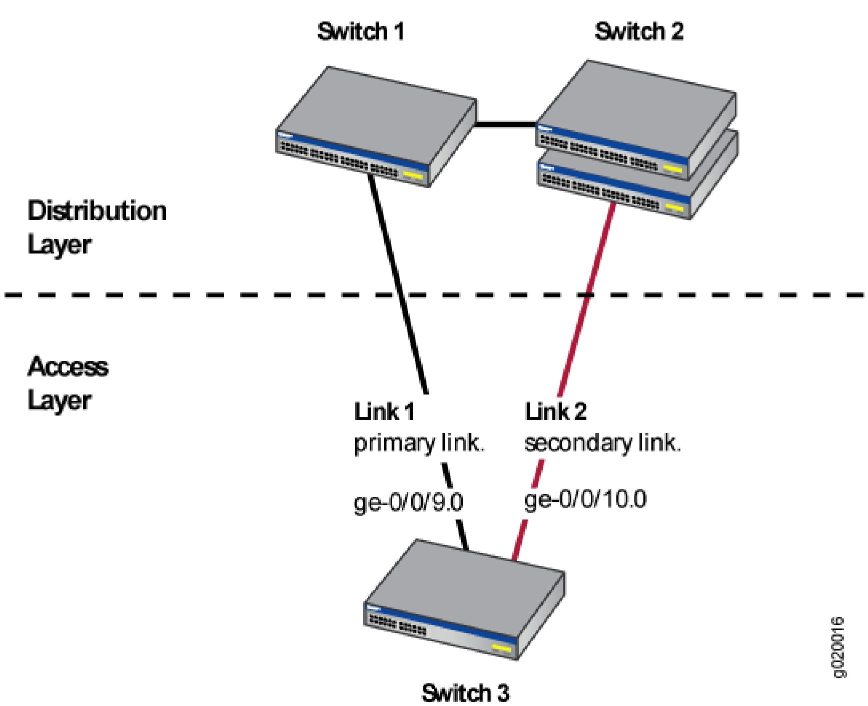


Table 21: Components of the Redundant Trunk Link Topology

Property	Settings
Switch hardware	• Switch 1—1 EX Series or QFX Series distribution switch • Switch 2—1 EX Series or QFX Series distribution switch • Switch 3—1 EX Series or QFX Series access switch
Trunk interfaces	On Switch 3 (access switch): ge-0/0/9.0 and ge-0/0/10.0
Redundant trunk group	example1

Disabling RSTP on Switches 1 and 2

To disable RSTP on Switch 1 and Switch 2, perform this task on each switch:

CLI Quick Configuration

To quickly disable RSTP on Switch 1 and Switch 2, copy the following command and paste it into each switch terminal window:

```
[edit]
set protocols rstp disable
```

Step-by-Step Procedure

To disable RSTP on Switch 1 and Switch 2:

1. Disable RSTP on Switch 1 and Switch 2:

```
[edit]
user@switch# set protocols rstp disable
```

Results

Check the results of the configuration:

```
[edit]
user@switch# show
protocols {
  rstp {
    disable;
  }
}
```

Configuring Redundant Trunk Links on Switch 3

To configure redundant trunk links on Switch 3, perform this task:

CLI Quick Configuration

To quickly configure the redundant trunk group example1 on Switch 3, copy the following commands and paste them into the switch terminal window:

```
[edit]
set protocols rstp disable
set switch-options redundant-trunk-group group example1 interface ge-0/0/9.0 primary
set switch-options redundant-trunk-group group example1 interface ge-0/0/10.0
set redundant-trunk-group group example1 preempt-cutover-timer 60
```

Step-by-Step Procedure

Configure the redundant trunk group example1 on Switch 3.

1. Turn off RSTP:

```
[edit]
user@switch# set protocols rstp disable
```

2. Name the redundant trunk group example1 while configuring trunk interface ge-0/0/9.0 as the primary link and ge-0/0/10 as an unspecified link to serve as the secondary link:

```
[edit switch-options]
user@switch#  set redundant-trunk-group group example1 interface ge-0/0/9.0 primary
user@switch#  set redundant-trunk-group group example1 interface ge-0/0/10.0
```

3. (Optional) Change the time interval (from the default 120 seconds) that a re-enabled primary link waits to take over for an active secondary link:

```
[edit switch-options]
user@switch#  set redundant-trunk-group group example1 preempt-cutover-timer 60
```

Results Check the results of the configuration:

```
[edit]
user@switch# show
switch-options
  redundant-trunk-group {
    group example1 {
      preempt-cutover-timer 60;
      interface ge-0/0/9.0 {
        primary;
      }
      interface ge-0/0/10.0;
    }
  }
protocols {
  rstp {
    disable;
  }
}
```

Verification

To confirm that the configuration is set up correctly, perform this task:

- Verifying That a Redundant Trunk Group Was Created on page 76

Verifying That a Redundant Trunk Group Was Created

Purpose Verify that the redundant trunk group example1 has been created on Switch 1 and that trunk interfaces are members of the redundant trunk group.

Action List all redundant trunk groups configured on the switch:

```
user@switch>  show redundant-trunk-group
Group       Interface    State       Time of last flap          Flap
name                                                            count

example1    ge-0/0/9.0  Up/Pri      Never                        0
            ge-0/0/10.0 Up          Never                        0
```


Meaning The **show redundant-trunk-group** command lists all redundant trunk groups configured on the switch as well as the interface names and their current states (up or down for an unspecified link, and up or down and primary for a primary link). For this configuration example, the output shows that the redundant trunk group example1 is configured on the switch. The **Up** beside the interfaces indicates that both link cables are physically connected. The **Pri** beside trunk interface ge-0/0/9.0 indicates that it is configured as the primary link.

Related Documentation

- Understanding Redundant Trunk Links on page 51

CHAPTER 3

Configuration Tasks

Configuring Gigabit and 10-Gigabit Ethernet Interfaces

Devices include a factory default configuration that:

- Enables all 10-Gigabit Ethernet network interfaces on the switch
- Sets a default port mode (access)
- Sets default link settings
- Specifies a logical unit (**unit 0**) and assigns it to **family ethernet-switching**
- Configures Storm Control on all 10-Gigabit Ethernet network interfaces
- Provides basic Rapid Spanning Tree Protocol (RSTP) and Link Layer Discovery Protocol (LLDP) configuration

This topic describes:

Configuring Port Mode

If you are connecting a switch to other switches and to routers on the LAN, you need to assign the interface to a logical port and you need to configure the logical port as a trunk port.

To configure a Gigabit Ethernet or 10-Gigabit interface for trunk port mode:

`[edit]`
`user@switch#` **set interfaces *interface-name* unit *logical-unit-number* family ethernet-switching port-mode trunk**

Configuring the Link Settings for Gigabit Ethernet and 10-Gigabit Ethernet Interfaces

Devices include a factory default configuration that enables Gigabit Ethernet and 10-Gigabit Ethernet and interfaces with applicable link settings.

The following default configurations are available on Gigabit Ethernet interfaces:

- The speed for Gigabit Ethernet interfaces is set to 1000 Mbps by default.
- Gigabit Ethernet interfaces operate in full-duplex mode by default, and autonegotiation is supported. If you want to disable autonegotation, you need to manually set the speed to 1g.

The following default configurations are available on 10-Gigabit Ethernet interfaces:

- The speed for 10-Gigabit Ethernet interfaces is set to 10 Gbps by default. The speed cannot be configured.
- 10-Gigabit Ethernet interfaces operate in full-duplex mode by default. Autonegotiation is not supported.

The **ether-options** statement enables you to modify the following options:

- **802.3ad**—Specify an aggregated Ethernet bundle for both Gigabit Ethernet and 10-Gigabit Ethernet interfaces.
- **autonegotiation**—Enable or disable autonegotation of flow control, link mode, and speed for Gigabit Ethernet interfaces.
- **link-mode**—Specify **full-duplex**, **half-duplex**, or **automatic** for Gigabit Ethernet interfaces.
- **loopback**—Enable or disable a loopback interface for both Gigabit Ethernet and 10-Gigabit Ethernet interfaces.

To set **ether-options** for both Gigabit Ethernet and 10-Gigabit Ethernet interfaces:

`[edit]`
`user@switch#` **set interfaces *interface-name* ether-options**

Configuring the IP Options

To specify an IP address for the logical unit:

`[edit]`
`user@switch#` **set interfaces *interface-name* unit *logical-unit-number* family inet address *ip-address***

Related Documentation

- Monitoring Interface Status and Traffic on page 199
- **show interfaces xe on page 297**
- *show interfaces ge-*
- Understanding Interface Naming Conventions on page 15

Configuring Aggregated Ethernet LACP

For aggregated Ethernet interfaces, you can configure the Link Aggregation Control Protocol (LACP). LACP is one method of bundling several physical interfaces to form one logical interface. You can configure aggregated Ethernet with or without LACP enabled.

Before you configure LACP, be sure you have configured the aggregated Ethernet bundles—also known as link aggregation groups (LAGs).

When LACP is enabled, the local and remote sides of the aggregated Ethernet links exchange protocol data units (PDUs), containing information about the state of the link. You can configure Ethernet links to actively transmit PDUs, or you can configure the links to passively transmit them, sending out LACP PDUs only when they receive them from another link. One side of the link must be configured as **active** for the link to be up.

NOTE: **Do not add LACP to a LAG if the remote end of the LAG link is a security device, unless the security device supports LACP. Security devices often do not support LACP because they require a deterministic configuration.**

To configure LACP:

1. Enable the LACP mode:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp mode
   ```

   For example, to specify the mode as active, execute the following command:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp active
   ```
2. Specify the interval and speed at which the interfaces send LACP packets:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp periodic interval
   ```

   For example, to specify the interval as fast, execute the following command:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp periodic fast
   ```

Configuring Ethernet Loopback Capability

To place an interface in loopback mode, include the **loopback** statement:

loopback;

To return to the default—that is, to disable loopback mode—delete the **loopback** statement from the configuration:

[edit]
user@switch# **delete interfaces *interface-name* ether-options loopback**

To explicitly disable loopback mode, include the **no-loopback** statement:

no-loopback;

You can include the **loopback** and **no-loopback** statements at the following hierarchy levels:

- **[edit interfaces *interface-name* aggregated-ether-options]**
- **[edit interfaces *interface-name* ether-options]**

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79

Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure)

Juniper Networks EX Series and QFX Series switches use a hashing algorithm to determine how to forward traffic over a Link Aggregation group (LAG) bundle or to the next-hop device when equal-cost multipath (ECMP) is enabled.

The hashing algorithm makes hashing decisions based on values in various packet fields, as well as on some internal values like source port ID and source device ID. You can configure some of the fields that are used by the hashing algorithm.

Configuring the fields used by the hashing algorithm is useful in scenarios where most of the traffic entering the bundle is similar and the traffic needs to be managed in the LAG bundle. For instance, if the only difference in the IP packets for all incoming traffic is the source and destination IP address, you can tune the hashing algorithm to make hashing decisions more efficiently by configuring the algorithm to make hashing decisions using only those fields.

Configuring the Hashing Algorithm to Use Fields in the Layer 2 Header for Hashing

To configure the hashing algorithm to use fields in the Layer 2 header for hashing:

1. Configure the hash mode to Layer 2 header:

```
[edit forwarding-options enhanced-hash-key]
user@switch# set hash-mode layer2-header
```


The default hash mode is Layer 2 payload. Therefore, this step must be performed if you have not previously configured the hash mode.

2. Configure the fields in the Layer 2 header that the hashing algorithm uses for hashing:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set layer2 {no-destination-mac-address | no-ether-type |
   no-source-mac-address | vlan-id}
   ```

   By default, the hashing algorithm uses the values in the destination MAC address, Ethertype, and source MAC address fields in the header to hash traffic on the LAG. You can configure the hashing algorithm to not use the values in these fields by configuring **no-destination-mac-address**, **no-ether-type**, or **no-source-mac-address**.

   You can also configure the hashing algorithm to include the VLAN ID field in the header by configuring the **vlan-id** option.

   If you want the hashing algorithm to not use the Ethertype field for hashing:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set layer2 no-ether-type
   ```

Configuring the Hashing Algorithm to Use Fields in the IP Payload for Hashing

To configure the hashing algorithm to use fields in the IP payload for hashing:

1. Configure the hash mode to Layer 2 payload:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set hash-mode layer2-payload
   ```

   The IP payload is not checked by the hashing algorithm unless the hash mode is set to Layer 2 payload. The default hash mode is Layer 2 payload.

2. Configure the fields in the IP payload that the hashing algorithm uses for hashing:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set inet {no-ipv4-destination-address | no-ipv4-source-address |
   no-l4-destination-port | no-l4-source-port | no-protocol | vlan-id}
   ```

   For instance, if you want the hashing algorithm to ignore the Layer 4 destination port, Layer 4 source port, and protocol fields and instead hash traffic based only on the IPv4 source and destination addresses:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set inet no-l4-destination-port no-l4-source-port no-protocol
   ```

Configuring the Hashing Algorithm to Use Fields in the IPv6 Payload for Hashing

To configure the hashing algorithm to use fields in the IPv6 payload for hashing:

1. Configure the hash mode to Layer 2 payload:

   ```
   [edit forwarding-options enhanced-hash-key]
   user@switch# set hash-mode layer2-payload
   ```

   The IPv6 payload is not checked by the hashing algorithm unless the hash mode is set to Layer 2 payload. The default hash mode is Layer 2 payload.

2. Configure the fields in the IPv6 payload that the hashing algorithm uses for hashing:

   ```
   [edit forwarding-options enhanced-hash-key]
   ```

`user@switch#` **set** inet6 **{no-ipv6-destination-address | no-ipv6-source-address | no-l4-destination-port | no-l4-source-port | no-next-header | vlan-id}**

For instance, if you want the hashing algorithm to ignore the Layer 4 destination port, Layer 4 source port, and the Next Header fields and instead hash traffic based only on the IPv6 source and IPv6 destination address fields only:

```
[edit forwarding-options enhanced-hash-key]
user@switch# set inet6 no-l4-destination-port no-l4-source-port no-next-header
```

Related Documentation

- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- *Understanding Aggregated Ethernet Interfaces and LACP*

Configuring Interfaces for Uplink Failure Detection

You can configure uplink failure detection to help ensure balanced traffic flow. Using this feature, switches can monitor and detect link failure on uplink interfaces and can propagate the failure information to downlink interfaces, so that servers connected to those downlinks can switch over to secondary interfaces.

Follow these configuration guidelines:

- Configure an interface in only one group.
- Configure a maximum of eight groups for each switch.
- Configure a maximum of eight uplinks to monitor and a maximum of 48 downlinks to disable in each group.
- Configure physical links and logical links in separate groups.

To configure uplink failure detection on a switch:

1. Specify a name for an uplink failure detection group:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group-name
   ```
2. Add an uplink interface to the group:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group-name link-to-monitor interface-name
   ```
3. Repeat Step 2 for each uplink interface you add to the group.
4. Add a downlink interface to the group:

   ```
   [edit protocols]
   user@switch# set uplink-failure-detection group group-name link-to-disable interface-name
   ```
5. Repeat Step 4 for each downlink interface you add to the group.

NOTE: After you have configured an uplink failure detection group, use the show uplink-failure-detection ***group (Uplink Failure Detection) group-name*** command to verify that all interfaces in the group are up. If the interfaces are down, uplink failure detection does not work.

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Example: Configuring Interfaces for Uplink Failure Detection on page 59
- *Verifying That Uplink Failure Detection Is Working Correctly*

Configuring a Layer 3 Logical Interface

Devices use Layer 3 logical interfaces to divide a physical interface into multiple logical interfaces, each corresponding to a VLAN. Layer 3 logical interfaces route traffic between subnets.

To configure Layer 3 logical interfaces, enable VLAN tagging and partition one or more physical ports into multiple logical interfaces, each corresponding to a VLAN ID.

Before you begin, make sure you set up your VLANs. See *Configuring VLANs*.

To configure Layer 3 logical interfaces:

1. Enable VLAN tagging:

   ```
   [edit interfaces interface-name]
   user@switch# set vlan-tagging
   ```
2. Bind each VLAN ID to a logical interface:

   ```
   [edit interfaces interface-name]
   user@switch# set unit logical-unit-number vlan-id vlan-id-number
   ```

Related Documentation

- Understanding Layer 3 Logical Interfaces on page 22
- Verifying That Layer 3 Logical Interfaces Are Working on page 200

Configuring Link Aggregation

Use the link aggregation feature to aggregate one or more links to form a virtual link or aggregation group. The MAC client can treat this virtual link as if it were a single link. Link aggregation increases bandwidth, provides graceful degradation as failure occurs, and increases link availability.

NOTE: An interface with an already configured IP address cannot form part of the aggregation group.

NOTE: On QFX5100 and EX4600 standalone switches and on QFX5100 Virtual Chassis and EX4600 Virtual Chassis, you can configure a mixed rate of link speeds for the aggregated Ethernet bundle. Only link speeds of 40G and 10G are supported. Load balancing will not work if you configure link speeds that are not supported.

Creating an Aggregated Ethernet Interface

To create an aggregated Ethernet interface:

1. Specify the number of aggregated Ethernet interfaces to be created:

   ```
   [edit chassis]
   user@switch# set aggregated-devices interfaces device-count device-count
   ```

   For example, to specify 5:

   ```
   [edit chassis]
   user@switch#  set aggregated-devices interfaces device-count
   ```
2. Specify the minimum number of links for the aggregated Ethernet interface (ae*x*), that is, the defined bundle, to be labeled “up”:

   NOTE: By default only one link must be up for the bundle to be labeled “up”.

   ```
   [edit interfaces]
   user@switch# set interface-name aggregated-ether-options minimum-links minimum-links
   ```

   For example, to specify 5:

   ```
   [edit interfaces]
   user@switch#  set interface-name aggregated-ether-options minimum-links 5
   ```
3. Specify the link speed for the aggregated Ethernet bundle:

   ```
   [edit interfaces]
   user@switch# set interface-name aggregated-ether-options link-speed link-speed
   ```

   For example, to specify 10g:

   ```
   [edit interfaces]
   user@switch#  set interface-name aggregated-ether-options link-speed 10g
   ```
4. Specify the members to be included within the aggregated Ethernet bundle:

   ```
   [edit interfaces]
   user@switch#  set interface-name ether-options 802.3ad aex
   user@switch#  set interface-name ether-options 802.3ad aex
   ```

Configuring the VLAN Name and VLAN ID Number

```
[edit vlans]
user@switch# set vlan-name vlan-id vlan-id-number
```

For example, 100.

Configuring Aggregated Ethernet LACP

For aggregated Ethernet interfaces, you can configure the Link Aggregation Control Protocol (LACP). LACP is one method of bundling several physical interfaces to form one logical interface. You can configure aggregated Ethernet with or without LACP enabled.

Before you configure LACP, be sure you have configured the aggregated Ethernet bundles—also known as link aggregation groups (LAGs).

When LACP is enabled, the local and remote sides of the aggregated Ethernet links exchange protocol data units (PDUs), containing information about the state of the link. You can configure Ethernet links to actively transmit PDUs, or you can configure the links to passively transmit them, sending out LACP PDUs only when they receive them from another link. One side of the link must be configured as **active** for the link to be up.

NOTE: Do not add LACP to a LAG if the remote end of the LAG link is a security device, unless the security device supports LACP. Security devices often do not support LACP because they require a deterministic configuration.

To configure LACP:

1. Enable the LACP mode:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp mode
   ```

   For example, to specify the mode as active, execute the following command:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp active
   ```

2. Specify the interval and speed at which the interfaces send LACP packets:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp periodic interval
   ```

   For example, to specify the interval as fast, execute the following command:

   ```
   [edit interfaces]
   user@switch# set aex aggregated-ether-options lacp periodic fast
   ```

Related Documentation

- Understanding Interface Naming Conventions on page 15
- *Configuring an FCoE LAG*
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- Verifying the Status of a LAG Interface on page 200
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 201
- **show lacp statistics interfaces (View) on page 320**

Configuring Local Link Bias (CLI Procedure)

Local link bias is used to conserve bandwidth on Virtual Chassis ports (VCPs) by using local links to forward unicast traffic exiting a Virtual Chassis or Virtual Chassis Fabric (VCF) that has a Link Aggregation group (LAG) bundle composed of member links on different member switches in the same Virtual Chassis or VCF. A local link is a member link in the LAG bundle that is on the member switch that received the traffic. Because traffic is received and forwarded on the same member switch when local link bias is enabled, no VCP bandwidth is consumed by traffic traversing the VCPs to exit the Virtual Chassis or VCF on a different member link in the LAG bundle.

You should enable local link bias if you want to conserve VCP bandwidth by always forwarding egress unicast traffic on a LAG out of a local link. You should not enable local link bias if you want egress traffic load-balanced as it exits the Virtual Chassis or VCF.

To enable local link bias on a LAG bundle:

```
[edit]
user@switch# set interface aex aggregated-ether-options local-bias
```

where **ae*x*** is the name of the aggregated Ethernet link bundle.

For instance, to enable local link bias on aggregated Ethernet interface ae0:

```
[edit]
user@switch# set interface ae0 aggregated-ether-options local-bias
```

Related Documentation

- Understanding Local Link Bias on page 22

Configuring Generic Routing Encapsulation Tunneling

Generic routing encapsulation (GRE) provides a private, secure path for transporting packets through an otherwise public network by encapsulating (or tunneling) the packets. GRE tunneling is accomplished through tunnel endpoints that encapsulate or de-encapsulate traffic.

You can also use a firewall filter to de-encapsulate GRE traffic on a QFX5100 switch. This feature provides significant benefits in terms of scalability, performance, and flexibility because you don't need to create a tunnel interface to perform the de-encapsulation. For example, you can terminate many tunnels from multiple source IP addresses with one firewall term. For more information on this feature, see *Configuring a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100 Switch*.

This topic describes:

Configuring a GRE Tunnel

To configure a GRE tunnel interface:

1. Create a GRE interface with a unit number and address:

[edit interfaces]
user@switch# **set gr-0/0/0 unit** ***number*** **family inet** ***address***

NOTE: The base name of the interface must be gr-0/0/0.

This is a pseudo interface, and the address you specify can be any IP address. The routing table must specify **gr-0/0/0.*x*** as the outgoing interface for any packets that will be tunneled.

If you configure a GRE interface on a QFX5100 switch that is a member of a Virtual Chassis and later change the Virtual Chassis member number of the switch, the name of the GRE interface does not change in any way (because it is a pseudo interface). For example, if you change the member number from **0** to **5**, the GRE interface name does *not* change from **gr-0/0/0.*x*** to **gr-5/0/0.*x***.

2. Specify the tunnel source address for the logical interface:

   [edit interfaces]
   user@switch# **set gr-0/0/0 unit** ***number*** **tunnel source** ***source-address***

3. Specify the destination address:

   [edit interfaces]
   user@switch# **set gr-0/0/0 unit** ***number*** **tunnel destination** ***destination-address***

   The destination address must be reachable through static or dynamic routing. If you use static routing, you must get the destination MAC address (for example, by using **ping**) before user traffic can be forwarded through the tunnel.

Related Documentation

- Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly on page 202
- Understanding Generic Routing Encapsulation on page 53

- *Configuring a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100 Switch*

Configuring the LPM Table With Junos OS 13.2x51-D10

In addition to choosing a profile, you can further optimize memory allocation for LPM table entries by configuring how many IPv6 addresses with prefixes in the range /65 through /127 you want to store. If you want to use more than 16 IPv6 addresses with prefixes in this range, you must enter and commit the following statement:

```
[edit]
user@switch# set chassis forwarding-options profile-name num-65-127-prefix value
```

in which *value* can be a value in the range 1 through 128. Each increment adds support for 16 IPv6 addresses with prefixes between /65 and /127, for a maximum of 2048 such addresses (16 x 128 = 2048). The system supports 16 of these addresses by default, so to increase the number of supported addresses, you must enter a value of 2 or greater. For example, if you enter **2**, the system will support 32 IPv6 addresses with prefixes in the range /65 through /127.

NOTE: **When you configure the num-65-127-prefix value, all the data interfaces on the switch restart. The management interfaces are unaffected.**

The LPM table is shared, and each increment that you add for IPv6 addresses with prefixes in the range /65 through /127 reduces the number of forwarding table entries that are available for IPv4 addresses and IPv6 addresses with prefixes less than /65. Table 22 on page 91 provides examples of valid combinations that the LPM table can store, also using the **l2-profile-one** profile. Once again, each row in the table represents a case in which the table is full and cannot accommodate any more entries.

Table 22: Example LPM Table Combinations Using l2-profile-one With Junos OS 13.2X51-D10

IPv4 entries	IPv6 Entries (prefix <= 64)	IPv6 Entries (prefix >= 65)	num-65-127-prefix
16K	0K	16	**1** (default)
0K	8K	16	**1** (default)
8K	4K	16	**1** (default)
4K	4K	1K	**64**
2K	5K	1K	**64**
0K	6K	1K	**64**
4K	2K	2K	**128**
2K	3K	2K	**128**
0K	4K	2K	**128**

Table 23 on page 92 provides examples of valid combinations that the LPM table can store when you use the **lpm-profile** profile. As before, each row represents a case in which the table is full and cannot accommodate any more entries.

Table 23: Example LPM Table Combinations Using lpm-profile With Junos OS 13.2X51-D10

IPv4 entries	IPv6 Entries (prefix <= 64)	IPv6 Entries (prefix >= 65)	num-65-127-prefix
128K	0K	16	**1** (default)
0K	8K	16	**1** (default)
8K	4K	16	**1** (default)
4K	4K	1K	**64**
2K	5K	1K	**64**
0K	6K	1K	**64**
4K	2K	2K	**128**
2K	3K	2K	**128**
0K	4K	2K	**128**

Related Documentation

- *Understanding the Unified Forwarding Table*
- *Configuring the Unified Forwarding Table*

CHAPTER 4

Configuration Tasks

Channelizing Interfaces

The QFX3500, QFX3600, QFX5100, and EX4600 switches provide 40-Gbps QSFP+ ports that can be channelized. Channelization allows you to configure 40-Gbps QSFP+ ports to operate as four 10-Gigabit Ethernet (*xe*) interfaces. 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 servers, storage, and switches. By default, the four 40-Gbps QSFP+ ports operate as 40-Gigabit Ethernet (*et*) ports. When an *et* port is channelized to four *xe* ports, a colon is used to signify the four separate channels. For example, on a QFX3500 standalone switch with port 2 on PIC 1 configured as four 10-Gigabit Ethernet ports, the interface names are *xe-0/1/2:0*, *xe-0/1/2:1*, *xe-0/1/2:2*, and *xe-0/1/2:3*.

By default, the 40-Gbps QSFP+ ports on EX4600 and QFX5100 switches are channelized automatically (auto-channelized) if any of the four channels on a 40-Gbps QSFP+ port receive data, unless you have configured channelization either at the chassis level or at the port level. Auto-channelization is not supported on interfaces contained in expansion modules or on Virtual Chassis ports.

You can disable auto-channelization by including the **disable-auto-speed-detection** statement at the **[edit chassis fpc *slot-number* pic *pic-number* (port *port-number* | port-range *port-range-low port-range-high*) channel-speed]** hierarchy.

There are restrictions on the ports you can channelize on the QFX5100-24Q and QFX5100-96S switches, depending on the system mode you enable. If you try to channelize ports that are restricted, the configuration is ignored. See "Configuring the System Mode" on page 96 for more information.

CAUTION: **The Packet Forwarding Engine on the switch is restarted when you configure or delete a port. As a result, you might experience packet loss on the device. When you channelize a 40-Gbps QSFP+ port on the master of a Virtual Chassis, traffic might be disrupted on the master as well as on the line card members, and a mastership switchover occurs.**

The following steps describe how to configure a block of ports or an individual port to operate as 10-Gigabit Ethernet ports.

1. To configure a block of 40-Gigabit Ethernet (*et*) ports to operate as 10-Gigabit Ethernet ports, specify a port range and channel speed:

   [edit chassis fpc *fpc-slot* pic *pic-slot*]
   user@switch# **set port-range *port–range-low port-range-high* channel-speed *speed***

   For example, to configure ports 0 through 3 on PIC 1 to operate as 10-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 1]
   user@switch# **set port-range 0 3 channel-speed 10g**

2. To configure an individual 40-Gigabit Ethernet (*et*) port to operate as 10-Gigabit Ethernet (xe) ports, specify a port number and channel speed:

   [edit chassis fpc 0 pic 0]
   user@switch# **set port** ***port-number*** **channel-speed** ***speed***

   For example, to configure port 2 to operate as 10-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 0]
   user@switch# **set port 2 channel-speed 10g**

3. Review your configuration and issue the **commit** command.

   [edit]
   user@switch# **commit**
   commit complete

4. To return a range of ports to the default 40-Gigabit Ethernet configuration, delete the 10g statement:

   [edit chassis fpc 0 pic 1]
   user@switch# **delete port-range** ***port-range-low port-range-high*** **channel-speed** ***speed***

   For example, to return ports 0 through 3 to the default 40-Gigabit Ethernet configuration:

   [edit chassis fpc 0 pic 1]
   user@switch# **delete port-range 0 3 channel-speed 10g**

5. Review your configuration and issue the **commit** command.

   [edit]
   user@switch# **commit**
   commit complete

6. To return a port to the default 40-Gigabit Ethernet configuration, delete the 10g statement:

   [edit chassis fpc 0 pic 0]
   user@switch# **delete port** ***port-number*** **channel-speed** ***speed***

   For example, to return port 2 to the default 40-Gigabit Ethernet configuration:

   [edit chassis fpc 0 pic 0]
   user@switch# **delete port 2 channel-speed 10g**

7. Review your configuration and issue the **commit** command.

   [edit]
   user@switch# **commit**
   commit complete

The following steps describe how to disable auto-channelization at the port level.

1. To disable auto-channelization at the port level, include the **disable** statement:

   [edit]
   user@switch# **set chassis fpc** ***slot-number*** **pic** ***pic-number*** **(port** ***port-number*** **| port-range** ***port-range-low port-range-high*****) channel-speed disable-auto-speed-detection**

For example, to disable auto-channelization for one port:

```
[edit]
user@switch# set chassis fpc 0 pic 0 port 2 channel-speed
  disable-auto-speed-detection
```

For example, to disable auto-channelization for a range of ports:

```
[edit]
user@switch# set chassis fpc 0 pic 0 port-range 2 4 channel-speed
  disable-auto-speed-detection
```

2. Review your configuration and issue the **commit** command.

```
[edit]
user@switch# commit
commit complete
```

Related Documentation

- Configuring the System Mode on page 96
- **channel-speed on page 114**
- **fpc on page 136**
- **pic on page 177**

Configuring the System Mode

You can configure different system modes to achieve varying levels of port density on the QFX5100-24Q and QFX5100-96S switches. Depending on the system mode you configure, there are restrictions on which ports you can channelize. If you channelize ports that are restricted, the configuration is ignored. By default, all QSFP+ interfaces are auto-channelized. Auto-channelization is not supported on interfaces contained in expansion modules or on Virtual Chassis ports. To disable auto-channelization, see "Channelizing Interfaces" on page 94 for more information.

NOTE: **When you request the system mode change, you must reboot for the system mode to take effect.**

CAUTION: **The Packet Forwarding Engine on the switch is restarted when you issue system mode changes. As a result, you might experience packet loss on the switch.**

The following system modes are available on the QFX5100-24Q switch:

- Default-mode
- Mode-104-port
- Flexi-PIC mode
- Non-oversubscribed mode

The following system modes are available on the QFX5100-96S switch:

- Default-mode
- Non-oversubscribed mode

See Table 24 on page 97 for more information regarding the supported system modes for your switch.

Table 24: System Modes Supported on QFX5100 Switches Running Enhanced Layer 2 Software

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5100-48S	Not supported	Not supported	Not supported	Not supported
QFX5100-24Q	Supported You do not need to configure the switch to be in this mode. On PIC 0, you can channelize all 24 40-Gbps QSFP+ ports. On PIC 1 and PIC 2, the 40-Gbps QSFP+ ports in the expansion modules are supported but cannot be channelized. In this mode, you can have one of two port combinations: 32 40-Gbps QSFP+ ports, or 96 10-Gigabit Ethernet ports plus 8 40-Gbps QSFP+ ports.	Supported On PIC 0, all 24 40-Gbps QSFP+ ports are channelized by default, which provides 96 10-Gigabit Ethernet ports. 40-Gbps QSFP+ ports contained in an expansion module on PIC 1 are supported. On PIC 1, ports 0 and 2 are channelized by default, and ports 1 and 3 are disabled. If 40-Gbps QSFP+ ports contained in an expansion module are detected on PIC 2, they are ignored.	Supported On PIC 0, the first four ports (ports 0 through 3) cannot be channelized. 40-Gbps QSFP+ ports contained in expansion modules on PIC 1 and PIC 2 are supported but cannot be channelized.	Supported All 24 40-Gbps QSFP+ ports on PIC 0 can be channelized to 96 10-Gigabit Ethernet ports. 40-Gbps QSFP+ ports contained in the expansion modules on PIC 1 and PIC 2 are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.
QFX5100-96S	Supported You do not need to configure the switch to be in this mode. On PIC 0, all 96 10-Gigabit Ethernet ports are supported. You can only channelize the 40-Gbps QSFP+ interfaces to 10-Gibabit Ethernet interfaces on ports 96 and 100. When you channelize the interfaces on ports 96 and 100, ports 97, 98, 99, 101, 102 and 103 are disabled.	Not supported	Not supported	Supported On PIC 0, all 96 10-Gigabit Ethernet ports are supported. However, the eight 40-Gbps QSFP+ ports are not supported and cannot be channelized. There is no packet loss for packets of any size in this mode.

The following steps describe how to change the system mode.

1. To change the system mode, issue the following operational command:

   {master:0}

root> **request chassis system-mode** ***mode***

For example:

{master:0}
root> **request chassis system-mode non-oversubscribed-mode**

2. To return to the default mode (default-mode), issue the following operational command:

   {master:0}
   root> **request chassis system-mode default-mode**

3. To see which system mode is configured, issue the following operational command:

   {master:0}
   root> **show chassis system-mode**

Related Documentation

- Understanding Interface Naming Conventions on page 15
- Understanding Port Ranges and System Modes on page 25
- Channelizing Interfaces on page 94

CHAPTER 5

Configuration Statements

[edit interfaces et] Configuration Statement Hierarchy on the QFX Series

This topic lists supported and unsupported configuration statements in the **[edit interfaces et]** hierarchy level on EX Series switches.

- *Supported* statements are those that you can use to configure some aspect of a software feature on the switch.
- *Unsupported* statements are those that appear in the command-line interface (CLI) on the switch, but that have no effect on switch operation if you configure them.
- Not all features are supported on all switch platforms. For detailed information about feature support on specific QFX Series platforms, see *QFX Series Virtual Chassis Software Features*.

This topic lists:

Supported Statements in the [edit interfaces et] Hierarchy Level

The following hierarchy shows the **[edit interfaces et]** configuration statements supported on EX Series switches.

```
interfaces {
  et-fpc/pic/port {
    accounting-profile name;
    description text;
    disable;
    encapsulation type;
    ether-options {
      802.3ad {
```

```
        aex;
        (backup | primary);
        lacp {
            force-up;
            port-priority number;
        }
    }
    ethernet-switch-profile {
        tag-protocol-id [tpids];
    }
    (flow-control | no-flow-control);
    (loopback | no-loopback);
    no-auto-mdix;
}
flexible-vlan-tagging;
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
mtu bytes;
native-vlan-id
no-gratuitous-arp-request;
traceoptions {
    flag flag;
}
(traps | no-traps);
unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    encapsulation type;
    family ccc;
        filter {
            group group-number;
            input filter-name;
            input-list [filter-names];
            output filter-name;
            output-list [filter-names];
        }
        policer {
            input policer-name;
            output policer-name;
        }
    }
    family ethernet-switching {
        filter {
            input filter-name;
            output filter-name;
        }
        interface-mode (access | trunk);
        recovery-timeout seconds;
        storm-control profile-name;
        vlan {
            members (vlan-name |[-vlan-names] | all);
        }
    }
    family inet {
```



```
    accounting {
      destination-class-usage;
      source-class-usage {
        input;
        output;
      }
    }
    address ipv4-address {
      arp ip-address (mac | multicast-mac) mac-address <publish>;
      broadcast address;
      preferred;
      primary;
      vrrp-group group-number {
        (accept-data | no-accept-data);
        advertise–interval seconds;
        advertisements-threshold number;
        authentication-key key;
        authentication-type authentication;
        fast-interval milliseconds;
        (preempt | no-preempt) {
          hold-time seconds;
        }
        priority number;
        track {
          interface interface-name {
            priority-cost number;
          }
          priority-hold-time seconds;
          route ip-address/mask routing-instance instance-name priority-cost cost;
        }
        virtual-address [addresses];
        vrrp-inherit-from {
          active-group group-number;
          active-interface interface-name;
        }
      }
    }
    filter {
      input filter-name;
      output filter-name;
    }
    mtu bytes;
    no-neighbor-learn;
    no-redirects;
    primary;
    rpf-check {
      fail-filter filter-name;
      mode {
        loose;
      }
    }
  }
  family inet6 {
    accounting {
      destination-class-usage;
      source-class-usage {
```

```
        input;
        output;
    }
}
address address {
    eui-64;
    ndp ip-address (mac | multicast-mac) mac-address <publish>;
    preferred;
    primary;
    vrrp-inet6-group group-id {
        accept-data | no-accept-data;
        advertisements-threshold number;
        authentication-key key;
        authentication-type authentication;
        fast-interval milliseconds;
        inet6-advertise-interval milliseconds;
        preempt | no-preempt {
            hold-time seconds;
        }
        priority number;
        track {
            interface interface-name {
                priority-cost number;
            }
            priority-hold-time seconds;
            route ip-address/mask routing-instance instance-name priority-cost cost;
        }
        virtual-inet6-address [addresses];
        virtual-link-local-address ipv6–address;
        vrrp-inherit-from {
            active-group group-name;
            active-interface interface-name;
        }
    }
}
(dad-disable | no-dad-disable);
filter {

    input filter-name;


    output filter-name;


}
mtu bytes;
nd6-stale-time time;
no-neighbor-learn;
no-redirects;
policer {
    input policer-name;
    output policer-name;
}
rpf-check {
    fail-filter filter-name;
    mode {
        loose;
```



```
            }
          }
        }
        family iso {
          address interface-address;
          mtu bytes;
        }
        input-vlan-map action;
        output-vlan-map action;
        proxy-arp (restricted | unrestricted);
        swap-by-poppush;
        (traps | no-traps);
        vlan-id vlan-id-number;
        vlan-id-list [vlan-id vlan-id–vlan-id];
      }
      vlan-tagging;
    }
  }
```

Unsupported Statements in the [edit interfaces et] Hierarchy Level

All statements in the **[edit interfaces et]** hierarchy level that are displayed in the command-line interface (CLI) on the switch are supported on the switch and operate as documented with the following exceptions:

Table 25: Unsupported [edit interfaces et] Configuration Statements for the QFX Series

Statement	Hierarchy
passive-monitor-mode	[edit interfaces et]
stacked-vlan-tagging	[edit interfaces et]
asynchronous-notification	[edit interfaces et ether-options]
ignore-l3-incompletes	[edit interfaces et ether-options]
mpls	[edit interfaces et ether-options]
source-address-filter	[edit interfaces et ether-options]
source-filtering	[edit interfaces et ether-options]
no-source-filtering	[edit interfaces et ether-options]
accept-source-mac	[edit interfaces et unit]
layer2-policer	[edit interfaces et unit]
native-inner-vlan-id	[edit interfaces et unit]
vlan-id-range	[edit interfaces et unit]

Table 25: Unsupported [edit interfaces et] Configuration Statements for the QFX Series *(continued)*

Statement	Hierarchy
vlan-tags	[edit interfaces et unit]
mpls	[edit interfaces et unit family]
tcc	[edit interfaces et unit family]
vpls	[edit interfaces et unit family]
bridge-domain-type	[edit interfaces et unit family ethernet-switching]
inner-vlan-id-list	[edit interfaces et unit family ethernet-switching]
vlan-rewrite	[edit interfaces et unit family ethernet-switching]
policer	[edit interfaces et unit family inet]
sampling	[edit interfaces et unit family inet]
service	[edit interfaces et unit family inet]
targeted-broadcast	[edit interfaces et unit family inet]
unnumbered-address	[edit interfaces et unit family inet]
bandwidth-threshold	[edit interfaces et unit family inet address vrrp-group track interface]
service	[edit interfaces et unit family inet6]
bandwidth-threshold	[edit interfaces et unit family inet6 address vrrp-group track interface]
group	[edit interfaces et unit family inet6 filter]

Related Documentation

- *QFX Series Virtual Chassis Software Features*

802.3ad

Syntax

```
802.3ad aex;
  lacp {
    force-up;
    (primary | backup);
  }
  port-priority;
}
```

Hierarchy Level [edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Specify the aggregated Ethernet logical interface number.

NOTE: The port-priority statement is not supported on QFabric systems.

Options **ae*x***—Aggregated Ethernet logical interface number.

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 on page 85
- Configuring Aggregated Ethernet LACP on page 81
- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- Troubleshooting an Aggregated Ethernet Interface on page 329
- *Junos OS Network Interfaces Library for Routing Devices*

address

Syntax

```
address address {
  arp ip-address (mac | multicast-mac) mac-address <publish>;
  broadcast address;
  destination address;
  destination-profile name;
  eui-64;
  master-only;
  multipoint-destination address dlci dlci-identifier;
  multipoint-destination address {
    epd-threshold cells;
    inverse-arp;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (disable | seconds);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst
        length);
      queue-length number;
    }
    vci vpi-identifier.vci-identifier;
  }
  primary;
  preferred;
  (vrrp-group | vrrp-inet6-group) group-number {
    (accept-data | no-accept-data);
    advertise–interval seconds;
    authentication-type authentication;
    authentication-key key;
    fast-interval milliseconds;
    (preempt | no-preempt) {
      hold-time seconds;
    }
    priority-number number;
    track {
      priority-cost seconds;
      priority-hold-time interface-name {
        interface priority;
        bandwidth-threshold bits-per-second {
          priority;
        }
      }
      route ip-address/mask routing-instance instance-name priority-cost cost;
    }
    virtual-address [ addresses ];
  }
}
```

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family *family*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the interface address.

Options ***address***—Address of the interface.

The remaining statements are explained separately.

NOTE: The **edit logical-systems** hierarchy is not available on QFabric systems.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring the Protocol Family*
- *negotiate-address*
- *unnumbered-address (Ethernet)*
- *Junos OS Administration Library for Routing Devices*
- *family*

aggregated-devices

Syntax

```
aggregated-devices {
  ethernet {
    device-count number;
  }
}
```

Hierarchy Level

[edit chassis],
[edit chassis node-group *name*]

Release Information

Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description

Configure properties for aggregated devices on the switch.

The remaining statements are explained separately.

Default

Aggregated devices are disabled.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- Configuring Link Aggregation on page 85
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- *Junos OS Network Interfaces Library for Routing Devices*

aggregated-ether-options

Syntax

```
aggregated-ether-options {
  configured-flow-control {
    rx-buffers (on | off);
    tx-buffers (on | off);
  }
  ethernet-switch-profile {
  tag-protocol-id;
  (fcoe-lag | no-fcoe-lag);
  (flow-control | no-flow-control);
  lacp mode {
    admin-key key;
    periodic interval;
    system-id mac-address;
    }
  }
  (link-protection | no-link-protection);
  link-speed speed;
  local-bias;
  (loopback | no-loopback);
  mc-ae {
    chassis-id chassis-id;
    mc-ae-id mc-ae-id;
    mode (active-active);
    status-control (active | standby);
  }
  minimum-links number;
  rebalance-periodic;
  source-address-filter filter;
  (source-filtering | no-source-filtering);
  }
}
```

Hierarchy Level [edit interfaces aex]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statements **fcoe-lag** and **no-fcoe-lag** introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description Configure properties specific to a specific aggregated Ethernet interface.

The statements are explained separately.

Default Options are not enabled.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- Configuring Aggregated Ethernet LACP on page 81

- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67
- *Junos OS Network Interfaces Library for Routing Devices*

alarm (chassis)

Syntax

```
alarm {
  interface-type {
    alarm-name (ignore |red | yellow);
  }
}
```

Hierarchy Level

[edit chassis],
[edit chassis interconnect-device *name*],
[edit chassis node-group *name*]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for the ACX Series.

Description

Configure the chassis alarms and whether they trigger a red or yellow alarm, or whether they are ignored. Red alarm conditions light the **RED ALARM** LED on either the router's craft interface or the switch's LCD screen and trigger an audible alarm if one is connected to the contact on the craft interface or LCD screen. Yellow alarm conditions light the **YELLOW ALARM** LED on either the router's craft interface or the switch's LCD screen and trigger an audible alarm if one is connected to the craft interface or LCD screen.

To configure more than one alarm, include multiple ***alarm-name*** lines.

Options

alarm-name—Alarm condition. For a list of conditions, see *System-Wide Alarms and Alarms for Each Interface Type*.

ignore—The specified alarm condition does not set off any alarm.

interface-type—Type of interface on which you are configuring the alarm: **atm**, **ethernet**, **sonet**, or **t3**.

red—The specified alarm condition sets off a red alarm.

yellow—The specified alarm condition sets off a yellow alarm.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Understanding Alarms*
- *Chassis Conditions That Trigger Alarms*
- *Chassis Alarm Messages on a QFX3500 Device*
- *Interface Alarm Messages*

auto-negotiation

Syntax (auto-negotiation | no-auto-negotiation);

Hierarchy Level [edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Explicitly enable or disable autonegotiation.

- **auto-negotiation**—Enable autonegotiation.
- **no-auto-negotiation**—Disable autonegotiation. When autonegotiation is disabled, you must explicitly configure link mode and speed options.

Default Autonegotiation is automatically enabled for Gigabit Ethernet interfaces. Autonegotation is not an option for 10-Gigabit Ethernet interfaces. No explicit action is taken after the autonegotiation is complete or if the negotiation fails.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- speed on page 184
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Junos OS Network Interfaces Library for Routing Devices*

channel-speed

Syntax channel-speed (10g;|disable-auto-speed-detection) ;

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number* (port *port-number* | port-range *port-range-low* *port-range-high*)]

Release Information Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description (QFX3500, QFX3600, and QFX5100 standalone switches running Enhanced Layer 2 Software only)—Enable the specified port on the Physical Interface Card (PIC) to perform in the specified channel speed. Additionally, you can disable auto-speed detection.

Default **40g** (40-Gigabit Ethernet).

Options **10g**—Set the channel speed to 10g (10-Gigabit Ethernet).

disable-auto-speed-detection—Disable auto-speed detection.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelizing Interfaces on page 94

chassis

Syntax

```
chassis {
  routing-engine {
  redundancy {
    failover {
      on-disk-failure {
      disk-failure-action (halt | reboot);
      }
      on-loss-of-keepalives;
    }
    graceful-switchover;
  }
  aggregated-devices {
    ethernet {
      device-count number;
    }
    alarm {
      interface-type {
        alarm-name (red | yellow | ignore);
      }
    }
  }
  forwarding-options profile-name {
    num-65-127-prefix value
  }
  fpc slot {
    auto-speed-detection disable
      pic pic-number{
      port port-number{
        tunnel-port port-number tunnel-services;
        channel-speed speed;
      }
      port-range port-range-low port-range-high {
        channel-speed speed;
      }
    }
  }
  maximum-ecmp next-hops;
}
```

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.

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 on page 85

configured-flow-control

Syntax

```
configured-flow-control {
  rx-buffers (on | off);
  tx-buffers (on | off);
}
```

Hierarchy Level [edit interfaces *interface-name* ether-options]

Description Configure Ethernet PAUSE asymmetric flow control on an interface. You can set an interface to generate and send PAUSE messages, and you can set an interface to respond to PAUSE messages sent by the connected peer. You must set both the **rx-buffers** and the **tx-buffers** values when you configure asymmetric flow control.

Use the **flow-control** and **no-flow-control** statements to enable and disable symmetric PAUSE on an interface. Symmetric flow control and asymmetric flow control are mutually exclusive features. If you attempt to configure both, the switch returns a commit error.

NOTE: Ethernet PAUSE temporarily stops transmitting all traffic on a link when the buffers fill to a certain threshold. To temporarily pause traffic on individual “lanes” of traffic (each lane contains the traffic associated with a particular IEEE 802.1p code point, so there can be eight lanes of traffic on a link), use priority-based flow control (PFC) by applying a congestion notification profile to the interface.

Ethernet PAUSE and PFC are mutually exclusive features, so you cannot configure both of them on the same interface. If you attempt to configure both Ethernet PAUSE and PFC on an interface, the switch returns a commit error.

Default Flow control is disabled. You must explicitly configure Ethernet PAUSE flow control on interfaces.

Options The statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *congestion-notification-profile*
- flow-control on page 134

container-devices

Syntax

```
container-devices {
  device-count number;
}
```

Hierarchy Level

[edit chassis]
[edit chassis interconnect-device *name*]
[edit chassis node-group *name*]

Release Information Statement introduced in Junos OS Release 11.3 for QFX Series switches.

Description Specify the container devices configuration. The **number** option specifies the number of sequentially numbered container interfaces, from **ci0** to **ci127** maximum.

Options **number**—Number of container devices.

Range: 1 through 128

Required Privilege Level

chassis—To view this statement in the configuration.
chassis-control—To add this statement to the configuration.

craft-lockout

Syntax

```
craft-lockout {
  alarm {
    interface-type {
      link-down (red | yellow | ignore);
    }
  }
  container-devices {
    device-count number;
      }
    }
  fpc slot {
    pic pic-number {
      fibre-channel {
        port-range {
          port-range-low port-range-high;
        }
      }
    }
  }
  routing-engine {
    on-disk-failure {
      disk-failure-action (halt | reboot);
      }
    }
  }
}
```

Hierarchy Level [edit chassis interconnect-device]

Release Information Statement introduced in Junos Release 11.3 for the QFX Series.

Description Disable the physical operation of the craft interface front panel.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring the Junos OS to Disable the Physical Operation of the Craft Interface*

description (Interfaces)

Syntax

description *text*;

Hierarchy Level

[edit interfaces *interface-name*],
[edit interfaces *interface-name* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

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 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Access Routers.

Description

Provide a textual description of the interface or the logical unit. Any descriptive text you include is displayed in the output of the **show interfaces** commands, and is also exposed in the **ifAlias** Management Information Base (MIB) object. It has no effect on the operation of the interface on the router or switch.

The textual description can also be included in the extended DHCP relay option 82 Agent Circuit ID suboption.

Options

text—Text to describe the interface. If the text includes spaces, enclose the entire text in quotation marks.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring Interface Description*
- *Adding a Logical Unit Description to the Configuration*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Enabling and Disabling Insertion of Option 82 Information*
- *Junos OS Network Interfaces Library for Routing Devices*
- *Example: Connecting Access Switches to a Distribution Switch*

destination (Tunnels)

Syntax destination *address*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family inet address *address*],
[edit interfaces *interface-name* unit *logical-unit-number* family inet unnumbered-address *interface-name*],
[edit interfaces *interface-name* unit *logical-unit-number* tunnel],
[edit logical-systems *logical-system-name* interfaces interface-name unit *logical-unit-number* family inet address *address*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family inet unnumbered-address *interface-name*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* tunnel]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description For encrypted, PPP-encapsulated, and tunnel interfaces, specify the remote address of the connection.

Options *address*—Address of the remote side of the connection.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring the Interface Address*
- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*
- *Junos OS Services Interfaces Library for Routing Devices*
- *point-to-point*

device-count

Syntax device-count *number*;

Hierarchy Level [edit chassis aggregated-devices ethernet],
[edit chassis node-group *name* aggregated-devices ethernet]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the number of aggregated Ethernet logical devices available to the switch.

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 on page 85
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63

disk-failure-action

Syntax disk-failure-action (halt | reboot);

Hierarchy Level [edit chassis redundancy on-disk-failure]
[edit chassis routing-engine on-disk-failure]

Release Information Statement introduced in Junos OS Release 9.2 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the Routing Engine to halt or reboot when the Routing Engine hard disk fails.

Options **halt**—Specify the Routing Engine to halt.

reboot—Specify the Routing Engine to reboot.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *graceful-switchover*
- *Configuring the Junos OS to Enable a Routing Engine to Reboot on Hard Disk Errors*
- *Installing Software on an EX Series Switch with Redundant Routing Engines (CLI Procedure)*
- *High Availability Features for EX Series Switches Overview*

enhanced-hash-key

Syntax

```
enhanced-hash-key {
  hash-mode {
    layer2-header;
    layer2-payload;
  }
  inet {
    no-ipv4-destination-address;
    no-ipv4-source-address;
    no-l4-destination-port;
    no-l4-source-port;
    no-protocol;
    vlan-id;
  }
  inet6 {
    no-ipv6-destination-address;
    no-ipv6-source-address;
    no-l4-destination-port;
    no-l4-source-port;
    no-next-header;
    vlan-id;
  }
  layer2 {
    no-destination-mac-address;
    no-ether-type;
    no-source-mac-address;
    vlan-id;
  }
}
```

Hierarchy Level [edit forwarding-options]

Release Information Statement introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Configure the hashing key used to hash link aggregation group (LAG) and equal-cost multipath (ECMP) traffic.

The hashing algorithm is used to make traffic-forwarding decisions for traffic entering a LAG bundle or for traffic exiting a switch when ECMP is enabled.

For LAG bundles, the hashing algorithm determines how traffic entering a LAG bundle is placed onto the bundle's member links. The hashing algorithm tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

When ECMP is enabled, the hashing algorithm determines how incoming traffic is forwarded to the next-hop device.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- hash-mode on page 139
- inet on page 146
- inet6 on page 148
- layer2 on page 163

ethernet

Syntax

```
ethernet {
  device-count number;
}
```

Hierarchy Level

[edit chassis aggregated-devices],
[edit chassis node-group aggregated-devices]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure properties for aggregated Ethernet devices on the switch.

The remaining statement is explained separately.

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 on page 85
- *Junos OS Network Interfaces Library for Routing Devices*

ethernet (Alarm)

Syntax

```
ethernet {
  link-down (red | yellow | ignore);
}
```

Hierarchy Level

[edit chassis alarm],
[edit chassis interconnect-device *name* alarm],
[edit chassis node-group *name* alarm]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure alarms for an Ethernet interface.

Options **The remaining statement is explained separately.—**

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Understanding Alarms*
- *Interface Alarm Messages*

ethernet-switching

Syntax

```
ethernet-switching {
  filter {
    group filter-group-number;
    input filter-name;
    input-list [ filter-names ];
    output filter-name;
    output-list [ filter-names ];
  }
  interface-mode (access | trunk);
  recovery-timeout seconds;
  storm-control profile-name;
  vlan {
    members (vlan-name |[-vlan-names] | all);
  }
}
```

Hierarchy Level [edit interfaces ge-*chassis/slot/port* unit *logical-unit-number*] family

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure Ethernet switching protocol family information for the logical interface.

The remaining statements are explained separately.

Default You must configure a logical interface to be able to use the physical device.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *JUNOS Software Network Interfaces Configuration Guide*

ether-options

Syntax

```
ether-options {
  802.3ad aex {
    lacp {
      force-up;
      (primary |backup);
    }
  }
  (auto-negotiation| no-auto-negotiation);
  configured-flow-control {
    rx-buffers (on | off);
    tx-buffers (on | off);
  }
  (flow-control | no-flow-control);
  link-mode mode;
  (loopback | no-loopback);
  speed (auto-negotiation | no-auto-negotiation);
}
```

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure **ether-options** properties for a Gigabit Ethernet or 10-Gigabit Ethernet interface.

The statements are explained separately.

Default Enabled.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Junos OS Network Interfaces Library for Routing Devices*

eui-64

Syntax eui-64;

Hierarchy Level [edit interfaces *interface-name* unit *number* family inet6 address *address*]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.3 for EX Series switches.
Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description For interfaces that carry IP version 6 (IPv6) traffic, automatically generate the host number portion of interface addresses.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- *Configuring the Interface Address*

family

Syntax

```
family {
  ethernet-switching {
    filter {
      group filter-group-number;
      input filter-name;
      input-list [ filter-names ];
      output filter-name;
      output-list [ filter-names ];
    }
    interface-mode (access | trunk);
    recovery-timeout seconds;
    storm-control profile-name;
    vlan {
      members (vlan-name |[-vlan-names] | all);
    }
  }
  inet {
    accounting {
      destination-class-usage;
      source-class-usage {
        input;
        output;
      }
    }
    address ipv4-address {
      arp ip-address (mac | multicast-mac) mac-address <publish>;
      broadcast address;
      preferred;
      primary;
      vrrp-group group-number {
        (accept-data | no-accept-data);
        advertise–interval seconds;
        advertisements-threshold number;
        authentication-key key;
        authentication-type authentication;
        fast-interval milliseconds;
        (preempt | no-preempt) {
          hold-time seconds;
        }
        priority number;
        track {
          interface interface-name {
            priority-cost number;
          }
          priority-hold-time seconds;
          route ip-address/mask routing-instance instance-name priority-cost cost;
        }
        virtual-address [addresses];
        vrrp-inherit-from {
          active-group group-number;
          active-interface interface-name;
        }
```



```
        }
      }
      filter {
        group filter-group-number;
        input filter-name;
        input-list [ filter-names ];
        output filter-name;
        output-list [ filter-names ];
      }
      mtu bytes;
      no-neighbor-learn;
      no-redirects;
      primary;
      rpf-check {
        fail-filter filter-name;
        mode {
          loose;
        }
      }
    }
    inet6 {
      accounting {
        destination-class-usage;
        source-class-usage {
          input;
          output;
        }
      }
      address address {
        eui-64;
        ndp ip-address (mac | multicast-mac) mac-address <publish>;
        preferred;
        primary;
        vrrp-inet6-group group-id {
          accept-data | no-accept-data;
          advertisements-threshold number;
          authentication-key key;
          authentication-type authentication;
          fast-interval milliseconds;
          inet6-advertise-interval milliseconds;
          preempt | no-preempt {
            hold-time seconds;
          }
          priority number;
          track {
            interface interface-name {
              priority-cost number;
            }
            priority-hold-time seconds;
            route ip-address/mask routing-instance instance-name priority-cost cost;
          }
          virtual-inet6-address [addresses];
          virtual-link-local-address ipv6–address;
          vrrp-inherit-from {
            active-group group-name;
            active-interface interface-name;
```

```
            }
          }
        }
        (dad-disable | no-dad-disable);
        filter {
          group filter-group-number;
          input filter-name;
          input-list [ filter-names ];
          output filter-name;
          output-list [ filter-names ];
        }
        mtu bytes;
        nd6-stale-time time;
        no-neighbor-learn;
        no-redirects;
        policer {
          input policer-name;
          output policer-name;
        }
        rpf-check {
          fail-filter filter-name;
          mode {
            loose;
          }
        }
        mpls {
          filter {
            group filter-group-number;
            input filter-name;
            input-list [ filter-names ];
            output filter-name;
            output-list [ filter-names ];
          }
        mtu bytes;
        }
      }
    }
```

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number*],
[edit interfaces interface-range *interface-name* unit *logical-unit-number* family]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure protocol family information for the logical interface on the QFX Series product.

Default Access interfaces on the QFX Series are set to **family ethernet-switching** by default. If you are going to change the family setting for an interface, you might have to delete this default setting or any user-configured family setting first.

You must configure a logical interface to be able to use the physical device.

Options Interface types on the switch are:

- Aggregated Ethernet (**ae**)
- Gigabit Ethernet (**ge**)
- Loopback (**lo0**)
- Management Ethernet (**me0**)
- Routed VLAN interface (RVI) (**vlan**)
- 10-Gigabit Ethernet (**xe**)

Not all interface types support all **family** substatements. Check your switch CLI for supported substatements for a particular protocol family configuration.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Configuring Link Aggregation on page 85
- *Configuring IRB Interfaces*
- *Junos OS Network Interfaces Library for Routing Devices*

fibre-channel (Alarm)

Syntax

```
fibre-channel {
  link-down (red | yellow | ignore);
}
```

Hierarchy Level [edit chassis alarm],
[edit chassis interconnect-device *name* alarm],
[edit chassis node-group *name* alarm]

Release Information Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description Configure alarms for a Fibre Channel interface.

Options **The remaining statement is explained separately.—**

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Understanding Alarms*
- *Interface Alarm Messages*

filter

Syntax

```
filter {
  group filter-group-number;
  input filter-name;
  input-list [ filter-names ];
  output filter-name;
  output-list [ filter-names ];
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family *family*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

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 11.1 for the QFX Series.

Description

Apply a filter to an interface. You can also use filters for encrypted traffic. When you configure filters, you can configure them under the **family ethernet-switching**, **inet**, **inet6**, **mpls**, or **vpls** only.

NOTE: On QFX3500 and QFX3600 switches running Enhanced Layer 2 Software, VPLS is not supported.

Options

group *filter-group-number*—Define an interface to be part of a filter group.

Range: 1 through 255

input *filter-name*—Name of one filter to evaluate when packets are received on the interface.

output *filter-name*—Name of one filter to evaluate when packets are transmitted on the interface.

The remaining statements are explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Applying a Filter to an Interface*
- *Junos OS Services Interfaces Library for Routing Devices*
- *Routing Policy Feature Guide for Routing Devices*
- *Junos OS Administration Library for Routing Devices*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*

- *Configuring Firewall Filters (CLI Procedure)*
- *Configuring Firewall Filters and Policers for VPLS*
- *family*
- *family*

flow-control

Syntax (flow-control | no-flow-control);

Hierarchy Level [edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Explicitly enable or disable symmetric Ethernet PAUSE flow control, which regulates the flow of packets from the switch to the remote side of the connection by pausing all traffic flows on a link during periods of network congestion. Symmetric flow control means that Ethernet PAUSE is enabled in both directions. The interface generates and sends Ethernet PAUSE messages when the receive buffers fill to a certain threshold and the interface responds to PAUSE messages received from the connected peer. By default, flow control is disabled.

You can configure asymmetric flow control by including the **configured-flow-control** statement at the **[edit interfaces *interface-name* ether-options** hierarchy level. Symmetric flow control and asymmetric flow control are mutually exclusive features. If you attempt to configure both, the switch returns a commit error.

NOTE: Ethernet PAUSE temporarily stops transmitting all traffic on a link when the buffers fill to a certain threshold. To temporarily pause traffic on individual “lanes” of traffic (each lane contains the traffic associated with a particular IEEE 802.1p code point, so there can be eight lanes of traffic on a link), use priority-based flow control (PFC).

Ethernet PAUSE and PFC are mutually exclusive features, so you cannot configure both of them on the same interface. If you attempt to configure both Ethernet PAUSE and PFC on an interface, the switch returns a commit error.

- **flow-control**—Enable flow control; flow control is useful when the remote device is a Gigabit Ethernet switch.
- **no-flow-control**—Disable flow control.

Default Flow control is disabled.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- configured-flow-control on page 116
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*
- *Junos OS Network Interfaces Library for Routing Devices*

force-up

Syntax force-up;

Hierarchy Level [edit interfaces *interface-name* ether-options 802.3ad lacp]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Set the state of the interface as up when the peer has limited LACP capability.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- Configuring Aggregated Ethernet LACP on page 81
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67
- *Junos OS Network Interfaces Library for Routing Devices*

fpc

Syntax

```
fpc slot {
  auto-speed-detection disable;
  pic pic-number{
    tunnel-port port-number tunnel-services;
    port port-number{
      channel-speed (speed|disable-auto-speed-detection) ;
    }
    port-range port-range-low port-range-high {
      channel-speed (speed|disable-auto-speed-detection);
    }
  }
}
```

Hierarchy Level [edit chassis]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the FPC slot number. For QFX3500 switches, the slot is a line card slot.

For generic routing encapsulation (GRE) tunneling, use the **tunnel-port** statement to specify the port that you want to convert to a GRE tunnel port.

Options *slot*—Number of the FPC slot. For QFX3500 and QFX3600 devices, the slot number is always **0**.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *show chassis fpc*
- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*

gratuitous-arp-reply

Syntax (gratuitous-arp-reply | no-gratuitous-arp-reply);

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Enable processing of ARP updates received via gratuitous ARP reply messages.

Default Updating of the ARP cache is disabled on all Ethernet interfaces.

Options **gratuitous-arp-reply**—Update the ARP cache.

no-gratuitous-arp-reply—Do not update the ARP cache.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

group

Syntax

```
group group-name {
  link-to-monitor interface-name;
  link-to-disable interface-name;
}
```

Hierarchy Level [edit protocols uplink-failure-detection]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Configure a group of uplink and downlink interfaces for uplink failure detection.

Options ***group-name***—Name of the uplink failure detection group.

The remaining statements are explained separately.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

group (Redundant Trunk Groups)

Syntax

```
group name {
  interface interface-name <primary>;
    interface interface-name;
  preempt-cutover-timer seconds;
}
```

Hierarchy Level

- For platforms with ELS:

  [edit switch-options redundant-trunk-group]

- For platforms without ELS:

  [edit ethernet-switching-optionsredundant-trunk-group]

Release Information

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Hierarchy level **[edit switch-options]** introduced in Junos OS Release 13.2X50-D10 (ELS). (See *Getting Started with Enhanced Layer 2 Software* for information about ELS.)
Statement introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description

Create a redundant trunk group.

Options

name—The name of the redundant trunk group. The group name must start with a letter and can consist of letters, numbers, dashes, and underscores.

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

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72
- Understanding Redundant Trunk Links on page 51

hash-mode

Syntax

```
hash-mode {
  layer2-header;
  layer2-payload;
}
```

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Select the mode for the hashing algorithm.

The hashing algorithm is used to make traffic-forwarding decisions for traffic entering a LAG bundle or for traffic exiting a switch when ECMP is enabled.

For LAG bundles, the hashing algorithm determines how traffic entering a LAG bundle is placed onto the bundle's member links. The hashing algorithm tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

When ECMP is enabled, the hashing algorithm determines how incoming traffic is forwarded to the next-hop device.

The hash mode that is set using this statement determines which fields are inspected by the hashing algorithm. You must set the hash mode to **layer2-payload** if you want the hashing algorithm to inspect fields in the Layer 2 payload when making hashing decisions. You must set the hash mode to **layer2-header** if you want the hashing algorithm to inspect fields in the Layer 2 header when making hashing decisions.

If the hash mode is set to **layer2-payload**, you can set the fields used by the hashing algorithm to hash IPv4 traffic using the **set forwarding-options enhanced-hash-key inet** statement. You can set the fields used by the hashing algorithm to hash IPv6 traffic using the **set forwarding-options enhanced-hash-key inet6** statement.

If the hash mode is set to **layer2-header**, you can set the fields that the hashing algorithm inspects in the Layer 2 header using the **set forwarding-options enhanced-hash-key layer2** statement.

Default layer2-payload

Options **layer-2-payload**—Set the hashing algorithm to use fields in the Layer 2 payload to make hashing decisions.

layer-2-header—Set the hashing algorithm to use fields in the Layer 2 header to make hashing decisions.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- **enhanced-hash-key on page 122**
- **inet on page 146**
- **inet6 on page 148**
- **layer2 on page 163**

hold-time (Physical Interface)

Syntax hold-time up *milliseconds* down *milliseconds*;

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 10.4R5 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Access Routers.

Description Specify the hold-time value to use to damp interface transitions. When an interface goes from up to down, it is not advertised to the rest of the system as being down until it has remained down for the hold-time period. Similarly, an interface is not advertised as being up until it has remained up for the hold-time period.

NOTE:

- We recommend that you configure the **hold-time** value after determining an appropriate value by performing repeated tests in the actual hardware environment. This is because the appropriate value for **hold-time** depends on the hardware (XFP, SFP, SR, ER, or LR) used in the networking environment.
- The **hold-time** option is not available for controller interfaces.

Default Interface transitions are not damped.

Options **down *milliseconds***—Hold time to use when an interface transitions from up to down. Junos OS advertises the transition within 100 milliseconds of the time value you specify.

Range: 0 through 4,294,967,295 milliseconds

Default: 0 milliseconds (interface transitions are not damped)

up *milliseconds*—Hold time to use when an interface transitions from down to up. Junos OS advertises the transition within 100 milliseconds of the time value you specify.

Range: 0 through 4,294,967,295 milliseconds

Default: 0 milliseconds (interface transitions are not damped)

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *advertise-interval*
- *interfaces (for EX Series switches)*

irb (Interfaces)

Syntax

```
irb {
  accounting-profile name;
  description  text;
  disable;

  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
  mtu bytes;
  no-gratuitous-arp-request;

  traceoptions {
    flag flag;
  }
  (traps | no-traps);
  unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    encapsulation type;
    family inet {
      accounting {
        destination-class-usage;
        source-class-usage {
          input;
          output;
        }
      }
      address ipv4-address {
        arp ip-address (mac | multicast-mac) mac-address <publish>;
        broadcast address;
        preferred;
        primary;
        vrrp-group group-number {
          (accept-data | no-accept-data);
          advertise–interval seconds;
          advertisements-threshold number;
          authentication-key key;
          authentication-type authentication;
          fast-interval milliseconds;
          (preempt | no-preempt) {
            hold-time seconds;
          }
          priority number;
          track {
            interface interface-name {
              bandwidth-threshold bandwidth;
              priority-cost number;
            }
            priority-hold-time seconds;
            route ip-address/mask routing-instance instance-name priority-cost cost;
          }
```



```
            virtual-address [ addresses ];
            vrrp-inherit-from {
                active-group group-number;
                active-interface interface-name;
            }
        }
    }
    filter {
        input filter-name;
        output filter-name;
    }
    mtu bytes;
    no-neighbor-learn;
    no-redirects;
    primary;
    rpf-check {
        fail-filter filter-name;
        mode {
            loose;
        }
    }
    targeted-broadcast {
        forward-and-send-to-re;
        forward-only;
    }
}
family inet6 {
    accounting {
        destination-class-usage;
        source-class-usage {
            input;
            output;
        }
    }
    address address {
        eui-64;
        ndp ip-address (mac | multicast-mac) mac-address <publish>;
        preferred;
        primary;
        vrrp-inet6-group group-id {
            accept-data | no-accept-data;
            advertisements-threshold number;
            authentication-key key;
            authentication-type authentication;
            fast-interval milliseconds;
            inet6-advertise-interval milliseconds;
            preempt | no-preempt {
                hold-time seconds;
            }
            priority number;
            track {
                interface interface-name {
                    bandwidth-threshold bandwidth priority-cost number;
                    priority-cost number;
                }
                priority-hold-time seconds;
```



```
                route ip-address/mask routing-instance instance-name priority-cost cost;
              }
              virtual-inet6-address [addresses];
              virtual-link-local-address ipv6–address;
              vrrp-inherit-from {
                active-group group-number;
                active-interface interface-name;
              }
            }
          }
          (dad-disable | no-dad-disable);
          filter {
            input filter-name;
            output filter-name;
          }
          mtu bytes;
          nd6-stale-time seconds;
          no-neighbor-learn;
          no-redirects;
          policer {
            input policer-name;
            output policer-name;
          }
          rpf-check {
            fail-filter filter-name;
            mode {
              loose;
            }
          }
        }
        family iso {
          address interface-address;
          mtu bytes;
        }
        family mpls {
          filter {
            input filter-name;
            output filter-name;
          }
          mtu bytes;
          policer {
            input policer-name;
            output policer-name;
          }
        }
        native-inner-vlan-id vlan-id;
        proxy-arp (restricted | unrestricted);
        (traps | no-traps);
        vlan-id-list [vlan-id’s];
        vlan-id-range [vlan-id-range];
      }
    }
```

Hierarchy Level [edit interfaces *interface-name*

Release Information Statement introduced in Junos OS Release 12.3R2 for EX Series switches.
irb option introduced in Junos OS Release 13.2 for the QFX Series.

Description Configure the properties of a specific integrated bridging and routing (IRB) interface.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *[edit interfaces] Hierarchy Level*
- *[edit interfaces] Configuration Statement Hierarchy on EX Series Switches*

inet (interfaces)

Syntax

```
inet {
  address address {
    primary;
  filter input filter-name;
  filter output filter-name;
  targeted-broadcast;
  }
}
```

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family],
[edit interfaces interface-range *interface-name* unit *logical-unit-number* family]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the primary IP address for the logical interface.

Default You must configure a logical interface to be able to use the physical device.

Options **The remaining statements are explained separately.—**

Required Privilege Level interface—To view this statement in the configuration.interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79

inet (enhanced-hash-key)

Syntax

```
inet {
  no-ipv4-destination-address;
  no-ipv4-source-address;
  no-l4-destination-port;
  no-l4-source-port;
  no-protocol;
  vlan-id;
}
```

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Select the payload fields in IPv4 traffic used by the hashing algorithm to make hashing decisions.

When IPv4 traffic enters a LAG and the hash mode is set to Layer 2 payload, the hashing algorithm checks the fields configured using the **inet** statement and uses the information in the fields to decide how to place traffic onto the LAG bundle's member links or how to forward traffic to the next hop device when ECMP is enabled.

The hashing algorithm, when used to hash LAG bundle traffic, always tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

The hashing algorithm only inspects the IPv4 fields in the payload to make hashing decisions when the hash mode is set to **layer2-payload**. The hash mode is set to Layer 2 payload by default. You can set the hash mode to Layer 2 payload using the **set forwarding-options enhanced-hash-key hash-mode layer2-payload** statement.

Default The following fields are used by the hashing algorithm to make hashing decisions for IPv4 traffic:

- IP destination address
- IP source address
- Layer 4 destination port
- Layer 4 source port
- Protocol

Options **no-ipv4-destination-address**—Exclude the IPv4 destination address field from the hashing algorithm.

no-ipv4-source-address—Exclude the IPv4 source address field from the hashing algorithm.

no-l4-destination-port—Exclude the Layer 4 destination port field from the hashing algorithm.

no-l4-source-port—Exclude the Layer 4 source port field from the hashing algorithm.

no-protocol—Exclude the protocol field from the hashing algorithm.

vlan-id—Include the VLAN ID field in the hashing algorithm.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- **enhanced-hash-key on page 122**
- **hash-mode on page 139**
- **inet6 on page 148**

inet6 (interfaces)

Syntax

```
inet6 {
  address address {
    eui-64
      preferred
    primary;
  filter input filter-name;
  filter output filter-name;
  }
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family],
[edit interfaces interface-range *interface-name* unit *logical-unit-number* family]

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description

Configure the primary IP address for the logical interface.

Default

You must configure a logical interface to be able to use the physical device.

Options

The remaining statements are explained separately.—

Required Privilege Level

interface—To view this statement in the configuration.interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79

inet6 (enhanced-hash-key)

Syntax

```
inet6 {
  no-ipv6-destination-address;
  no-ipv6-source-address;
  no-l4-destination-port;
  no-l4-source-port;
  no-next-header;
  vlan-id;
}
```

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Select the payload fields in an IPv6 packet used by the hashing algorithm to make hashing decisions.

When IPv6 traffic enters a LAG and the hash mode is set to Layer 2 payload, the hashing algorithm checks the fields configured using this statement and uses the information in the fields to decide how to place traffic onto the LAG bundle's member links or to forward traffic to the next hop device when ECMP is enabled.

The hashing algorithm, when used to hash LAG traffic, always tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

The hashing algorithm only inspects the IPv6 fields in the payload to make hashing decisions when the hash mode is set to Layer 2 payload. The hash mode is set to Layer 2 payload by default. You can set the hash mode to Layer 2 payload using the **set forwarding-options enhanced-hash-key hash-mode layer2-payload** statement.

Default The data in the following fields are used by the hashing algorithm to make hashing decisions for IPv6 traffic:

- IP destination address
- IP source address
- Layer 4 destination port
- Layer 4 source port
- Next header

Options **no-ipv6-destination-address**—Exclude the IPv6 destination address field from the hashing algorithm.

no-ipv6-source-address—Exclude the IPv6 source address field from the hashing algorithm.

no-l4-destination-port—Exclude the Layer 4 destination port field from the hashing algorithm.

no-l4-source-port—Exclude the Layer 4 source port field from the hashing algorithm.

no-next-header—Exclude the Next Header field from the hashing algorithm.

vlan-id—Include the VLAN ID field in the hashing algorithm.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- **enhanced-hash-key on page 122**
- **hash-mode on page 139**
- **inet on page 146**

interface (Redundant Trunk Groups)

Syntax

interface *interface-name* <primary>;
interface *interface-name*;

Hierarchy Level

For platforms with ELS:

[edit switch-options redundant-trunk-group group *name*]

For platforms without ELS:

[edit ethernet-switching-options redundant-trunk-group group *name*]

Release Information

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Hierarchy level **[edit switch-options]** introduced in Junos OS Release 13.2X50-D10 (ELS).
(See *Getting Started with Enhanced Layer 2 Software* for information about ELS.)
Statement introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description

Configure a primary link and secondary link on trunk ports. If the primary link fails, the secondary link automatically takes over as the primary link without waiting for normal STP convergence.

Options

interface *interface-name*—A logical interface or an aggregated interface containing multiple ports.

primary—(Optional) Specify one of the interfaces in the redundant group as the primary link. The interface without this option is the secondary link in the redundant group. If a link is not specified as **primary**, the software compares the two links and selects the link with the highest port number as the active link. For example, if the two interfaces are **ge-0/1/0** and **ge-0/1/1**, the software assigns **ge-0/1/1** as the active link.

Required Privilege Level

system—To view this statement in the configuration.
system–control—To add this statement to the configuration.

Related Documentation

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72
- Understanding Redundant Trunk Links on page 51

interface-mode

Syntax

interface-mode (access | trunk);

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family bridge],
[edit interfaces *interface-name* unit *logical-unit-number* family ethernet-switching],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family bridge]

Release Information

Statement introduced in Junos OS Release 9.2.
Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description

NOTE: This statement supports the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *port-mode*. For ELS details, see *Getting Started with Enhanced Layer 2 Software*.

(QFX Series 3500 and 3600 standalone switches)—Determine whether the logical interface accepts or discards packets based on VLAN tags. Specify the **trunk** option to accept packets with a VLAN ID that matches the list of VLAN IDs specified in the **vlan-id** or **vlan-id-list** statement, then forward the packet within the bridge domain or VLAN configured with the matching VLAN ID. Specify the **access** option to accept packets with no VLAN ID, then forward the packet within the bridge domain or VLAN configured with the VLAN ID that matches the VLAN ID specified in the **vlan-id** statement.

NOTE: On MX Series routers, if you want IGMP snooping to be functional for a bridge domain, then you should not configure interface-mode and irb for that bridge. Such a configuration commit succeeds, but IGMP snooping is not functional, and a message informing the same is displayed. For more information, see *Configuring a Trunk Interface on a Bridge Network*.

Options

access—Configure a logical interface to accept untagged packets. Specify the VLAN to which this interface belongs using the **vlan-id** statement.

trunk—Configure a single logical interface to accept packets tagged with any VLAN ID specified with the **vlan-id** or **vlan-id-list** statement.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring a Logical Interface for Access Mode*
- *Configuring a Logical Interface for Trunk Mode*

- *Example: Connecting Access Switches to a Distribution Switch*

interface-range

Syntax

```
interface-range interface-range-name {
   disable;
   description text;
   ether-options {
      802.3ad aex {
         lacp {
            force-up;
         }
      }
      (auto-negotiation| no-auto-negotiation);
      (flow-control | no-flow-control);
      link-mode mode;
      speed (auto-negotiation | speed);
   }
   hold-time milliseconds down milliseconds;
   member interface-name;
   member-range starting-interface-name to ending-interface-name;
   mtu bytes;
   unit logical-unit-number {
      description text;
      disable;
      family family-name {...}
      (traps | no traps);
      vlan-id vlan-id-number;
   }
}
```

Hierarchy Level [edit interfaces]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX series.

Description Group interfaces that share a common configuration profile.

NOTE: **The interface range definition is supported only for Gigabit Ethernet, 10-Gigabit Ethernet, and Fibre Channel interfaces.**

Options *interface-range-name*—Name of the interface range.

NOTE: **You can use regular expressions and wildcards to specify the interfaces in the member range configuration. Do not use wildcards for interface types.**

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Interface Ranges on page 20
- Interfaces Overview on page 3
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Junos OS Network Interfaces Library for Routing Devices*

interfaces

Syntax

```
interfaces {
  aex {
    disable;
      aggregated-ether-options {
      configured-flow-control {
        rx-buffers (on | off);
        tx-buffers (on | off);
      }
      (fcoe-lag | no-fcoe-lag);
      (flow-control | no-flow-control);
      lacp mode {
        admin-key key;
        periodic interval;
        system-id mac-address;
      }
      link-speed speed;
      local-bias;
      loopback;
      no-loopback;
      minimum-links number;
    }
      mc-ae {
        chassis-id chassis-id;
        mc-ae-id mc-ae-id;
        mode (active-active);
        status-control (active | standby);
      }
    description text;
    gratuitous-arp-reply | no-gratuitous-arp-reply)
    hold-time down milliseconds up milliseconds;
    mtu bytes;
    no-gratuitous-arp-request;
    traceoptions;
    (traps | no traps);
    unit logical-unit-number {
      disable;
      description text;
      family {
        ethernet-switching {
          filter input filter-name;
          filter output filter-name;
          native-vlan-id vlan-id;
          port-mode mode;
          reflective-relay;
          vlan {
            members [ (all | names | vlan-ids) ];
          }
        }
        inet {
          address address {
            primary;
          }
```

```
                filter input filter-name;
                filter output filter-name;
                primary;
                targeted-broadcast;
            }
        (traps | no traps);
        vlan-id vlan-id-number;
    }
    vlan-tagging;
}
interface-range interface-range-name {
    disable;
    description text;
    ether-options {
        802.3ad aex {
            lacp {
                force-up;
            }
        }
        (auto-negotiation| no-auto-negotiation);
        configured-flow-control {
            rx-buffers (on | off);
            tx-buffers (on | off);
        }
        (flow-control | no-flow-control);
        link-mode mode;
        speed (auto-negotiation | speed);
    }
    hold-time milliseconds down milliseconds;
    member interface-name;
    member-range starting-interface-name to  ending-interface-name;
    mtu bytes;
    unit logical-unit-number {
        disable;
        description text;
        family family-name {...}
        (traps | no traps);
        vlan-id vlan-id-number;
    }
}
lo0 {
    disable;
    description text;
    hold-time milliseconds down milliseconds;
    traceoptions;
    (traps | no traps);
    unit logical-unit-number {
        disable;
        description text;
        family {
            inet {
                address address {
                    primary;
                }
                filter input filter-name;
                filter output filter-name;
```



```
            primary;
            targeted-broadcast;
          }
        (traps | no traps);
      }
    }
    mex {
      disable;
      description text;
      hold-time milliseconds down milliseconds;
      (gratuitous-arp-reply | no-gratuitous-arp-reply);
      no-gratuitous-arp-request;
      traceoptions;
      traps;
      unit logical-unit-number {
        disable;
      description text;
        family {
          ethernet-switching {
            filter input filter-name;
            filter output filter-name;
            native-vlan-id vlan-id;
            port-mode mode;
            reflective-relay;
            vlan {
              members [ (all | names | vlan-ids) ];
            }
          }
          inet {
            address address {
            primary;
            filter input filter-name;
            filter output filter-name;
            primary;
            targeted-broadcast;
            }
          }
      traps;
      vlan-id vlan-id-number;
      }
    vlan-tagging;
    vlan {
      disable;
      description  text;
      (gratuitous-arp-reply| no-gratuitous-arp-reply);
      hold-time milliseconds down milliseconds;
      mtu bytes;
      no-gratuitous-arp-request;
      traceoptions;
      (traps | no traps);
      unit logical-unit-number {
        description text;
        disable;
        family {
          inet {
            address address {
```

```
                primary;
              }
              filter input filter-name;
              filter output filter-name;
              primary;
              targeted-broadcast;
            }
        (traps | no traps);
      }
    }
    fc-0/0/port {
      fibrechannel-options {
        bb-sc-n;
        (loopback | no-loopback);
        speed (auto-negotiation | 2g | 4g | 8g);
      }
      unit logical-unit-number {
        disable;
        description text;
        family {
          fibre-channel {
            port-mode np-port;
          }
        (traps | no traps);
      }
    ge-0/0/port {
      disable;
      description text;
      ether-options {
        802.3ad aex {
          lacp {
            force-up;
            primary;
          }
        }
        (auto-negotiation | no-auto-negotiation);
        configured-flow-control {
          rx-buffers (on | off);
          tx-buffers (on | off);
        }
        (flow-control | no-flow-control);
        link-mode mode;
        loopback;
        no-loopback;
        speed (auto-negotiation | speed);
      }
      gratuitous-arp-reply| no-gratuitous-arp-reply);
      hold-time milliseconds down milliseconds;
      mtu bytes;
      no-gratuitous-arp-request;
      traceoptions;
      (traps | no traps);
      unit logical-unit-number {
        description text;
        disable;
        family {
```



```
            ethernet-switching {
                filter input filter-name;
                filter output filter-name;
                native-vlan-id vlan-id;
                port-mode mode;
                reflective-relay;
                vlan {
                    members [ (all | names | vlan-ids) ];
                }
            }
            inet {
                address address {
                    primary;
                }
                filter input filter-name;
                filter output filter-name;
                primary;
                targeted-broadcast;
            }
        (traps | no traps);
        vlan-id vlan-id-number;
    }
    vlan-tagging;
}
vrrp-group group-id {
    (accept-data | no-accept-data);
    advertise-interval seconds;
    authentication-key key;
    authentication-type authentication;
    fast-interval milliseconds;
    (preempt | no-preempt) {
        hold-time seconds;
    }
    priority number;
    track {
        interface interface-name {
            bandwidth-threshold bits-per-second priority-cost priority;
            priority-cost priority;
        }
        priority-hold-time seconds;
        route prefix/prefix-length routing-instance instance-name priority-cost priority;
        }
    }
    virtual-address [ addresses ];
}
xe-0/0/port {
    disable;
    description text;
    ether-options {
        802.3ad aex {
            lacp {
                force-up;
                (primary | backup);
            }
        }
        configured-flow-control {
```

```
            rx-buffers (on | off);
            tx-buffers (on | off);
          }
          (flow-control | no-flow-control);
          loopback;
          no-loopback;
        }
        (gratuitous-arp-reply| no-gratuitous-arp-reply
        hold-time milliseconds down milliseconds;
        mtu bytes;
        no-gratuitous-arp-request;
        traceoptions;
        (traps | no traps);
        unit logical-unit-number {
          disable;
          description text;
          family {
            ethernet-switching {
              filter input filter-name;
              filter output filter-name;
              native-vlan-id vlan-id;
              port-mode mode;
              reflective-relay;
              vlan {
                members [ (all | names | vlan-ids) ];
              }
            }
            fibre-channel {
              port-mode (f-port | np-port);
            }
            inet {
              address address {
                primary;
              }
              filter input filter-name;
              filter output filter-name;
              primary;
              targeted-broadcast;
            }
          (traps | no traps);
          vlan-id vlan-id-number;
        }
        vlan-tagging;
      }
    }
```

Hierarchy Level [edit]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the interfaces on the QFX Series.

Most standard Junos OS configuration statements are available in the Junos OS for a switch. This topic lists Junos OS statements that you commonly use when configuring a switch as well as statements added to support switches only.

Options **ae*x***—Configure an aggregated Ethernet interface.

xe-0/0/*port/*—Configure a 10-Gigabit Ethernet interface.

ge-0/0/*port/*—Configure a Gigabit Ethernet interface.

fc-0/0/*port/*—Configure a Fibre Channel interface.

me*X/*—Configure a management interface.

mc-ae—Configure a multichassis aggregated Ethernet (MC-AE) interface.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Interfaces Overview on page 3
- Understanding Interface Ranges on page 20
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Configuring Link Aggregation on page 85
- Configuring a Layer 3 Logical Interface on page 85

lacp (802.3ad)

Syntax

```
lacp {
  force-up;
  (primary |backup);
  port-priority;
}
```

Hierarchy Level [edit interfaces *interface-name* ether-options 802.3ad]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the Link Aggregation Control Protocol (LACP) parameters for interfaces. The remaining statement is explained separately.

NOTE: **The port-priority statement is not supported on QFabric systems.**

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 on page 85
- Configuring Aggregated Ethernet LACP on page 81
- Understanding Aggregated Ethernet Interfaces and LACP on page 7

lacp (Aggregated Ethernet)

Syntax

```
lacp (active | passive) {
  admin-key key;
  periodic (fast | slow);
  system-ID mac-address;
}
```

Hierarchy Level [edit interfaces *interface-name*aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the Link Aggregation Control Protocol (LACP) parameters for interfaces. The remaining statement is explained separately.

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 on page 85
- Configuring Aggregated Ethernet LACP on page 81
- Understanding Aggregated Ethernet Interfaces and LACP on page 7

layer2 (enhanced-hash-key)

Syntax

```
layer2 {
  no-destination-mac-address;
  no-ether-type;
  no-source-mac-address;
  vlan-id;
}
```

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Select the fields in the Layer 2 header that are used by the hashing algorithm to make hashing decisions.

When traffic enters a link aggregation group (LAG) bundle, the hashing algorithm checks the fields configured using this statement and uses the information in the fields to decide how to place traffic onto the LAG bundle's member links. The hashing algorithm always tries to manage bandwidth by evenly load-balancing all incoming traffic across the member links in the bundle.

When traffic is exiting a device that has enabled ECMP, the hashing algorithm checks the fields configured using this statement and uses the information in the fields to decide how to forward traffic to the next hop device.

The hashing algorithm only inspects the fields in the Layer 2 header when the hash mode is set to Layer 2 header. You can set the hash mode to Layer 2 header using the **set forwarding-options enhanced-hash-key hash-mode layer2-header** statement.

Default The hash mode of the hashing algorithm is set to Layer 2 payload, by default. When the hash mode is set to Layer 2 payload, the hashing algorithm does not use fields in the Layer 2 header to make hashing decisions.

The following fields are used by the hashing algorithm when the hash mode of the hashing algorithm is set to Layer 2 header, by default:

- Destination MAC address
- Ethertype
- Source MAC address

Options **no-destination-mac-address**—Exclude the destination MAC address field from the hashing algorithm.

no-ether-type—Exclude the Ethertype field from the hashing algorithm.

no-source-mac-address—Exclude the source MAC address field from the hashing algorithm.

vlan-id—Include the VLAN ID field in the hashing algorithm.

Required Privilege Level
interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- **enhanced-hash-key on page 122**
- **hash-mode on page 139**

link-to-disable

Syntax link-to-disable *interface-name*;

Hierarchy Level [edit protocols uplink-failure-detection group *group-name*]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Configure the downlink interfaces to be disabled when the switch detects an uplink failure. The switch can monitor a maximum of eight downlink interfaces in a group.

Options *interface-name*—Name of the downlink interface in an uplink failure detection group. The interface can be a physical interface or a logical interface.

Required Privilege Level
admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation
- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

link-to-monitor

Syntax link-to-monitor *interface-name*;

Hierarchy Level [edit protocols uplink-failure-detection group *group-name*]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Configure the uplink interfaces to be monitored for uplink failure detection. The switch can monitor a maximum of eight uplink interfaces in a group.

Options ***interface-name***—Name of the uplink interface in an uplink failure detection group. The interface can be a physical interface or a logical interface.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

link-down

Syntax link-down (red | yellow | ignore);

Hierarchy Level [edit chassis alarm ethernet],
[edit chassis alarm fibre-channel],
[edit chassis interconnect-device *name* alarm ethernet],
[edit chassis node-group *name* alarm fibre-channel]

Release Information Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description Specify either red, yellow, or ignore to display when the link is down.

Options **red**—Indicates that one or more hardware components have failed or exceeded temperature thresholds, or an alarm condition configured on an interface has triggered a critical warning.

yellow—Indicates a noncritical condition on the device that, if left unchecked, might cause an interruption in service or degradation in performance. A yellow alarm condition requires monitoring or maintenance.

ignore—Suppresses or ignores the alarm.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

Related Documentation

link-mode

Syntax link-mode *mode*;

Hierarchy Level [edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Set the device's link-connection characteristic.

Default The **full-duplex** mode is enabled.

Options *mode* —Link characteristic:

- **full-duplex**—Connection is full duplex.
- **half-duplex**—Connection is half duplex.
- **automatic**—Link mode is negotiated.

If **no-auto-negotiation** is specified in the **ether-options** option, you can select only **full-duplex** or **half-duplex**. If **auto-negotiation** is specified in the **ether-options** option, you can select any mode.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Junos OS Network Interfaces Library for Routing Devices*

link-speed

Syntax link-speed *speed*;

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options]

Release Information Command introduced in Junos OS Release 11.1 for the QFX Series.

Description For aggregated Ethernet interfaces only, set the required link speed.

Options *speed*—For aggregated Ethernet links, you can specify the speed in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation **k** (1000), **m** (1,000,000), or **g** (1,000,000,000).

On QFX5100 standalone switches, you can configure **mixed** as the link speed. The **mixed** option allows you to configure mixed rate aggregated Ethernet bundles on a QFX5100 standalone switch with link speeds of 40G and 10G only. Load balancing will not work if you configure link speeds that are not supported.

Aggregated Ethernet links on the QFX Series can have one of the following speed values:

- **100g**—Links are 100 Gbps.
- **100m**—Links are 100 Mbps.
- **10g**—Links are 10 Gbps.
- **1g**—Links are 1 Gbps.
- **40g**—Links are 40 Gbps.
- **50g**—Links are 50 Gbps.
- **80g**—Links are 80 Gbps.
- **8g**—Links are 8 Gbps.
- **0c192**—Links are OC-192.
- **mixed**—Links are 10 Gbps and 40Gbps.

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 on page 85

local-bias

Syntax local-bias;

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 13.2X51-D20 for EX Series switches and QFX Series devices.

Description Enable local link bias for all links in the aggregated Ethernet interface.

Local link bias conserves bandwidth on Virtual Chassis ports (VCPs) by using local links to forward unicast traffic exiting a Virtual Chassis or Virtual Chassis Fabric (VCF) that has a Link Aggregation group (LAG) bundle composed of member links on different member switches in the same Virtual Chassis or VCF. A local link is a member link in the LAG bundle that is on the member switch that received the traffic.

You should enable local link bias if you want to conserve VCP bandwidth by always forwarding egress unicast traffic on a LAG bundle out of a local link. You should not enable local link bias if you want egress traffic load-balanced as it exits the Virtual Chassis or VCF.

Required Privilege Level system—To view this statement in the configuration.
system-control—To add this statement to the configuration.

Related Documentation

- Configuring Local Link Bias (CLI Procedure) on page 88
- Understanding Local Link Bias on page 22

loopback (Aggregated Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet)

Syntax (loopback | no-loopback);

Hierarchy Level [edit interfaces *interface-name* aggregated-ether-options],
[edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description For aggregated Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces, enable or disable loopback mode.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Ethernet Loopback Capability on page 81

management-ethernet (Alarm)

Syntax

```
management-ethernet {
  link-down (red | yellow | ignore);
}
```

Hierarchy Level [edit chassis alarm],
[edit chassis interconnect-device *name* alarm],
[edit chassis node-group *name* alarm]

Release Information Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description Configure alarms for a management Ethernet interface.

NOTE: If you configure a yellow alarm on the Interconnect device, it will be handled as a red alarm.

Options **The remaining statement is explained separately.—**

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Understanding Alarms*
- *Interface Alarm Messages*

member

Syntax member *interface-name*;

Hierarchy Level [edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Specify the name of the member interface belonging to an interface range on the QFX Series switch.

Options ***interface-name***—Name of the interface.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Interfaces Overview on page 3
- *Junos OS Network Interfaces Library for Routing Devices*

member-range

Syntax member-range *starting-interface-name ending-interface-name*;

Hierarchy Level [edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Specify the names of the first and last members of a sequence of interfaces belonging to an interface range.

Options ***starting interface-name ending interface-name***—Name of the first member and the name of the last member in the interface sequence.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Interface Ranges on page 20
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Interfaces Overview on page 3
- *Junos OS Network Interfaces Library for Routing Devices*

mtu

Syntax mtu *bytes*;

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces interface-range *interface-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Specify the maximum transmission unit (MTU) size for the media. Changing the media MTU size causes an interface to be deleted and added again. On a QFX3500 switch, either standalone or as part of the QFabric system, the maximum MTU value on an untagged packet transiting through an ingress Gigabit Ethernet interface must be no more than the currently configured MTU value plus four, whereas the maximum MTU value on a tagged packet transiting through an ingress Gigabit Ethernet interface must be no more than the currently configured MTU value plus eight. The maximum MTU value on an untagged or tagged packet transiting through an ingress 10-Gigabit Ethernet interface must be no more than the currently configured MTU value plus eight.

Keep the following points in mind if you are configuring MTU size for jumbo frames on these special types of interfaces:

- **For LAG interfaces**—Configuring the jumbo MTU size on a link aggregation group (LAG) interface (**aex**) automatically configures the jumbo MTU size on the member links.
- **For RVIs**—Jumbo frames of up to 9216 bytes are supported on the routed VLAN interface (RVI), which is named **vlan**. The RVI functions as a logical router. To route jumbo data packets on the RVI, you must configure the jumbo MTU size on the member physical interfaces of the RVI and not on the RVI itself (the **vlan** interface). However, for jumbo control packets—for example, to ping the RVI with a packet size of 6000 bytes or more—you must explicitly configure the jumbo MTU size on the interface named **vlan** (the RVI). On a QFX5100 switch, jumbo frames on the RVI are configured on the basis of the interface MTU

CAUTION: **Setting or deleting the jumbo MTU size on the RVI (the vlan interface) while the switch is transmitting packets might result in dropped packets.**

Options *bytes* —MTU size.

Range: 64 through 9216 bytes

Default: 1514 bytes

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79

- *Junos OS Network Interfaces Library for Routing Devices*

no-adaptation (Liveness Detection)

Syntax no-adaptation;

Hierarchy Level [edit protocols iccp peer liveness-detection]

Release Information Statement introduced in Junos OS Release 10.0 for MX Series routers.
Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description Configure Bidirectional Forwarding Detection (BFD) sessions to not adapt to changing network conditions.

Required Privilege Level routing—To view this statement in the configuration.
routing-control—To add this statement to the configuration.

no-gratuitous-arp-request

Syntax no-gratuitous-arp-request;

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces interface-range *interface-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the switch not to respond to gratuitous ARP requests. You can disable responses to gratuitous ARP requests on both Layer 2 Ethernet switching interfaces and routed VLAN interfaces (RVIs).

Default Gratuitous ARP responses are enabled on all Ethernet switching interfaces and RVIs.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring IRB Interfaces*

on-disk-failure

Syntax

```
on-disk-failure {
  disk-failure-action (halt | reboot);
}
```

Hierarchy Level

[edit chassis redundancy]
[edit chassis routing-engine]

Release Information

Statement introduced in Junos OS Release 9.2 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description

Instruct the router to halt or reboot if it detects hard disk errors on the Routing Engine.

Options

The remaining statement is explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *graceful-switchover*
- *Configuring the Junos OS to Enable a Routing Engine to Reboot on Hard Disk Errors*
- *Installing Software on an EX Series Switch with Redundant Routing Engines (CLI Procedure)*
- *High Availability Features for EX Series Switches Overview*

on-loss-of-keepalives

Syntax on-loss-of-keepalives;

Hierarchy Level [edit chassis redundancy failover]

Release Information Statement introduced in Junos OS Release 9.2 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Instruct the backup router to take mastership if it detects a loss of keepalive signal from the master Routing Engine.

Default The **on-loss-of-keepalives** statement must be included at the **[edit chassis redundancy failover]** hierarchy level for failover to occur.

When the **on-loss-of-keepalives** statement is included but graceful Routing Engine switchover *is not* configured, failover occurs after 300 seconds (5 minutes).

When the **on-loss-of-keepalives** statement is included and graceful Routing Engine switchover *is* configured, the keepalive signal is automatically enabled and the failover time is set to 2 seconds.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *graceful-switchover*
- *keepalive-time*
- *Installing Software on an EX Series Switch with Redundant Routing Engines (CLI Procedure)*
- *High Availability Features for EX Series Switches Overview*

periodic

Syntax periodic (fast | slow);

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options lacp]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the interval for periodic transmission of LACP packets.

Default **fast**

Options ***interval***—Interval at which to periodically transmit LACP packets:

- **fast**—Receive packets every second. This is the default.
- **slow**—Receive packets every 30 seconds.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- *Junos OS Network Interfaces Library for Routing Devices*

pic

Syntax

```
pic pic-number{
  tunnel-port port-number tunnel-services;
  port port-number{
    channel-speed (speed|disable-auto-speed-detection) ;
  }
  port-range port-range-low port-range-high {
    channel-speed (speed|disable-auto-speed-detection) ;
  }
}
```

Hierarchy Level

[edit chassis fpc *slot*]

Release Information

Option **channel-speed** introduced in Junos OS Release 13.2 for the QFX Series.

Description

(QFX3500, QFX3600, and QFX5100 standalone switches running Enhanced Layer 2 Software only)—Configure a specific port or a range of ports to operate as 10-Gigabit Ethernet ports or 40-Gigabit Ethernet ports.

Options

pic *pic-number*—(QFX3500 standalone switch only) Number of the physical interface card (PIC) on which you want to configure port types. Specify **1** to configure 10-Gigabit Ethernet or 40-Gigabit Ethernet type ports.

(QFX3600 standalone switch only) Number of the physical interface card (PIC) on which you want to configure port types. Specify **0** to configure 10-Gigabit Ethernet or 40-Gigabit Ethernet type ports.

port *physical-port-number*—Port number on which you want to configure the port type.

port-range-low—Lowest-numbered port in the range of ports.

port-range-high—Highest-numbered port in the range of ports.

channel-speed (*speed* |disable-auto-speed-detection) —Configure *10g* for 10-Gigabit Ethernet type ports, and configure disable-auto-speed-detection) to disable auto-channelization.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Channelizing Interfaces on page 94

preempt-cutover-timer

Syntax preempt-cutover-timer *seconds*;

Hierarchy Level

- For platforms with ELS:

  [edit switch-options redundant-trunk-group group *name*]

- For platforms without ELS:

  [edit ethernet-switching-optionsredundant-trunk-group group *name*]

Release Information Statement introduced in Junos OS Release 11.1 for EX Series switches.
Hierarchy level **[edit switch-options]** introduced in Junos OS Release 13.2X50-D10 (ELS). (See *Getting Started with Enhanced Layer 2 Software* for information about ELS.)
Statement introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description Change the length of time that a re-enabled primary link waits to take over from an active secondary link in a redundant trunk group.

Default If you do not change the time with the **preempt-cutover-timer** statement, a re-enabled primary link takes over from the active secondary link after 120 seconds.

Options **seconds**—Number of seconds that the primary link waits to take over from the active secondary link.

Range: 1 through 600 seconds

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72
- Understanding Redundant Trunk Links on page 51

redundancy (Graceful Switchover)

Syntax

```
redundancy {
  failover {
    on-disk-failure;
    on-loss-of-keepalives;
  }
  graceful-switchover;
}
```

Hierarchy Level [edit chassis]

Release Information Statement introduced in Junos OS Release 9.2 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Enable redundant Routing Engines on a Virtual Chassis with two or more member switches or on a Virtual Chassis Fabric, on a standalone EX6200 or EX8200 switch with more than one Routing Engine.

The remaining statements are explained separately.

Default Redundancy is enabled for the Routing Engines.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *graceful-switchover*
- *Configuring Graceful Routing Engine Switchover in a Virtual Chassis (CLI Procedure)*
- *Configuring Graceful Routing Engine Switchover*
- *Installing Software on an EX Series Switch with Redundant Routing Engines (CLI Procedure)*
- *High Availability Features for EX Series Switches Overview*

redundant-trunk-group

Syntax

```
redundant-trunk-group {
  group name {
    interface interface-name <primary>;
    interface interface-name;
    preempt-cutover-timer seconds;
  }
}
```

Hierarchy Level

- For platforms with ELS:

  [edit switch-options]

- For platforms without ELS:

  [edit ethernet-switching-options]

Release Information

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Hierarchy level **[edit switch-options]** introduced in Junos OS Release 13.2X50-D10 (ELS). (See *Getting Started with Enhanced Layer 2 Software* for information about ELS.)
Statement introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description

Configure a primary link and secondary link on trunk ports. If the primary link fails, the secondary link automatically takes over without waiting for normal spanning-tree protocol convergence.

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

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72
- Understanding Redundant Trunk Links on page 51

rx-buffers

Syntax rx-buffers (on | off);

Hierarchy Level [edit interfaces *interface-name* ether-options configured-flow-control]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Enable or disable an interface to generate and send Ethernet PAUSE messages. If you enable the receive buffers to generate and send PAUSE messages, when the receive buffers reach a certain level of fullness, the interface sends a PAUSE message to the connected peer. If the connected peer is properly configured, it stops transmitting frames to the interface on the entire link. When the interface receive buffer empties below a certain threshold, the interface sends a message to the connected peer to resume sending frames.

Ethernet PAUSE prevents buffers from overflowing and dropping packets during periods of network congestion. If the other devices in the network are also configured to support PAUSE, PAUSE supports lossless operation. Use the **rx-buffers** statement with the **tx-buffers** statement to configure asymmetric Ethernet PAUSE on an interface. (Use the **flow-control** statement to enable symmetric PAUSE and the **no-flow-control** statement to disable symmetric PAUSE on an interface. Symmetric flow control and asymmetric flow control are mutually exclusive features. If you attempt to configure both, the switch returns a commit error.)

NOTE: Ethernet PAUSE temporarily stops transmitting all traffic on a link when the buffers fill to a certain threshold. To temporarily pause traffic on individual "lanes" of traffic (each lane contains the traffic associated with a particular IEEE 802.1p code point, so there can be eight lanes of traffic on a link), use priority-based flow control (PFC).

Ethernet PAUSE and PFC are mutually exclusive features, so you cannot configure both of them on the same interface. If you attempt to configure both Ethernet PAUSE and PFC on an interface, the switch returns a commit error.

Default Flow control is disabled. You must explicitly configure Ethernet PAUSE flow control on interfaces.

Options **on | off**—Enable or disable an interface to generate and send Ethernet PAUSE messages.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- flow-control on page 134
- tx-buffers on page 189

- *Enabling and Disabling CoS Symmetric Ethernet PAUSE Flow Control*
- *Configuring CoS Asymmetric Ethernet PAUSE Flow Control*
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*

routing-engine

Syntax

```
routing-engine {
  on-disk-failure {
    disk-failure-action (halt | reboot);
  }
}
```

Hierarchy Level

[edit chassis]
[edit chassis interconnect-device *name*],
[edit chassis node-group *name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure a Routing Engine to halt or reboot automatically when a hard disk error occurs. A hard disk error may cause a Routing Engine to enter a state in which it responds to local pings and interfaces remain up, but no other processes are responding. Rebooting or halting prevents this.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring the Junos OS to Enable a Routing Engine to Reboot on Hard Disk Errors*
- *Junos OS High Availability Library for Routing Devices*

source

Syntax source *source-address*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* tunnel]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description Specify the source address of the tunnel.

Default If you do not specify a source address, the tunnel uses the unit's primary address as the source address of the tunnel.

Options ***source-address***—Address of the local side of the tunnel. This is the address that is placed in the outer IP header's source field.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation
- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*

speed

Syntax speed (auto-negotiation | *speed*);

Hierarchy Level [edit interfaces *interface-name* ether-options]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure the speed of the interface.

Default Autonegotiation is automatically enabled for Gigabit Ethernet interfaces. Autonegotation is not an option for 10-Gigabit Ethernet interfaces. No explicit action is taken after the autonegotiation is complete or if the negotiation fails. If the **autonegotiation** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level is enabled, the **auto-negotiation** option is enabled by default.

Options

- **auto-negotiation**—Automatically negotiate the speed based on the speed of the other end of the link. Autonegotiation is automatically enabled for Gigabit Ethernet interfaces. Autonegotation is not an option for 10-Gigabit Ethernet interfaces. No explicit action is taken after the autonegotiation is complete or if the negotiation fails.
- ***speed*** —Specify the interface speed. This value sets the speed that is used on the link. If the **auto-negotiation** statement is enabled on a Gigabit Ethernet interface, configure the value to advertise to the interface at the other end of the link. If you disable autonegotation on a Gigabit Ethernet interface, you must explicitly configure the speed to 1g.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- **auto-negotiation on page 113**
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- *Junos OS Network Interfaces Library for Routing Devices*

targeted-broadcast

Syntax targeted-broadcast;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family inet],
[edit interfaces interface-range *interface-range-name* unit *logical-unit-number* family inet]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Specify whether the IP packets destined for a Layer 3 broadcast need to be forwarded to both an egress interface and the Routing Engine, or to an egress interface only. The packets are broadcast only if the egress interface is a LAN interface.

Default When this statement is not included, broadcast packets are sent to the Routing Engine only.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Example: Configuring IP Directed Broadcast on an EX Series Switch*
- *Configuring IP Directed Broadcast (CLI Procedure)*
- *Understanding IP Directed Broadcast for EX Series Switches*

traceoptions (Individual Interfaces)

Syntax

```
traceoptions {
  flag flag;
}
```

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Define tracing operations for individual interfaces.

To specify more than one tracing operation, include multiple **flag** statements.

The **traceoptions** statement for interfaces does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system **syslog** file in the directory **/var/log**.

NOTE: **The traceoptions statement is not supported on the QFX3000 QFabric system.**

Default If you do not include this statement, no interface-specific tracing operations are performed.

Options *flag*—Tracing operation to perform. To specify more than one tracing operation, include multiple **flag** statements. The following are the interface-specific tracing options.

- **all**—All interface tracing operations
- **event**—Interface events
- **ipc**—Interface interprocess communication (IPC) messages
- **media**—Interface media changes
- **q921**—ISDN Q.921 frames
- **q931**—ISDN Q.931 frames

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Tracing Operations of an Individual Router or Switch Interface*

traps

Syntax (traps | no-traps);

Hierarchy Level [edit interfaces *interface-name*],
[edit interfaces *interface-name* unit *logical-unit-number*],
[edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Enable or disable the sending of SNMP notifications when the state of the connection changes.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Enabling or Disabling SNMP Notifications on Physical Interfaces*
- *Enabling or Disabling SNMP Notifications on Logical Interfaces*

tunnel

Syntax

```
tunnel {
  destination destination-address;
  source source-address;
  ttl number;
}
```

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number*]

Release Information Statement introduced in Junos OS Release 12.1 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description Configure a tunnel. You can use the tunnel for unicast and multicast traffic or just for multicast traffic. You can also use tunnels for encrypted traffic.

The remaining statements are explained separately.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*

tunnel-port

Syntax tunnel-port *port-number* tunnel-services;

Hierarchy Level [edit chassis fpc *slot* pic *pic-number*]

Release Information Statement introduced in Junos OS Release 12.1 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description Configure the port number for generic routing encapsulation (GRE) tunneling.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*

tx-buffers

Syntax tx-buffers (on | off);

Hierarchy Level [edit interfaces *interface-name* ether-options configured-flow-control]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Enable or disable an interface to respond to received Ethernet PAUSE messages. If you enable the transmit buffers to respond to PAUSE messages, when the interface receives a PAUSE message from the connected peer, the interface stops transmitting frames on the entire link. When the receive buffer on the connected peer empties below a certain threshold, the peer interface sends a message to the paused interface to resume sending frames.

Ethernet PAUSE prevents buffers from overflowing and dropping packets during periods of network congestion. If the other devices in the network are also configured to support PAUSE, PAUSE supports lossless operation. Use the **tx-buffers** statement with the **rx-buffers** statement to configure asymmetric Ethernet PAUSE on an interface. (Use the **flow-control** statement to enable symmetric PAUSE and the **no-flow-control** statement to disable symmetric PAUSE on an interface. Symmetric flow control and asymmetric flow control are mutually exclusive features. If you attempt to configure both, the switch returns a commit error.)

NOTE: Ethernet PAUSE temporarily stops transmitting all traffic on a link when the buffers fill to a certain threshold. To temporarily pause traffic on individual “lanes” of traffic (each lane contains the traffic associated with a particular IEEE 802.1p code point, so there can be eight lanes of traffic on a link), use priority-based flow control (PFC).

Ethernet PAUSE and PFC are mutually exclusive features, so you cannot configure both of them on the same interface. If you attempt to configure both Ethernet PAUSE and PFC on an interface, the switch returns a commit error.

Default Flow control is disabled. You must explicitly configure Ethernet PAUSE flow control on interfaces.

Options **on | off**—Enable or disable an interface to respond to an Ethernet PAUSE message.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- flow-control on page 134
- rx-buffers on page 181

- *Enabling and Disabling CoS Symmetric Ethernet PAUSE Flow Control*
- *Configuring CoS Asymmetric Ethernet PAUSE Flow Control*
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*

unit

Syntax

```
unit logical-unit-number {
  family {
    ethernet-switching {
      filter input filter-name;
      filter output filter-name;
      native-vlan-id vlan-id;
      port-mode mode;
      vlan {
        members [ (all | names | vlan-ids) ];
      }
    }
    fibre-channel {
      port-mode (f-port | np-port);
    }
    inet {
      address address {
        primary;
      }
      filter input filter-name;
      filter output filter-name;
      primary;
      targeted-broadcast;
    }
```

Hierarchy Level

[edit interfaces *interface-name*],
[edit interfaces interface-range *interface-range-name*]

Release Information

Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description

Configure a logical interface on the physical device. You must configure a logical interface to be able to use the physical device.

Default

You must configure a logical interface to be able to use the physical device.

Options

logical-unit-number—Number of the logical unit.

Range: 0 through 16,384

The remaining statements are explained separately.

Required Privilege Level

interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Configuring Link Aggregation on page 85
- *Junos OS Network Interfaces Library for Routing Devices*

uplink-failure-detection

Syntax

```
uplink-failure-detection {
  group group-name {
    link-to-monitor interface-name;
    link-to-disable interface-name;
  }
}
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.

Description Configure uplink and downlink interfaces in a group to monitor uplink failures and to propagate uplink failure information to the downlink interfaces.

The remaining statements are explained separately.

Required Privilege Level admin—To view this statement in the configuration.
admin-control—To add this statement to the configuration.

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

vlan-id

Syntax vlan-id *vlan-id-number*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number*]

Release Information Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description For 10-Gigabit Ethernet and aggregated Ethernet interfaces only, bind an 802.1Q VLAN tag ID to a logical interface.

NOTE: The VLAN tag ID cannot be configured on logical interface unit 0. The logical unit number must be 1 or higher.

Options *vlan-id-number*—Valid VLAN identifier.

Range: 1 through 4094

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- vlan-tagging on page 193
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces on page 79
- Configuring a Layer 3 Logical Interface on page 85
- *Junos OS Network Interfaces Library for Routing Devices*

vlan-tagging

Syntax vlan-tagging;

Hierarchy Level [edit interfaces *interface-name*]
[edit interfaces interface-range *interface-range-name*]

Release Information Statement introduced in Junos OS Release 11.3 for the QFX Series.

Description Enable VLAN tagging. The platform receives and forwards single-tag frames with 802.1Q VLAN tags.

Default VLAN tagging is disabled by default.

Required Privilege Level interface—To view this statement in the configuration.
interface-control—To add this statement to the configuration.

Related Documentation

- vlan-id on page 193
- Configuring a Layer 3 Logical Interface on page 85

PART 3

Administration

CHAPTER 6

Routine Monitoring

Monitoring System Process Information

Purpose View the processes running on the device.

Action To view the software processes running on the device:

[edit system]

user@switch> ***show system processes***

Meaning Table 26 on page 197 summarizes the output fields in the system process information display.

The display includes the total CPU load and total memory utilization.

Table 26: Summary of System Process Information Output Fields

Field	Values
PID	Identifier of the process.
Name	Owner of the process.
State	Current state of the process.
CPU Load	Percentage of the CPU that is being used by the process.
Memory Utilization	Amount of memory that is being used by the process.

Table 26: Summary of System Process Information Output Fields *(continued)*

Field	Values
Start Time	Time of day when the process started.

Related Documentation

- Monitoring System Properties on page 198
- *show system uptime*

Monitoring System Properties

Purpose View system properties such as the name, IP address, and resource usage.

Action To monitor system properties in the CLI, enter the following commands:

- ***show system uptime***
- ***show system users***
- ***show system storage***

Meaning Table 27 on page 198 summarizes key output fields in the system properties display.

Table 27: Summary of Key System Properties Output Fields

Field	Values	Additional Information
General Information		
Serial Number	Serial number of device.	
Junos OS Version	Version of Junos OS active on the switch, including whether the software is for domestic or export use.	Export software is for use outside the USA and Canada.
Hostname	Name of the device.	
IP Address	IP address of the device.	
Loopback Address	Loopback address.	
Domain Name Server	Address of the domain name server.	
Time Zone	Time zone on the device.	
Time		
Current Time	Current system time, in Coordinated Universal Time (UTC).	

Table 27: Summary of Key System Properties Output Fields *(continued)*

Field	Values	Additional Information
System Booted Time	Date and time when the device was last booted and how long it has been running.	
Protocol Started Time	Date and time when the protocols were last started and how long they have been running.	
Last Configured Time	Date and time when a configuration was last committed. This field also shows the name of the user who issued the last **commit** command.	
Load Average	CPU load average for 1, 5, and 15 minutes.	
Storage Media		
Internal Flash Memory	Usage details of internal flash memory.	
External Flash Memory	Usage details of external USB flash memory.	
Logged in Users Details		
User	Username of any user logged in to the switch.	
Terminal	Terminal through which the user is logged in.	
From	System from which the user has logged in. A hyphen indicates that the user is logged in through the console.	
Login Time	Time when the user logged in.	This is the **user@switch** field in **show system users** command output.
Idle Time	How long the user has been idle.	

Related Documentation

- Monitoring System Process Information on page 197
- *show system processes*

Monitoring Interface Status and Traffic

Purpose View interface status to monitor interface bandwidth utilization and traffic statistics.

Action

- To view interface status for all the interfaces, enter **show interfaces xe**.
- To view status and statistics for a specific interface, enter **show interfaces xe *interface-name***.

- To view status and traffic statistics for all interfaces, enter either **show interfaces xe detail** or **show interfaces xe extensive**.

Meaning For details about output from the CLI commands, see show interfaces xe.

Verifying That Layer 3 Logical Interfaces Are Working

Purpose After configuring Layer 3 logical interfaces, verify that they are set up properly and transmitting data.

Action

1. To determine if you have successfully created the logical interfaces and the links are up:

```
[edit interfaces]
user@switch> show interfaces interface-name terse
Interface               Admin Link Proto    Local                 Remote
ge-0/0/0                up    up
ge-0/0/0.0              up    up   inet     1.1.1.1/24
ge-0/0/0.1              up    up   inet     2.1.1.1/24
ge-0/0/0.2              up    up   inet     3.1.1.1/24
ge-0/0/0.3              up    up   inet     4.1.1.1/24
ge-0/0/0.4              up    up   inet     5.1.1.1/24
ge-0/0/0.32767          up    up
```

2. Use the **ping** command from a device on one subnet to an address on another subnet to determine if packets were transmitted correctly on the logical interface VLANs:

```
user@switch> ping ip-address
PING 1.1.1.1 (1.1.1.1): 56 data bytes
64 bytes from 1.1.1.1: icmp_seq=0 ttl=64 time=0.157 ms
64 bytes from 1.1.1.1: icmp_seq=1 ttl=64 time=0.238 ms
64 bytes from 1.1.1.1: icmp_seq=2 ttl=64 time=0.255 ms
64 bytes from 1.1.1.1: icmp_seq=3 ttl=64 time=0.128 ms
--- 1.1.1.1 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
```

Meaning The output confirms that the logical interfaces have been created and the links are up.

Related Documentation

- Configuring a Layer 3 Logical Interface on page 85

Verifying the Status of a LAG Interface

Purpose Verify that a link aggregation group (LAG) (**ae0**) has been created on the switch.

Action To verify that the **ae0** LAG has been created:

```
[edit interfaces]
show interfaces ae0 terse

Interface              Admin    Link   Proto      Local              Remote


ae0                     up        up

ae0.0                   up        up     inet      10.10.10.2/24
```


Meaning The output confirms that the **ae0** link is up and shows the family and IP address assigned to this link.

Related Documentation

- Configuring Link Aggregation on page 85
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 201
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63

  Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67
- **show lacp statistics interfaces (View) on page 320**

Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets

Verify that LACP has been set up correctly and that the bundle members are transmitting LACP protocol packets.

1. Verifying the LACP Setup on page 201
2. Verifying That LACP Packets Are Being Exchanged on page 201

Verifying the LACP Setup

Purpose Verify that the LACP has been set up correctly.

Action To verify that LACP has been enabled as active on one end:

```
user@switch>show lacp interfaces xe-0/0/0
Aggregated interface: ae0
LACP state:       Role    Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
xe-0/1/0          Actor   No    Yes   No   No   No   Yes     Fast    Active
xe-0/1/0          PartnerNo    Yes   No   No   No   Yes     Fast    Passive
LACP protocol:    Receive State    Transmit State          Mux      State
xe-0/1/0          Defaulted        Fast periodic           Detached
```

Meaning This example shows that LACP has been configured with one side as active and the other as passive. When LACP is enabled, one side must be set as active in order for the bundled link to be up.

Verifying That LACP Packets Are Being Exchanged

Purpose Verify that LACP packets are being exchanged between interfaces.

Action Use the **show lacp statistics interfaces *interface-name*** command to display LACP BPDU exchange information.

show lacp statistics interfaces ae0

```
Aggregated interface: ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      xe-0/0/2                1352        2035            0            0
      xe-0/0/3                1352        2056            0            0
```

Meaning The output here shows that the link is up and that PDUs are being exchanged.

Related Documentation

- Configuring Link Aggregation on page 85
- Verifying the Status of a LAG Interface on page 200
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67
- **show lacp statistics interfaces (View) on page 320**

Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly

Purpose Verify that the generic routing encapsulation (GRE) interface is sending tunneled traffic.

Action Display status information about the specified GRE interface by using the command **show interfaces**.

```
user@switch> show interfaces gr-0/0/0.0
Physical interface: gr-0/0/0, Enabled, Physical link is Up
Interface index: 132, SNMP ifIndex: 26
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 800mbps
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface gr-0/0/0.0 (Index 68) (SNMP ifIndex 47)
    Flags: Point-To-Point SNMP-Traps 16384
    IP-Header 1.1.1.2:1.1.1.1:47:df:64:0000000000000000 Encapsulation: GRE-NULL
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1476
      Flags: None
      Addresses, Flags: Is-Primary
        Local: 1.10.1.1
```

Meaning The output indicates that the GRE interface gr-0/0/0 is up. The output displays the name of the physical interface and the traffic statistics for this interface---the number of and the rate at which input and output bytes and packets are received and transmitted on the physical interface.

Related Documentation

- *Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)*

CHAPTER 7

Monitoring Commands

monitor interface

Syntax

monitor interface
<*interface-name* | traffic <detail>>

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.

Description

Display real-time statistics about interfaces, updating the statistics every second. Check for and display common interface failures, such as SONET/SDH and T3 alarms, loopbacks detected, and increases in framing errors.

NOTE: This command is not supported on the QFX3000 QFabric system.

Options

none—Display real-time statistics for all interfaces.

detail—(Optional) With traffic option only, display detailed output.

interface-name—(Optional) Display real-time statistics for the specified interface. In a TX Matrix or TX Matrix Plus router, display real-time statistics for the physical interfaces on the specified line-card chassis (LCC) only.

traffic—(Optional) Display traffic data for all active interfaces. In a TX Matrix or TX Matrix Plus router, display real-time statistics for the physical interfaces on the specified LCC only.

Additional Information

The output of this command shows how much each field has changed since you started the command or since you cleared the counters by pressing the c key. For a description of the statistical information provided in the output of this command, see the **show interfaces extensive** command for a particular interface type in the CLI Explorer. To control the output of the **monitor interface** command while it is running, use the keys listed in Table 28 on page 206. The keys are not case-sensitive.

Table 28: Output Control Keys for the monitor interface Command

Key	Action
c	Clears (returns to zero) the delta counters since **monitor interface** was started. This does not clear the accumulative counter. To clear the accumulative counter, use the **clear interfaces interval** command.
f	Freezes the display, halting the display of updated statistics and delta counters.
i	Displays information about a different interface. The command prompts you for the name of a specific interface.

Table 28: Output Control Keys for the monitor interface Command *(continued)*

Key	Action
n	Displays information about the next interface. The **monitor interface** command displays the physical or logical interfaces in the same order as the **show interfaces terse** command.
q or Esc	Quits the command and returns to the command prompt.
t	Thaws the display, resuming the update of the statistics and delta counters.

To control the output of the **monitor interface traffic** command while it is running, use the keys listed in Table 29 on page 207. The keys are not case-sensitive.

Table 29: Output Control Keys for the monitor interface traffic Command

Key	Action
b	Displays the statistics in units of bytes and bytes per second (Bps).
c	Clears (return to 0) the delta counters in the **Current Delta** column. The statistics counters are not cleared.
d	Displays the **Current Delta** column (instead of the rate column) in Bps or packets per second (pps).
p	Displays the statistics in units of packets and packets per second (pps).
q or Esc	Quits the command and returns to the command prompt.
r	Displays the rate column (instead of the **Current Delta** column) in Bps and pps.

Required Privilege Level

trace

List of Sample Output

monitor interface (Physical) on page 209
monitor interface (OTN Interface) on page 210
monitor interface (Logical) on page 211
monitor interface (QFX3500 Switch) on page 211
monitor interface traffic on page 212
monitor interface traffic (QFX3500 Switch) on page 212
monitor interface traffic detail (QFX3500 Switch) on page 213

Output Fields

Table 30 on page 208 describes the output fields for the **monitor interface** command. Output fields are listed in the approximate order in which they appear.

Table 30: monitor interface Output Fields

Field Name	Field Description	Level of Output
router1	Hostname of the router.	All levels
Seconds	How long the monitor interface command has been running or how long since you last cleared the counters.	All levels
Time	Current time (UTC).	All levels
Delay *x/y/z*	Time difference between when the statistics were displayed and the actual clock time. • *x*—Time taken for the last polling (in milliseconds). • *y*—Minimum time taken across all pollings (in milliseconds). • *z*—Maximum time taken across all pollings (in milliseconds).	All levels
Interface	Short description of the interface, including its name, status, and encapsulation.	All levels
Link	State of the link: **Up**, **Down**, or **Test**.	All levels
Current delta	Cumulative number for the counter in question since the time shown in the Seconds field, which is the time since you started the command or last cleared the counters.	All levels
Local Statistics	(Logical interfaces only) Number and rate of bytes and packets destined to the router or switch through the specified interface. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	All levels
Remote Statistics	(Logical interfaces only) Statistics for traffic transiting the router or switch. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	All levels

Table 30: monitor interface Output Fields *(continued)*

Field Name	Field Description	Level of Output
Traffic statistics	Total number of bytes and packets received and transmitted on the interface. These statistics are the sum of the local and remote statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It usually takes less than 1 second for this counter to stabilize. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	All levels
Description	With the **traffic** option, displays the interface description configured at the **[edit interfaces *interface-name*]** hierarchy level.	**detail**

Sample Output

monitor interface (Physical)

```
user@host> monitor interface so-0/0/0
router1                             Seconds: 19                   Time: 15:46:29

Interface: so-0/0/0, Enabled, Link is Up
Encapsulation: PPP, Keepalives, Speed: OC48
Traffic statistics:                                              Current Delta
  Input packets:                      6045 (0 pps)                        [11]
  Input bytes:                     6290065 (0 bps)                     [13882]
  Output packets:                    10376 (0 pps)                        [10]
  Output bytes:                   10365540 (0 bps)                      [9418]
Encapsulation statistics:
  Input keepalives:                   1901                                 [2]
  Output keepalives:                  1901                                 [2]
  NCP state: Opened
  LCP state: Opened
Error statistics:
  Input errors:                          0                                 [0]
  Input drops:                           0                                 [0]
  Input framing errors:                  0                                 [0]
  Policed discards:                      0                                 [0]
  L3 incompletes:                        0                                 [0]
  L2 channel errors:                     0                                 [0]
  L2 mismatch timeouts:                  0                                 [0]
  Carrier transitions:                   1                                 [0]
  Output errors:                         0                                 [0]
  Output drops:                          0                                 [0]
  Aged packets:                          0                                 [0]
Active alarms : None
Active defects: None
SONET error counts/seconds:
  LOS count                              1                                 [0]
  LOF count                              1                                 [0]
  SEF count                              1                                 [0]
  ES-S                                   0                                 [0]
  SES-S                                  0                                 [0]
SONET statistics:
  BIP-B1                            458871                                 [0]
```

```
  BIP-B2                            460072                             [0]
  REI-L                             465610                             [0]
  BIP-B3                            458978                             [0]
  REI-P                             458773                             [0]
Received SONET overhead:
  F1      : 0x00  J0        : 0x00  K1        : 0x00
  K2      : 0x00  S1        : 0x00  C2        : 0x00
  C2(cmp) : 0x00  F2        : 0x00  Z3        : 0x00
  Z4      : 0x00  S1(cmp)   : 0x00
Transmitted SONET overhead:
  F1      : 0x00  J0        : 0x01  K1        : 0x00
  K2      : 0x00  S1        : 0x00  C2        : 0xcf
  F2      : 0x00  Z3        : 0x00  Z4        : 0x00

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (OTN Interface)

user@host> **monitor interface ge-7/0/0**

```
Interface: ge-7/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
Traffic statistics:
  Input bytes:                         0 (0 bps)
  Output bytes:                        0 (0 bps)
  Input packets:                       0 (0 pps)
  Output packets:                      0 (0 pps)
Error statistics:
  Input errors:                        0
  Input drops:                         0
  Input framing errors:                0
  Policed discards:                    0
  L3 incompletes:                      0
  L2 channel errors:                   0
  L2 mismatch timeouts:                0
  Carrier transitions:                 5
  Output errors:                       0
  Output drops:                        0
  Aged packets:                        0
Active alarms : None
Active defects: None
Input MAC/Filter statistics:
  Unicast packets                      0
  Broadcast packets                    0
  Multicast packets                    0
  Oversized frames                     0
  Packet reject count                  0
  DA rejects                           0
  SA rejects                           0
Output MAC/Filter Statistics:
  Unicast packets                      0
  Broadcast packets                    0
  Multicast packets                    0
  Packet pad count                     0
  Packet error count                   0
OTN Link 0
  OTN Alarms: OTU_BDI, OTU_TTIM, ODU_BDI
  OTN Defects: OTU_BDI, OTU_TTIM, ODU_BDI, ODU_TTIM
  OTN OC - Seconds
    LOS                                2
```



```
    LOF                                  9
  OTN OTU - FEC Statistics
    Corr err ratio                     N/A
    Corr bytes                           0
    Uncorr words                         0
  OTN OTU - Counters
    BIP                                  0
    BBE                                  0
    ES                                   0
    SES                                  0
    UAS                                422
  OTN ODU - Counters
    BIP                                  0
    BBE                                  0
    ES                                   0
    SES                                  0
    UAS                                422
  OTN ODU - Received Overhead    APSPCC 0-3:              0
```

monitor interface (Logical)

```
user@host> monitor interface so-1/0/0.0
host name                Seconds: 16                  Time: 15:33:39
                                                               Delay: 0/0/1
Interface: so-1/0/0.0, Enabled, Link is Down
Flags: Hardware-Down Point-To-Point SNMP-Traps
Encapsulation: PPP
Local statistics:                                             Current delta
  Input bytes:                       0                                  [0]
  Output bytes:                      0                                  [0]
  Input packets:                     0                                  [0]
  Output packets:                    0                                  [0]
Remote statistics:
  Input bytes:                       0 (0 bps)                          [0]
  Output bytes:                      0 (0 bps)                          [0]
  Input packets:                     0 (0 pps)                          [0]
  Output packets:                    0 (0 pps)                          [0]
Traffic statistics:
  Destination address: 192.168.8.193, Local: 192.168.8.21

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (QFX3500 Switch)

```
user@switch> monitor interface ge-0/0/0
Interface: ge-0/0/0, Enabled, Link is Down
Encapsulation: Ethernet, Speed: Unspecified
Traffic statistics:                                           Current delta
  Input bytes:                      0 (0 bps)                           [0]
  Output bytes:                     0 (0 bps)                           [0]
  Input packets:                    0 (0 pps)                           [0]
  Output packets:                   0 (0 pps)                           [0]
Error statistics:
  Input errors:                     0                                   [0]
  Input drops:                      0                                   [0]
  Input framing errors:             0                                   [0]
  Policed discards:                 0                                   [0]
  L3 incompletes:                   0                                   [0]
  L2 channel errors:                0                                   [0]
  L2 mismatch timeouts:             0                                   [0]
  Carrier transitions:              0                                   [0]
```



```
  Output errors:                     0                                [0]
  Output drops:                      0                                [0]
  Aged packets:                      0                                [0]
Active alarms : LINK
Active defects: LINK
Input MAC/Filter statistics:
  Unicast packets                    0                                [0]
  Broadcast packets                  0  Multicast packet              [0]

Interface warnings:
  o Outstanding LINK alarm
```

monitor interface traffic

```
user@host> monitor interface traffic
host name                Seconds: 15                 Time: 12:31:09

Interface     Link  Input packets          (pps)     Output packets         (pps)
 so-1/0/0     Down              0            (0)                  0           (0)
 so-1/1/0     Down              0            (0)                  0           (0)
 so-1/1/1     Down              0            (0)                  0           (0)
 so-1/1/2     Down              0            (0)                  0           (0)
 so-1/1/3     Down              0            (0)                  0           (0)
 t3-1/2/0     Down              0            (0)                  0           (0)
 t3-1/2/1     Down              0            (0)                  0           (0)
 t3-1/2/2     Down              0            (0)                  0           (0)
 t3-1/2/3     Down              0            (0)                  0           (0)
 so-2/0/0       Up         211035            (1)              36778           (0)
 so-2/0/1       Up         192753            (1)              36782           (0)
 so-2/0/2       Up         211020            (1)              36779           (0)
 so-2/0/3       Up         211029            (1)              36776           (0)
 so-2/1/0       Up         189378            (1)              36349           (0)
 so-2/1/1     Down              0            (0)              18747           (0)
 so-2/1/2     Down              0            (0)              16078           (0)
 so-2/1/3       Up              0            (0)              80338           (0)
 at-2/3/0       Up              0            (0)                  0           (0)
 at-2/3/1     Down              0            (0)                  0           (0)

Bytes=b, Clear=c, Delta=d, Packets=p, Quit=q or ESC, Rate=r, Up=^U, Down=^D
```

monitor interface traffic (QFX3500 Switch)

```
user@switch> monitor interface traffic
switch                             Seconds: 7                  Time: 16:04:37

Interface     Link  Input packets          (pps)     Output packets         (pps)
 ge-0/0/0     Down              0            (0)                  0           (0)
 ge-0/0/1       Up         392187            (0)             392170           (0)
 ge-0/0/2     Down              0            (0)                  0           (0)
 ge-0/0/3     Down              0            (0)                  0           (0)
 ge-0/0/4     Down              0            (0)                  0           (0)
 ge-0/0/5     Down              0            (0)                  0           (0)
 ge-0/0/6     Down              0            (0)                  0           (0)
 ge-0/0/7     Down              0            (0)                  0           (0)
 ge-0/0/8     Down              0            (0)                  0           (0)
 ge-0/0/9       Up         392184            (0)             392171           (0)
 ge-0/0/10    Down              0            (0)                  0           (0)
 ge-0/0/11    Down              0            (0)                  0           (0)
 ge-0/0/12    Down              0            (0)                  0           (0)
 ge-0/0/13    Down              0            (0)                  0           (0)
 ge-0/0/14    Down              0            (0)                  0           (0)
```

```
 ge-0/0/15    Down            0          (0)              0          (0)
 ge-0/0/16    Down            0          (0)              0          (0)
 ge-0/0/17    Down            0          (0)              0          (0)
 ge-0/0/18    Down            0          (0)              0          (0)
 ge-0/0/19    Down            0          (0)              0          (0)
 ge-0/0/20    Down            0          (0)              0          (0)
 ge-0/0/21    Down            0          (0)              0          (0)
 ge-0/0/22      Up       392172          (0)         392187          (0)
 ge-0/0/23      Up       392185          (0)         392173          (0)
 vcp-0        Down            0                           0
 vcp-1        Down            0                           0
 ae0          Down            0          (0)              0          (0)
 bme0           Up            0                     1568706
```

monitor interface traffic detail (QFX3500 Switch)

```
user@switch> monitor interface traffic detail
switch                                                   Seconds: 74
        Time: 16:03:02

Interface     Link  Input packets        (pps)     Output packets        (pps)
Description
 ge-0/0/0     Down            0          (0)              0          (0)
 ge-0/0/1       Up       392183          (0)         392166          (0)
 ge-0/0/2     Down            0          (0)              0          (0)
 ge-0/0/3     Down            0          (0)              0          (0)
 ge-0/0/4     Down            0          (0)              0          (0)
 ge-0/0/5     Down            0          (0)              0          (0)
 ge-0/0/6     Down            0          (0)              0          (0)
 ge-0/0/7     Down            0          (0)              0          (0)
 ge-0/0/8     Down            0          (0)              0          (0)
 ge-0/0/9       Up       392181          (0)         392168          (0)
 ge-0/0/10    Down            0          (0)              0          (0)
 ge-0/0/11    Down            0          (0)              0          (0)
 ge-0/0/12    Down            0          (0)              0          (0)
 ge-0/0/13    Down            0          (0)              0          (0)
 ge-0/0/14    Down            0          (0)              0          (0)
 ge-0/0/15    Down            0          (0)              0          (0)
 ge-0/0/16    Down            0          (0)              0          (0)
 ge-0/0/17    Down            0          (0)              0          (0)
 ge-0/0/18    Down            0          (0)              0          (0)
 ge-0/0/19    Down            0          (0)              0          (0)
 ge-0/0/20    Down            0          (0)              0          (0)
 ge-0/0/21    Down            0          (0)              0          (0)
 ge-0/0/22      Up       392169          (0)         392184          (1)
 ge-0/0/23      Up       392182          (0)         392170          (0)
 vcp-0        Down            0                           0
 vcp-1        Down            0                           0
 ae0          Down            0          (0)              0          (0)
 bme0           Up            0                     1568693
```

show forwarding-options enhanced-hash-key

Syntax **show forwarding-options enhanced-hash-key**

Release Information Command introduced in Junos OS Release 13.2X51-D15 for EX Series switches.
Command introduced in Junos OS Release 13.2X51-D20 for QFX Series devices.

Description Display information about which packet fields are used by the hashing algorithm to make hashing decisions.

You can configure the fields that are inspected by the hashing algorithm to make hashing decisions for traffic entering a LAG bundle using the **forwarding-options** enhanced-hash-key statement.

Required Privilege Level view

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 82
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 10
- **enhanced-hash-key on page 122**

List of Sample Output **show forwarding-options enhanced-hash-key (Layer 2 Payload Hash Mode) on page 215**
show forwarding-options enhanced-hash-key (Layer 2 Header Hash Mode) on page 216

Output Fields Table 31 on page 214 lists the output fields for the **show forwarding-options enhanced-hash-key** command. Output fields are listed in the approximate order in which they first appear.

Table 31: show forwarding-options enhanced-hash-key Output Fields

Field Name	Field Description
Hash-Mode	Current hash mode: Layer 2 header or Layer 2 payload.
Protocol	Indicates whether the Protocol field is or is not used by the hashing algorithm: Yes or No.
Destination L4 Port	Indicates whether the Destination L4 Port field is or is not used by the hashing algorithm: Yes or No.
Source L4 Port	Indicates whether the Source L4 Port field is or is not used by the hashing algorithm: Yes or No.
Destination IPv4 Addr	Indicates whether the Destination IPv4 Addr field is or is not used by the hashing algorithm: Yes or No.
Source IPv4 Addr	Indicates whether the Source IPv4 Addr field is or is not used by the hashing algorithm: Yes or No.

Table 31: show forwarding-options enhanced-hash-key Output Fields *(continued)*

Field Name	Field Description
Vlan id	Indicates whether the Vlan id field is or is not used by the hashing algorithm: Yes or No.
Next Hdr	Indicates whether the Next Hdr field is or is not used by the hashing algorithm: Yes or No.
Destination IPv6 Addr	Indicates whether the Destination IPv6 Addr field is or is not used by the hashing algorithm: Yes or No.
Source IPv6 Addr	Indicates whether the Source IPv6 Addr field is or is not used by the hashing algorithm: Yes or No.
Ether Type	Indicates whether the Ether Type field is or is not used by the hashing algorithm: Yes or No.
Destination MAC Address	Indicates whether the Destination MAC Address field is or is not used by the hashing algorithm: Yes or No.
Source MAC Address	Indicates whether the Source MAC Address field is or is not used by the hashing algorithm: Yes or No.

Sample Output

show forwarding-options enhanced-hash-key (Layer 2 Payload Hash Mode)

```
user@switch> show forwarding-options enhanced-hash-key
Slot 0


Current Hash Settings
----------------------
Hash-Mode                              :layer2-payload

  inet Hash settings-
  --------------------
    inet packet fields
       Protocol                        : Yes
       Destination L4 Port             : Yes
       Source L4 Port                  : Yes
       Destination IPv4 Addr           : Yes
       Source IPv4 Addr                : Yes
       Vlan id                         : No


  inet6 Hash settings-
  ---------------------
    inet6 packet fields
       Next Hdr                        : Yes
       Destination L4 Port             : Yes
       Source L4 Port                  : Yes
       Destination IPv6 Addr           : Yes
       Source IPv6 Addr                : Yes
       Vlan id                         : No
```


show forwarding-options enhanced-hash-key (Layer 2 Header Hash Mode)

```
user@switch> show forwarding-options enhanced-hash-key
Slot 0


Current Hash Settings
----------------------

Hash-Mode                              : layer2-header

  layer2 Hash settings-
  ----------------------
     layer2 packet fields
       Ether Type                      : Yes
       Destination MAC Address         : Yes
       Source MAC Address              : Yes
       VLAN ID                         : No
```


show interfaces diagnostics optics

Syntax show interfaces diagnostics optics *interface-name*

Release Information Command introduced in Junos OS Release 10.0 for EX Series switches.
Command introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description Display diagnostics data and alarms for Gigabit Ethernet optical transceivers (SFP, SFP+, XFP, QSFP+, or CFP) installed in EX Series or QFX Series switches. The information provided by this command is known as digital optical monitoring (DOM) information. For a list of transceivers supported on EX Series switches and their specifications, including DOM support, see *Pluggable Transceivers Supported on EX Series Switches*.

Thresholds that trigger a high alarm, low alarm, high warning, or low warning are set by the transponder vendors. Generally, a high alarm or low alarm indicates that the optics module is not operating properly. This information can be used to diagnose why a transceiver is not working.

Options ***interface-name***—Name of the interface associated with the port in which the transceiver is installed: ge-*fpc/pic/port*, xe-*fpc/pic/port*, or et-*fpc/pic/port*.

Required Privilege Level view

Related Documentation

- *Monitoring Interface Status and Traffic*
- Monitoring Interface Status and Traffic on page 199
- *Installing a Transceiver in an EX Series Switch*
- *Installing a Transceiver in a QFX Series Device*
- *Removing a Transceiver from an EX Series Switch*
- *Removing a Transceiver from a QFX Series Device*
- *Junos OS Ethernet Interfaces Configuration Guide*

List of Sample Output

show interfaces diagnostics optics ge-0/1/0 (SFP Transceiver) on page 224
show interfaces diagnostics optics xe-0/1/0 (SFP+ Transceiver) on page 225
show interfaces diagnostics optics xe-0/1/0 (XFP Transceiver) on page 226
show interfaces diagnostics optics et-3/0/0 (QSFP+ Transceiver) on page 227
show interfaces diagnostics optics et-4/1/0 (CFP Transceiver) on page 228

Output Fields Table 32 on page 217 lists the output fields for the **show interfaces diagnostics optics** command. Output fields are listed in the approximate order in which they appear.

Table 32: show interfaces diagnostics optics Output Fields

Field Name	Field Description
Physical interface	Displays the name of the physical interface.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser bias current	Displays the magnitude of the laser bias power setting current, in milliamperes. The laser bias provides direct modulation of laser diodes and modulates currents.
Laser output power (Not available for QSFP+ transceivers)	Displays the laser output power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).
Laser temperature (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the laser temperature, in Celsius and Fahrenheit.
Module temperature	Displays the temperature, in Celsius and Fahrenheit.
Module voltage (Not available for XFP transceivers)	Displays the voltage, in Volts.
Laser rx power (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Displays the laser received optical power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).
Receiver signal average optical power (Not available for XFP, QSFP+, and CFP transceivers)	Displays the receiver signal average optical power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).
Laser bias current high alarm	Displays whether the laser bias power setting high alarm is **On** or **Off**.
Laser bias current low alarm	Displays whether the laser bias power setting low alarm is **On** or **Off**.
Laser bias current high warning	Displays whether the laser bias power setting high warning is **On** or **Off**.
Laser bias current low warning	Displays whether the laser bias power setting low warning is **On** or **Off**.
Laser output power high alarm (Not available for QSFP+ transceivers)	Displays whether the laser output power high alarm is **On** or **Off**.
Laser output power low alarm (Not available for QSFP+ transceivers)	Displays whether the laser output power low alarm is **On** or **Off**.
Laser output power high warning (Not available for QSFP+ transceivers)	Displays whether the laser output power high warning is **On** or **Off**.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser output power low warning (Not available for QSFP+ transceivers)	Displays whether the laser output power low warning is **On** or **Off**.
Laser temperature high alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the laser temperature high alarm is **On** or **Off**.
Laser temperature low alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the laser temperature low alarm is **On** or **Off**.
Laser temperature high warning (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the laser temperature high warning is **On** or **Off**.
Laser temperature low warning (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the laser temperature low warning is **On** or **Off**.
Module temperature high alarm (Not available for QSFP+ transceivers)	Displays whether the module temperature high alarm is **On** or **Off**.
Module temperature low alarm (Not available for QSFP+ transceivers)	Displays whether the module temperature low alarm is **On** or **Off**.
Module temperature high warning (Not available for QSFP+ transceivers)	Displays whether the module temperature high warning is **On** or **Off**.
Module temperature low warning (Not available for QSFP+ transceivers)	Displays whether the module temperature low warning is **On** or **Off**.
Module voltage high alarm (Not available for XFP and QSFP+ transceivers)	Displays whether the module voltage high alarm is **On** or **Off**.
Module voltage low alarm (Not available for XFP and QSFP+ transceivers)	Displays whether the module voltage low alarm is **On** or **Off**.
Module voltage high warning (Not available for XFP and QSFP+ transceivers)	Displays whether the module voltage high warning is **On** or **Off**.
Module voltage low warning (Not available for XFP and QSFP+ transceivers)	Displays whether the module voltage low warning is **On** or **Off**.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser rx power high alarm (Not available for QSFP+ and CFP transceivers)	Displays whether the receive laser power high alarm is **On** or **Off**.
Laser rx power low alarm (Not available for QSFP+ and CFP transceivers)	Displays whether the receive laser power low alarm is **On** or **Off**.
Laser rx power high warning (Not available for QSFP+ and CFP transceivers)	Displays whether the receive laser power high warning is **On** or **Off**.
Laser rx power low warning (Not available for QSFP+ and CFP transceivers)	Displays whether the receive laser power low warning is **On** or **Off**.
Laser bias current high alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser bias current high alarm.
Module not ready alarm (Not available for SFP, SFP+, and QSFP+ transceivers)	Displays whether the module not ready alarm is **On** or **Off**. When the output is **On**, the module has an operational fault.
Module low power alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the module low power alarm is **On** or **Off**.
Module initialization incomplete alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the module initialization incomplete alarm is **On** or **Off**.
Module fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the module fault alarm is **On** or **Off**.
PLD Flash initialization fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the PLD Flash initialization fault alarm is **On** or **Off**.
Power supply fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the power supply fault alarm is **On** or **Off**.
Checksum fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the checksum fault alarm is **On** or **Off**.
Tx laser disabled alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the Tx laser disabled alarm is **On** or **Off**.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Module power down alarm (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Displays whether the module power down alarm is **On** or **Off**. When the output is **On**, module is in a limited power mode, low for normal operation.
Tx data not ready alarm (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Any condition leading to invalid data on the transmit path. Displays whether the Tx data not ready alarm is **On** or **Off**.
Tx not ready alarm (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Any condition leading to invalid data on the transmit path. Displays whether the Tx not ready alarm is **On** or **Off**.
Tx laser fault alarm (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Laser fault condition. Displays whether the Tx laser fault alarm is **On** or **Off**.
Tx CDR loss of lock alarm (Not available for SFP, SFP+, and QSFP+ transceivers)	Transmit clock and data recovery (CDR) loss of lock. Loss of lock on the transmit side of the CDR. Displays whether the Tx CDR loss of lock alarm is **On** or **Off**.
Rx not ready alarm (Not available for SFP, SFP+, QSFP+, and CFP transceivers)	Any condition leading to invalid data on the receive path. Displays whether the Rx not ready alarm is **On** or **Off**.
Rx loss of signal alarm (Not available for SFP and SFP+ transceivers)	Receive loss of signal alarm. When the output is **On**, indicates insufficient optical input power to the module. Displays whether the Rx loss of signal alarm is **On** or **Off**.
Rx CDR loss of lock alarm (Not available for SFP, SFP+, and QSFP+ transceivers)	Receive CDR loss of lock. Loss of lock on the receive side of the CDR. Displays whether the Rx CDR loss of lock alarm is **On** or **Off**.
Laser bias current low alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser bias current low alarm.
Laser bias current high warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser bias current high warning.
Laser bias current low warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser bias current low warning.
Laser output power high alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser output power high alarm.
Laser output power low alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser output power low alarm.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser output power high warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser output power high warning.
Laser output power low warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser output power low warning.
Module temperature high alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the module temperature high alarm.
Module temperature low alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the module temperature low alarm.
Module temperature high warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the module temperature high warning.
Module temperature low warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the module temperature low warning.
Module voltage high alarm threshold (Not available for XFP and QSFP+ transceivers)	Displays the vendor-specified threshold for the module voltage high alarm.
Module voltage low alarm threshold (Not available for XFP and QSFP+ transceivers)	Displays the vendor-specified threshold for the module voltage low alarm.
Module voltage high warning threshold (Not available for XFP and QSFP+ transceivers)	Displays the vendor-specified threshold for the module voltage high warning.
Module voltage low warning threshold (Not available for XFP and QSFP+ transceivers)	Displays the vendor-specified threshold for the module voltage low warning.
Laser rx power high alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser rx power high alarm.
Laser rx power low alarm threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser rx power low alarm.
Laser rx power high warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser rx power high warning.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser rx power low warning threshold (Not available for QSFP+ transceivers)	Displays the vendor-specified threshold for the laser rx power low warning.
Laser temperature high alarm threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for the laser temperature high alarm, in Celsius and Fahrenheit.
Laser temperature low alarm threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for the laser temperature low alarm, in Celsius and Fahrenheit.
Laser temperature high warning threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for the laser temperature high warning, in Celsius and Fahrenheit.
Laser temperature low warning threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for the laser temperature low warning, in Celsius and Fahrenheit.
SOA bias current high alarm threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for SOA bias current high alarm.
SOA bias current low alarm threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for SOA bias current low alarm.
SOA bias current high warning threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for SOA bias current high warning.
SOA bias current low warning threshold (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays the vendor-specified threshold for SOA bias current low warning.
Laser receiver power high alarm (Not available for SFP, SFP+, and XFP transceivers)	Displays whether the laser receiver power high alarm is **On** or **Off**.
Laser receiver power low alarm (Not available for SFP, SFP+, and XFP transceivers)	Displays whether the laser receiver power low alarm is **On** or **Off**.
Laser receiver power high warning (Not available for SFP, SFP+, and XFP transceivers)	Displays whether the laser receiver power high warning is **On** or **Off**.
Laser receiver power low warning (Not available for SFP, SFP+, and XFP transceivers)	Displays whether the laser receiver power low warning is **On** or **Off**.

Table 32: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
Laser receiver power (Not available for SFP, SFP+, and XFP transceivers)	Displays the laser receiver power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).
Tx loss of signal functionality alarm (Not available for SFP, SFP+, and XFP transceivers)	Displays whether the Tx loss of signal functionality alarm is **On** or **Off**.
APD supply fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the APD supply fault alarm is **On** or **Off**.
TEC fault alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the TEC fault alarm is **On** or **Off**.
Wavelength unlocked alarm (Not available for SFP, SFP+, XFP, and QSFP+ transceivers)	Displays whether the Wavelength unlocked alarm is **On** or **Off**.

Sample Output

show interfaces diagnostics optics ge-0/1/0 (SFP Transceiver)

```
user@switch> show interfaces diagnostics optics ge-0/1/0
Physical interface: ge-0/1/0
    Laser bias current                        :  5.444 mA
    Laser output power                        :  0.3130 mW / -5.04 dBm
    Module temperature                        :  36 degrees C / 97 degrees F
    Module voltage                            :  3.2120 V
    Receiver signal average optical power     :  0.3840 mW / -4.16 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser output power high alarm             :  Off
    Laser output power low alarm              :  Off
    Laser output power high warning           :  Off
    Laser output power low warning            :  Off
    Module temperature high alarm             :  Off
    Module temperature low alarm              :  Off
    Module temperature high warning           :  Off
    Module temperature low warning            :  Off
    Module voltage high alarm                 :  Off
    Module voltage low alarm                  :  Off
    Module voltage high warning               :  Off
    Module voltage low warning                :  Off
    Laser rx power high alarm                 :  Off
    Laser rx power low alarm                  :  Off
    Laser rx power high warning               :  Off
    Laser rx power low warning                :  Off
    Laser bias current high alarm threshold   :  15.000 mA
    Laser bias current low alarm threshold    :  1.000 mA
    Laser bias current high warning threshold :  12.000 mA
```



```
    Laser bias current low warning threshold  :  2.000 mA
    Laser output power high alarm threshold   :  0.6300 mW / -2.01 dBm
    Laser output power low alarm threshold    :  0.0660 mW / -11.80 dBm
    Laser output power high warning threshold :  0.6300 mW / -2.01 dBm
    Laser output power low warning threshold  :  0.0780 mW / -11.08 dBm
    Module temperature high alarm threshold   :  109 degrees C / 228 degrees F
    Module temperature low alarm threshold    :  -29 degrees C / -20 degrees F
    Module temperature high warning threshold :  103 degrees C / 217 degrees F
    Module temperature low warning threshold  :  -13 degrees C / 9 degrees F
    Module voltage high alarm threshold       :  3.900 V
    Module voltage low alarm threshold        :  2.700 V
    Module voltage high warning threshold     :  3.700 V
    Module voltage low warning threshold      :  2.900 V
    Laser rx power high alarm threshold       :  1.2589 mW / 1.00 dBm
    Laser rx power low alarm threshold        :  0.0100 mW / -20.00 dBm
    Laser rx power high warning threshold     :  0.7939 mW / -1.00 dBm
    Laser rx power low warning threshold      :  0.0157 mW / -18.04 dBm
```

Sample Output

show interfaces diagnostics optics xe-0/1/0 (SFP+ Transceiver)

```
user@switch> show interfaces diagnostics optics xe-0/1/0
Physical interface: xe-0/1/0
    Laser bias current                        :  4.968 mA
    Laser output power                        :  0.4940 mW / -3.06 dBm
    Module temperature                        :  27 degrees C / 81 degrees F
    Module voltage                            :  3.2310 V
    Receiver signal average optical power     :  0.0000
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser output power high alarm             :  Off
    Laser output power low alarm              :  Off
    Laser output power high warning           :  Off
    Laser output power low warning            :  Off
    Module temperature high alarm             :  Off
    Module temperature low alarm              :  Off
    Module temperature high warning           :  Off
    Module temperature low warning            :  Off
    Module voltage high alarm                 :  Off
    Module voltage low alarm                  :  Off
    Module voltage high warning               :  Off
    Module voltage low warning                :  Off
    Laser rx power high alarm                 :  Off
    Laser rx power low alarm                  :  On
    Laser rx power high warning               :  Off
    Laser rx power low warning                :  On
    Laser bias current high alarm threshold   :  10.500 mA
    Laser bias current low alarm threshold    :  2.000 mA
    Laser bias current high warning threshold :  9.000 mA
    Laser bias current low warning threshold  :  2.500 mA
    Laser output power high alarm threshold   :  1.4120 mW / 1.50 dBm
    Laser output power low alarm threshold    :  0.0740 mW / -11.31 dBm
    Laser output power high warning threshold :  0.7070 mW / -1.51 dBm
    Laser output power low warning threshold  :  0.1860 mW / -7.30 dBm
    Module temperature high alarm threshold   :  75 degrees C / 167 degrees F
    Module temperature low alarm threshold    :  -5 degrees C / 23 degrees F
    Module temperature high warning threshold :  70 degrees C / 158 degrees F
    Module temperature low warning threshold  :  0 degrees C / 32 degrees F
```



```
        Module voltage high alarm threshold       :  3.630 V
        Module voltage low alarm threshold        :  2.970 V
        Module voltage high warning threshold     :  3.465 V
        Module voltage low warning threshold      :  3.135 V
        Laser rx power high alarm threshold       :  1.5849 mW / 2.00 dBm
        Laser rx power low alarm threshold        :  0.0407 mW / -13.90 dBm
        Laser rx power high warning threshold     :  0.7943 mW / -1.00 dBm
        Laser rx power low warning threshold      :  0.1023 mW / -9.90 dBm
```

Sample Output

show interfaces diagnostics optics xe-0/1/0 (XFP Transceiver)

```
user@switch> show interfaces diagnostics optics xe-0/1/0
Physical interface: xe-0/1/0
    Laser bias current                          :  8.029 mA
    Laser output power                          :  0.6430 mW / -1.92 dBm
    Module temperature                          :  4 degrees C / 39 degrees F
    Laser rx power                              :  0.0012 mW / -29.21 dBm
    Laser bias current high alarm               :  Off
    Laser bias current low alarm                :  Off
    Laser bias current high warning             :  Off
    Laser bias current low warning              :  Off
    Laser output power high alarm               :  Off
    Laser output power low alarm                :  Off
    Laser output power high warning             :  Off
    Laser output power low warning              :  Off
    Module temperature high alarm               :  Off
    Module temperature low alarm                :  Off
    Module temperature high warning             :  Off
    Module temperature low warning              :  Off
    Laser rx power high alarm                   :  Off
    Laser rx power low alarm                    :  On
    Laser rx power high warning                 :  Off
    Laser rx power low warning                  :  On
    Module not ready alarm                      :  On
    Module power down alarm                     :  Off
    Tx data not ready alarm                     :  Off
    Tx not ready alarm                          :  Off
    Tx laser fault alarm                        :  Off
    Tx CDR loss of lock alarm                   :  Off
    Rx not ready alarm                          :  On
    Rx loss of signal alarm                     :  On
    Rx CDR loss of lock alarm                   :  On
    Laser bias current high alarm threshold     :  13.000 mA
    Laser bias current low alarm threshold      :  2.000 mA
    Laser bias current high warning threshold :  12.000 mA
    Laser bias current low warning threshold    :  3.000 mA
    Laser output power high alarm threshold     :  0.8310 mW / -0.80 dBm
    Laser output power low alarm threshold      :  0.1650 mW / -7.83 dBm
    Laser output power high warning threshold :  0.7410 mW / -1.30 dBm
    Laser output power low warning threshold    :  0.1860 mW / -7.30 dBm
    Module temperature high alarm threshold     :  90 degrees C / 194 degrees F
    Module temperature low alarm threshold      :  0 degrees C / 32 degrees F
    Module temperature high warning threshold :  85 degrees C / 185 degrees F
    Module temperature low warning threshold    :  0 degrees C / 32 degrees F
    Laser rx power high alarm threshold         :  0.8912 mW / -0.50 dBm
    Laser rx power low alarm threshold          :  0.0912 mW / -10.40 dBm
    Laser rx power high warning threshold       :  0.7943 mW / -1.00 dBm
    Laser rx power low warning threshold        :  0.1023 mW / -9.90 dBm
```


Sample Output

show interfaces diagnostics optics et-3/0/0 (QSFP+ Transceiver)

```
user@switch> show interfaces diagnostics optics et-3/0/0
Physical interface: et-3/0/0
    Module temperature                        :  33 degrees C / 92 degrees F
    Module voltage                            :  3.3060 V
  Lane 0
    Laser bias current                        :  7.182 mA
    Laser receiver power                      :  0.743 mW / -1.29 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Rx loss of signal alarm                   :  Off
  Lane 1
    Laser bias current                        :  7.326 mA
    Laser receiver power                      :  0.752 mW / -1.24 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Rx loss of signal alarm                   :  Off
  Lane 2
    Laser bias current                        :  7.447 mA
    Laser receiver power                      :  0.790 mW / -1.03 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Rx loss of signal alarm                   :  Off
  Lane 3
    Laser bias current                        :  7.734 mA
    Laser receiver power                      :  0.768 mW / -1.15 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Rx loss of signal alarm                   :  Off
```

Sample Output

show interfaces diagnostics optics et-4/1/0 (CFP Transceiver)

```
user@switch> show interfaces diagnostics optics et-4/1/0
Physical interface: et-4/1/0
    Module temperature                         :  38 degrees C / 101 degrees F
    Module voltage                             :  3.2500 V
    Module temperature high alarm              :  Off
    Module temperature low alarm               :  Off
    Module temperature high warning            :  Off
    Module temperature low warning             :  Off
    Module voltage high alarm                  :  Off
    Module voltage low alarm                   :  Off
    Module voltage high warning                :  Off
    Module voltage low warning                 :  Off
    Module not ready alarm                     :  Off
    Module low power alarm                     :  Off
    Module initialization incomplete alarm     :  Off
    Module fault alarm                         :  Off
    PLD Flash initialization fault alarm       :  Off
    Power supply fault alarm                   :  Off
    Checksum fault alarm                       :  Off
    Tx laser disabled alarm                    :  Off
    Tx loss of signal functionality alarm      :  Off
    Tx CDR loss of lock alarm                  :  Off
    Rx loss of signal alarm                    :  Off
    Rx CDR loss of lock alarm                  :  Off
    Module temperature high alarm threshold    :  75 degrees C / 167 degrees F
    Module temperature low alarm threshold     :  -5 degrees C / 23 degrees F
    Module temperature high warning threshold :  70 degrees C / 158 degrees F
    Module temperature low warning threshold   :  0 degrees C / 32 degrees F
    Module voltage high alarm threshold        :  3.5000 V
    Module voltage low alarm threshold         :  3.0990 V
    Module voltage high warning threshold      :  3.4000 V
    Module voltage low warning threshold       :  3.2000 V
    Laser bias current high alarm threshold    :  250.000 mA
    Laser bias current low alarm threshold     :  37.500 mA
    Laser bias current high warning threshold :  225.000 mA
    Laser bias current low warning threshold   :  50.000 mA
    Laser output power high alarm threshold    :  3.9800 mW / 6.00 dBm
    Laser output power low alarm threshold     :  0.4670 mW / -3.31 dBm
    Laser output power high warning threshold :  3.5480 mW / 5.50 dBm
    Laser output power low warning threshold   :  0.5240 mW / -2.81 dBm
    Laser rx power high alarm threshold        :  3.5481 mW / 5.50 dBm
    Laser rx power low alarm threshold         :  0.0616 mW / -12.10 dBm
    Laser rx power high warning threshold      :  3.1622 mW / 5.00 dBm
    Laser rx power low warning threshold       :  0.0691 mW / -11.61 dBm
    Laser temperature high alarm threshold     :  67 degrees C / 153 degrees F
    Laser temperature low alarm threshold      :  35 degrees C / 95 degrees F
    Laser temperature high warning threshold   :  62 degrees C / 144 degrees F
    Laser temperature low warning threshold    :  40 degrees C / 104 degrees F
    SOA bias current high alarm threshold      :  0.000 mA
    SOA bias current low alarm threshold       :  0.000 mA
    SOA bias current high warning threshold    :  0.000 mA
    SOA bias current low warning threshold     :  0.000 mA
  Lane 0
    Laser bias current                         :  131.684 mA
    Laser output power                         :  1.002 mW / 0.01 dBm
    Laser temperature                          :  54 degrees C / 128 degrees F
    Laser receiver power                       :  0.497 mW / -3.03 dBm
```

```
    Laser bias current high alarm           :  Off
    Laser bias current low alarm            :  Off
    Laser bias current high warning         :  Off
    Laser bias current low warning          :  Off
    Laser output power high alarm           :  Off
    Laser output power low alarm            :  Off
    Laser output power high warning         :  Off
    Laser output power low warning          :  Off
    Laser temperature high alarm            :  Off
    Laser temperature low alarm             :  Off
    Laser temperature high warning          :  Off
    Laser temperature low warning           :  Off
    Laser receiver power high alarm         :  Off
    Laser receiver power low alarm          :  Off
    Laser receiver power high warning       :  Off
    Laser receiver power low warning        :  Off
    Tx loss of signal functionality alarm   :  Off
    Tx CDR loss of lock alarm               :  Off
    Rx loss of signal alarm                 :  Off
    Rx CDR loss of lock alarm               :  Off
    APD supply fault alarm                  :  Off
    TEC fault alarm                         :  Off
    Wavelength unlocked alarm               :  Off
  Lane 1
    Laser bias current                      :  122.345 mA
    Laser output power                      :  1.002 mW / 0.01 dBm
    Laser temperature                       :  51 degrees C / 124 degrees F
    Laser receiver power                    :  0.611 mW / -2.14 dBm
    Laser bias current high alarm           :  Off
    Laser bias current low alarm            :  Off
    Laser bias current high warning         :  Off
    Laser bias current low warning          :  Off
    Laser output power high alarm           :  Off
    Laser output power low alarm            :  Off
    Laser output power high warning         :  Off
    Laser output power low warning          :  Off
    Laser temperature high alarm            :  Off
    Laser temperature low alarm             :  Off
    Laser temperature high warning          :  Off
    Laser temperature low warning           :  Off
    Laser receiver power high alarm         :  Off
    Laser receiver power low alarm          :  Off
    Laser receiver power high warning       :  Off
    Laser receiver power low warning        :  Off
    Tx loss of signal functionality alarm   :  Off
    Tx CDR loss of lock alarm               :  Off
    Rx loss of signal alarm                 :  Off
    Rx CDR loss of lock alarm               :  Off
    APD supply fault alarm                  :  Off
    TEC fault alarm                         :  Off
    Wavelength unlocked alarm               :  Off
  Lane 2
    Laser bias current                      :  112.819 mA
    Laser output power                      :  1.000 mW / 0.00 dBm
    Laser temperature                       :  50 degrees C / 122 degrees F
    Laser receiver power                    :  0.540 mW / -2.67 dBm
    Laser bias current high alarm           :  Off
    Laser bias current low alarm            :  Off
    Laser bias current high warning         :  Off
    Laser bias current low warning          :  Off
    Laser output power high alarm           :  Off
```

```
    Laser output power low alarm              :  Off
    Laser output power high warning           :  Off
    Laser output power low warning            :  Off
    Laser temperature high alarm              :  Off
    Laser temperature low alarm               :  Off
    Laser temperature high warning            :  Off
    Laser temperature low warning             :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Tx CDR loss of lock alarm                 :  Off
    Rx loss of signal alarm                   :  Off
    Rx CDR loss of lock alarm                 :  Off
    APD supply fault alarm                    :  Off
    TEC fault alarm                           :  Off
    Wavelength unlocked alarm                 :  Off
  Lane 3
    Laser bias current                        :  100.735 mA
    Laser output power                        :  1.002 mW / 0.01 dBm
    Laser temperature                         :  50 degrees C / 122 degrees F
    Laser receiver power                      :  0.637 mW / -1.96 dBm
    Laser bias current high alarm             :  Off
    Laser bias current low alarm              :  Off
    Laser bias current high warning           :  Off
    Laser bias current low warning            :  Off
    Laser output power high alarm             :  Off
    Laser output power low alarm              :  Off
    Laser output power high warning           :  Off
    Laser output power low warning            :  Off
    Laser temperature high alarm              :  Off
    Laser temperature low alarm               :  Off
    Laser temperature high warning            :  Off
    Laser temperature low warning             :  Off
    Laser receiver power high alarm           :  Off
    Laser receiver power low alarm            :  Off
    Laser receiver power high warning         :  Off
    Laser receiver power low warning          :  Off
    Tx loss of signal functionality alarm     :  Off
    Tx CDR loss of lock alarm                 :  Off
    Rx loss of signal alarm                   :  Off
    Rx CDR loss of lock alarm                 :  Off
    APD supply fault alarm                    :  Off
    TEC fault alarm                           :  Off
    Wavelength unlocked alarm                 :  Off
```


show interfaces ge

Syntax

show interfaces *device-name*:*type-fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 11.1 for the QFX Series.

Description

Display status information about the specified Gigabit Ethernet interface. This command does not display statistics for routed VLAN interfaces.

Options

brief | detail | extensive | terse—(Optional) Display the specified level of output.

device-name*:*type-fpc/pic/port—The device name is either the serial number or the alias of the QFabric system component, such as a Node device, Interconnect device, or QFabric infrastructure. The name can contain a maximum of 128 characters and cannot contain any colons.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

routing instance (all | *instance-name*)—(Optional) Display the name of an individual routing-instance or display all routing-instances.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level

view

Related Documentation

- Monitoring Interface Status and Traffic on page 199
- Troubleshooting Network Interfaces on page 329
- Troubleshooting an Aggregated Ethernet Interface on page 329

- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces on page 239
show interfaces brief on page 239
show interfaces detail (Symmetric Flow Control and Autonegotiation Enabled) on page 239
show interfaces detail (Asymmetric Flow Control and Autonegotiation Enabled) on page 240

show interfaces extensive (Symmetric Flow Control and Autonegotiation Enabled) on page 241
show interfaces extensive (Asymmetric Flow Control and Autonegotiation Enabled) on page 243
show interfaces terse on page 245
show interfaces terse (QFabric Systems) on page 245

Output Fields Table 33 on page 232 lists the output fields for the **show interfaces ge** command. Output fields are listed in the approximate order in which they appear.

Table 33: show interfaces ge Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface: **Enabled** or **Disabled**.	All levels
Interface index	Index number of the physical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Description	Optional user-specified description.	**brief detail extensive**
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface. The default is 1514.	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Loopback status: **Enabled** or **Disabled**. If loopback is enabled, type of loopback: **Local** or **Remote**.	All levels
Source filtering	Source filtering status: **Enabled** or **Disabled**.	All levels
Flow control	Flow control status: **Enabled** or **Disabled**. NOTE: This field is only displayed if asymmetric flow control is not configured.	detail extensive
Configured-flow-control	Configured flow control for the interface transmit buffers (**tx-buffers**) and receive buffers (**rx-buffers**): • **tx-buffers—On** if the interface is configured to respond to Ethernet PAUSE messages received from the connected peer. **Off** if the interface is not configured to respond to received PAUSE messages. • **rx-buffers—On** if the interface is configured to generate and send Ethernet PAUSE messages to the connected peer. **Off** if the interface is not configured to generate and send PAUSE messages. NOTE: This field is only displayed if asymmetric flow control is configured.	detail extensive

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output
Auto-negotiation	Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	Remote fault status: • **Online**—Autonegotiation is manually configured as online. • **Offline**—Autonegotiation is manually configured as offline.	All levels
Device flags	Information about the physical device.	All levels
Interface flags	Information about the interface.	All levels
Link flags	Information about the link.	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Current address	Configured MAC address.	**detail extensive** none
Hardware address	MAC address of the hardware.	**detail extensive** none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped:** ***year-month-day hour:minute:second timezone*** **(*hour:minute:second* ago)**. For example, **Last flapped: 2008–01–16 10:52:40 UTC (3d 22:58 ago).**	**detail extensive** none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Traffic statistics	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface • **Output packets**—Number of packets transmitted on the interface. NOTE: The bandwidth bps counter is not enabled on the switch.	**detail extensive**

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output
Input errors	Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 sanity checks of the headers. For example, a frame with less than 20 bytes of available IP header is discarded. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **FIFO errors**—Number of FIFO errors in the receive direction that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Collisions**—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug. • **Aged packets**—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • **FIFO errors**—Number of FIFO errors in the send direction as reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **HS link CRC errors**—Number of errors on the high-speed links between the ASICs responsible for handling the switch interfaces. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues	Total number of egress queues supported on the specified interface.	**detail extensive**
Queue counters (Egress)	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**detail extensive**
Queue Number	The CoS queue number and the forwarding classes mapped to the queue number. The **Mapped forwarding class** column lists the forwarding classes mapped to each CoS queue.	**detail extensive**
Active alarms and Active defects	Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the switch configuration, an alarm can ring the red or yellow alarm bell on the switch or turn on the red or yellow alarm LED on the front of the switch. These fields can contain the value **None** or **Link**. • **None**—There are no active defects or alarms. • **Link**—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning.	**detail extensive** none

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output
MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem. • **Total octets** and **total packets**—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. • **Unicast packets, Broadcast packets,** and **Multicast packets**—Number of unicast, broadcast, and multicast packets. • **CRC/Align errors**—Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error). • **FIFO error**—Number of FIFO errors that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **MAC control frames**—Number of MAC control frames. • **MAC pause frames**—Number of MAC control frames with **pause** operational code. • **Oversized frames**—Number of packets that exceeds the configured MTU. • **Jabber frames**—Number of frames that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition in which any packet exceeds 20 ms. The allowed range to detect jabber is from 20 ms to 150 ms. • **Fragment frames**—Total number of packets that were less than 64 octets in length (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. Fragment frames normally increment because both runts (which are normal occurrences caused by collisions) and noise hits are counted. • **VLAN tagged frames**—Number of frames that are VLAN tagged. The system uses the TPID of 0x8100 in the frame to determine whether a frame is tagged or not. This counter is not supported on EX Series switches and is always displayed as 0. • **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."	**extensive**
Filter Statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem.	**extensive**

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output

Autonegotiation information	Information about link autonegotiation:
	• **Negotiation status:**
	  ◦ **Incomplete**—Ethernet interface has the speed or link mode configured.
	  ◦ **No autonegotiation**—Remote Ethernet interface has the speed or link mode configured or does not perform autonegotiation.
	  ◦ **Complete**—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner status**—**OK** when the Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner:**
	  ◦ **Link mode**—Depending on the capability of the attached Ethernet device, either **Full-duplex** or **Half-duplex**.
	  ◦ **Flow control**—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), and **Symmetric/Asymmetric** (link partner supports **PAUSE** on both receive and transmit or **PAUSE** only on receive).
	  ◦ **Remote fault**—Remote fault information from the link partner—**Failure** indicates a receive link error. **OK** indicates that the link partner is receiving. **Negotiation error** indicates a negotiation error. **Offline** indicates that the link partner is going offline.
	  ◦ **Link partner speed**—Speed of the link partner.
	• **Local resolution**:
	  ◦ **Flow control**—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), and **Symmetric/Asymmetric** (link partner supports **PAUSE** on both receive and transmit or **PAUSE** only on receive). For asymmetric **PAUSE**, shows if the PAUSE transmit and **PAUSE** receive states on the interface are **enable** or **disable**.
	  ◦ **Remote fault**—Remote fault information. **Link OK** (no error detected on receive), **Offline** (local interface is offline), and **Link Failure** (link error detected on receive).
		extensive

Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Index number of the logical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP interface index number for the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Flags	Information about the logical interface.	All levels

Table 33: show interfaces ge Output Fields *(continued)*

Field Name	Field Description	Level of Output
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received (input) and transmitted (output) on the specified interface.	**detail extensive**
IPv6 transit statistics	If IPv6 statistics tracking is enabled, number of IPv6 bytes and packets received and transmitted on the logical interface.	**extensive**
Local statistics	Number and rate of bytes and packets destined to and from the switch.	**extensive**
Transit statistics	Number and rate of bytes and packets transiting the switch.	**extensive**
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route Table	Route table in which the logical interface address is located. For example, **0** refers to the routing table **inet.0**.	**detail extensive** none
Input Filters	Names of any input filters applied to this interface.	**detail extensive**
Output Filters	Names of any output filters applied to this interface.	**detail extensive**
Flags	Information about protocol family flags. If unicast reverse-path forwarding (RPF) is explicitly configured on the specified interface, the uRPF flag is displayed. If unicast RPF was configured on a different interface (and therefore is enabled on all switch interfaces) but was not explicitly configured on the specified interface, the uRPF flag is not displayed even though unicast RPF is enabled.	**detail extensive**
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the IP address of the interface is also displayed.	**brief**
Flags	Information about the address flags.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none
Broadcast	Broadcast address of the logical interlace.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Sample Output

show interfaces

```
user@switch> show interfaces ge-0/0/9
Physical interface: ge-0/0/9, Enabled, Physical link is Down
  Interface index: 129, SNMP ifIndex: 21
  Link-level type: Ethernet, MTU: 1514, Speed: Unspecified, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled
  Remote fault: Online
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:19:e2:50:3f:41, Hardware address: 00:19:e2:50:3f:41
  Last flapped   : 2008-01-16 11:40:53 UTC (4d 02:30 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Ingress rate at Packet Forwarding Engine      : 0 bps (0 pps)
  Ingress drop rate at Packet Forwarding Engine : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface ge-0/0/9.0 (Index 65) (SNMP ifIndex 22)
    Flags: SNMP-Traps
    Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch
      Flags: None
```

show interfaces brief

```
user@switch> show interfaces ge-0/0/9 brief
Physical interface: ge-0/0/9, Enabled, Physical link is Down
  Description: voice priority and tcp and icmp traffic rate-limiting filter at i
ngress port
  Link-level type: Ethernet, MTU: 1514, Speed: Unspecified, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  Link flags     : None

  Logical interface ge-0/0/9.0
    Flags: Device-Down SNMP-Traps Encapsulation: ENET2
    eth-switch
```

show interfaces detail (Symmetric Flow Control and Autonegotiation Enabled)

```
user@switch> show interfaces ge-0/0/9 detail
Physical interface: ge-0/0/9, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 206, Generation: 196
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, Duplex: Auto,
  BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
```

```
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:30:ff:40, Hardware address: 00:1f:12:30:ff:40
  Last flapped   : 2009-05-05 06:03:05 UTC (00:22:13 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Egress queues: 8 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 assured-forw                   0                    0                    0

    5 expedited-fo                   0                    0                    0

    7 network-cont                   0                    0                    0

  Active alarms  : None
  Active defects : None

  Logical interface ge-0/0/9.0 (Index 65) (SNMP ifIndex 235) (Generation 130)
    Flags: SNMP-Traps Encapsulation: ENET2
    Bandwidth: 0
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Local statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Transit statistics:
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol eth-switch, Generation: 146, Route table: 0
      Flags: Is-Primary
      Input Filters: f1,
      Output Filters: f2,,,,
```

show interfaces detail (Asymmetric Flow Control and Autonegotiation Enabled)

```
user@switch> show interfaces ge-0/0/9 detail
Physical interface: ge-0/0/9, Enabled, Physical link is Up
  Interface index: 193, SNMP ifIndex: 206, Generation: 196
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, Duplex: Auto,
  BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
  Source filtering: Disabled,  Configured-flow-control  tx-buffers: off
rx-buffers: on ,
  Auto-negotiation: Enabled,
```



```
Remote fault: Online
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x0
Link flags     : None
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:1f:12:30:ff:40, Hardware address: 00:1f:12:30:ff:40
Last flapped   : 2009-05-05 06:03:05 UTC (00:22:13 ago)
Statistics last cleared: Never
Traffic statistics:
 Input  bytes  :                    0                   0 bps
 Output bytes  :                    0                   0 bps
 Input  packets:                    0                   0 pps
 Output packets:                    0                   0 pps
 IPv6 transit statistics:
  Input  bytes  :                   0
  Output bytes  :                   0
  Input  packets:                   0
  Output packets:                   0
Egress queues: 8 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                    0                    0                    0

  1 assured-forw                   0                    0                    0

  5 expedited-fo                   0                    0                    0

  7 network-cont                   0                    0                    0

Active alarms  : None
Active defects : None

Logical interface ge-0/0/9.0 (Index 65) (SNMP ifIndex 235) (Generation 130)
  Flags: SNMP-Traps Encapsulation: ENET2
  Bandwidth: 0
  Traffic statistics:
   Input  bytes  :                  0
   Output bytes  :                  0
   Input  packets:                  0
   Output packets:                  0
  Local statistics:
   Input  bytes  :                  0
   Output bytes  :                  0
   Input  packets:                  0
   Output packets:                  0
  Transit statistics:
   Input  bytes  :                  0                   0 bps
   Output bytes  :                  0                   0 bps
   Input  packets:                  0                   0 pps
   Output packets:                  0                   0 pps
  Protocol eth-switch, Generation: 146, Route table: 0
    Flags: Is-Primary
    Input Filters: f1,
    Output Filters: f2,,,,
```

show interfaces extensive (Symmetric Flow Control and Autonegotiation Enabled)

```
user@switch> show interfaces ge-0/0/12 extensive
interface: ge-0/0/12, Enabled, Physical link is Down
  Interface index: 49164, SNMP ifIndex: 574, Generation: 142
```

```
Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Duplex: Full-Duplex,
BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
Remote fault: Online
Device flags   : Present Running Down
Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
Link flags     : None
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:22:83:2a:d8:dc, Hardware address: 00:22:83:2a:d8:dc
Last flapped   : 2011-02-25 00:45:03 UTC (22:42:48 ago)
Statistics last cleared: Never
Traffic statistics:
 Input  bytes  :                   0                    0 bps
 Output bytes  :                   0                    0 bps
 Input  packets:                   0                    0 pps
 Output packets:                   0                    0 pps
 IPv6 transit statistics:
  Input  bytes  :                  0
  Output bytes  :                  0
  Input  packets:                  0
  Output packets:                  0
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  FIFO errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,

  FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Egress queues: 8 supported, 8 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort                   0                    0                    0

  2 no-loss                       0                    0                    0

  3 fcoe                          0                    0                    0

  7 network-cont                  0                    0                    0

Queue number:         Mapped forwarding classes
  0                   best-effort
  2                   no-loss
  3                   fcoe
  7                   network-control
Active alarms  : LINK
Active defects : LINK
MAC statistics:                      Receive         Transmit
  Total octets                             0                0
  Total packets                            0                0
  Unicast packets                          0                0
  Broadcast packets                        0                0
  Multicast packets                        0                0
  CRC/Align errors                         0                0
  FIFO errors                              0                0
  MAC control frames                       0                0
  MAC pause frames                         0                0
  Oversized frames                         0
  Jabber frames                            0
  Fragment frames                          0
```



```
    VLAN tagged frames                     0
    Code violations                        0
  MAC Priority Flow Control Statistics:
    Priority :  0                           0                 0
    Priority :  1                           0                 0
    Priority :  2                           0                 0
    Priority :  3                           0                 0
    Priority :  4                           0                 0
    Priority :  5                           0                 0
    Priority :  6                           0                 0
    Priority :  7                           0                 0
  Filter statistics:
    Input packet count                     0
    Input packet rejects                   0
    Input DA rejects                       0
    Input SA rejects                       0
    Output packet count                                      0
    Output packet pad count                                  0
    Output packet error count                                0
    CAM destination filters: 1, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Incomplete
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %            usec
    0 best-effort            75      750000000    75               0       low
none
    7 network-control         5       50000000     5               0       low
none
    8 mcast-be               15      150000000    15               0       low
none
    11 mcast-nc               5       50000000     5               0       low
none
```

show interfaces extensive (Asymmetric Flow Control and Autonegotiation Enabled)

```
user@switch> show interfaces ge-0/0/12 extensive
interface: ge-0/0/12, Enabled, Physical link is Down
  Interface index: 49164, SNMP ifIndex: 574, Generation: 142
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Duplex: Full-Duplex,
  BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
  Source filtering: Disabled,  Configured-flow-control  tx-buffers: off
rx-buffers: on
  Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:22:83:2a:d8:dc, Hardware address: 00:22:83:2a:d8:dc
  Last flapped   : 2011-02-25 00:45:03 UTC (22:42:48 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 0                    0 bps
   Output bytes  :                 0                    0 bps
   Input  packets:                 0                    0 pps
```

```
     Output packets:                 0                    0 pps
     IPv6 transit statistics:
      Input  bytes  :                0
      Output bytes  :                0
      Input  packets:                0
      Output packets:                0
    Input errors:
      Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
      L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
      FIFO errors: 0, Resource errors: 0
    Output errors:
      Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,

      FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
    Egress queues: 8 supported, 8 in use
    Queue counters:       Queued packets  Transmitted packets      Dropped packets

      0 best-effort                    0                    0                    0

      2 no-loss                        0                    0                    0

      3 fcoe                           0                    0                    0

      7 network-cont                   0                    0                    0

    Queue number:         Mapped forwarding classes
      0                   best-effort
      2                   no-loss
      3                   fcoe
      7                   network-control
    Active alarms  : LINK
    Active defects : LINK
    MAC statistics:                      Receive         Transmit
      Total octets                             0                0
      Total packets                            0                0
      Unicast packets                          0                0
      Broadcast packets                        0                0
      Multicast packets                        0                0
      CRC/Align errors                         0                0
      FIFO errors                              0                0
      MAC control frames                       0                0
      MAC pause frames                         0                0
      Oversized frames                         0
      Jabber frames                            0
      Fragment frames                          0
      VLAN tagged frames                       0
      Code violations                          0
    MAC Priority Flow Control Statistics:
      Priority :  0                             0                0
      Priority :  1                             0                0
      Priority :  2                             0                0
      Priority :  3                             0                0
      Priority :  4                             0                0
      Priority :  5                             0                0
      Priority :  6                             0                0
      Priority :  7                             0                0
    Filter statistics:
      Input packet count                       0
      Input packet rejects                     0
      Input DA rejects                         0
      Input SA rejects                         0
```



```
    Output packet count                                     0
    Output packet pad count                                 0
    Output packet error count                               0
    CAM destination filters: 1, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Complete
    Link Partner:
      Link mode: Full-duplex, Flow control: None, Remote fault: OK,
      Link partner Speed: 1000 Mbps
    Local resolution:
      Flow control: enable  PAUSE transmit and Disable PAUSE receive, Remote
fault: Link OK
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %            usec
    0 best-effort            75      750000000    75               0       low
none
    7 network-control         5       50000000     5               0       low
none
    8 mcast-be               15      150000000    15               0       low
none
    11 mcast-nc               5       50000000     5               0       low
none
```

show interfaces terse

user@switch> **show interfaces ge-0/0/12 terse**

```
Interface               Admin Link Proto    Local                 Remote
ge-0/0/12               up    up
```

show interfaces terse (QFabric Systems)

user@switch> **show interfaces node1:ge-0/0/0 terse**

```
Physical interface: node1:ge-0/0/0, Enabled, Physical link is Down
  Interface index: 129, SNMP ifIndex: 2884086
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
  Interface flags: Internal: 0x4000
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 02:00:09:03:00:00, Hardware address: 02:00:09:03:00:00
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
```

show interfaces (GRE)

Syntax

show interfaces *interface-type*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 12.1 for EX Series switches.
Statement introduced in Junos OS Release 13.2 for the QFX Series.

Description

Display status information about the specified generic routing encapsulation (GRE) interface.

Options

interface-type—On M Series and T Series routers and EX Series switches, the interface type is **gr-*fpc/pic/port***. On J Series routers, the interface type is **gr-*pim*/0/*port***.

brief | detail | extensive | terse—(Optional) Display the specified output level of interface information.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

NOTE: You can configure generic routing encapsulation (GRE) interfaces (gre-x/y/z) only for GMPLS control channels. GRE interfaces are not supported or configurable for other applications. For more information about GMPLS, see the *Junos OS MPLS Applications Library for Routing Devices* and the *Junos OS, Release 13.2*.

Required Privilege Level

view

List of Sample Output

show interfaces (GRE) on page 250
show interfaces brief (GRE) on page 250
show interfaces detail (GRE) on page 250
show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch on page 251
show interfaces extensive (GRE) on page 252

Output Fields

Table 34 on page 247 lists the output fields for the **show interfaces** (GRE) command. Output fields are listed in the approximate order in which they appear.

Table 34: GRE show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Type	Type of interface.	All levels
Link-level type	Encapsulation used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Speed	Speed at which the interface is running.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Device Flags	Information about the physical device. Possible values are described in the “Device Flags” section under *Common Output Fields Description*.	All levels
Interface Flags	Information about the interface. Possible values are described in the “Interface Flags” section under *Common Output Fields Description*.	All levels
Input rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Traffic statistics	The number of and the rate at which input and output bytes and packets are received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	**detail extensive** none

Table 34: GRE show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
SNMP ifIndex	Logical interface SNMP interface index number.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support.	**detail extensive**
Flags	Information about the logical interface. Possible values listed in the “Logical Interface Flags” section under *Common Output Fields Description*. describe general information about the logical interface. GRE-specific information about the logical interface is indicated by the presence or absence of the following value in this field: • **Reassemble-Pkts**—If the **Flags** field includes this string, the GRE tunnel is configured to reassemble tunnel packets that were fragmented after tunnel encapsulation.	All levels
IP-Header	IP header of the logical interface. If the **tunnel key** statement is configured, this information is included in the **IP Header** entry. GRE-specific information about the logical interface is indicated by the presence or absence of the following value in this field: • **df**—If the **IP-Header** field includes this string immediately following the 16 bits of identification information (that is, if **:df:** displays after the twelfth byte), the GRE tunnel is configured to allow fragmentation of GRE packets after encapsulation.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Copy-tos-to-outer-ip-header	Status of type of service (ToS) bits in the GRE packet header: • **On**—ToS bits were copied from the payload packet header into the header of the IP packet sent through the GRE tunnel. • **Off**—ToS bits were not copied from the payload packet header and are set to 0 in the GRE packet header. NOTE: EX Series switches do not support copying ToS bits to the encapsulated packet, so the value of this field is always **Off** in switch output.	**detail extensive**
Gre keepalives configured	Indicates whether a GRE keepalive time and hold time are configured for the GRE tunnel. NOTE: EX Series switches do not support configuration of GRE tunnel keepalive times and hold times, so the value of this field is always **Off** in switch output.	**detail extensive**
Gre keepalives adjacency state	Status of the other end of the GRE tunnel: **Up** or **Down**. If keepalive messages are not received by either end of the GRE tunnel within the hold-time period, the GRE keepalive adjacency state is down even when the GRE tunnel is up.	**detail extensive**
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified

Table 34: GRE show interfaces Output Fields *(continued)*

Field Name	Field Description	Level of Output
Traffic statistics	Rate of bytes and packets received and transmitted on the logical interface. These statistics are the sum of the local and transit statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize. • **Input rate**—Rate of bits and packets received on the interface. • **Output rate**—Rate of bits and packets transmitted on the interface.	**detail extensive**
Local statistics	Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	**detail extensive**
Transit statistics	Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	**detail extensive** none
Protocol	Protocol family configured on the logical interface, such as **iso**, **inet6**, or **mpls**.	**detail extensive none**
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the IP address of the interface is also displayed.	**brief**
MTU	MTU size on the logical interface.	**detail extensive none**
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route table	Routing table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive**
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under *Common Output Fields Description*.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under *Common Output Fields Description*.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none
Broadcast	Broadcast address of the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Sample Output

show interfaces (GRE)

```
user@host> show interfaces gr-1/2/0
Physical interface: gr-0/0/0, Enabled, Physical link is Up
  Interface index: 132, SNMP ifIndex: 26
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 800mbps
  Device flags    : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface gr-0/0/0.0 (Index 68) (SNMP ifIndex 47)
    Flags: Point-To-Point SNMP-Traps 16384
    IP-Header 1.1.1.2:1.1.1.1:47:df:64:0000000000000000 Encapsulation: GRE-NULL
  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1476
      Flags: None
      Addresses, Flags: Is-Primary
        Local: 1.10.1.1
```

show interfaces brief (GRE)

```
user@host> show interfaces gr-1/2/0 brief
Physical interface: gr-1/2/0, Enabled, Physical link is Up
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 800mbps
  Device flags    : Present Running
  Interface flags: Point-To-Point SNMP-Traps

  Logical interface gr-1/2/0.0
    Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000
    IP-Header 10.10.0.2:10.10.0.1:47:df:64:0000000000000000
    Encapsulation: GRE-NULL
    inet  10.100.0.1/30
    mpls
```

show interfaces detail (GRE)

```
user@host> show interfaces gr-1/2/0 detail
Physical interface: gr-0/0/0, Enabled, Physical link is Up
  Interface index: 132, SNMP ifIndex: 26, Generation: 13
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 800mbps
  Hold-times     : Up 0 ms, Down 0 ms
  Device flags    : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                   0                    0 bps
   Output bytes  :                   0                    0 bps
   Input  packets:                   0                    0 pps
   Output packets:                   0                    0 pps

  Logical interface gr-0/0/0.0 (Index 68) (SNMP ifIndex 47) (Generation 8)
    Flags: Point-To-Point SNMP-Traps 16384
    IP-Header 1.1.1.2:1.1.1.1:47:df:64:0000000000000000 Encapsulation: GRE-NULL
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
```



```
      Output packets:                   0
     Local statistics:
      Input  bytes  :                   0
      Output bytes  :                   0
      Input  packets:                   0
      Output packets:                   0
     Transit statistics:
      Input  bytes  :                   0                    0 bps
      Output bytes  :                   0                    0 bps
      Input  packets:                   0                    0 pps
      Output packets:                   0                    0 pps
     Protocol inet, MTU: 1476, Generation: 12, Route table: 0
       Flags: None
       Addresses, Flags: Is-Primary
         Destination: Unspecified, Local: 1.10.1.1, Broadcast: Unspecified,
         Generation: 15
```

show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch

```
user@switch> show interfaces gr-2/0/15 detail
Physical interface: gr-2/0/15, Enabled, Physical link is Up
  Interface index: 195, SNMP ifIndex: 846, Generation: 198
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 1000mbps
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:38:0f:d2, Hardware address: 00:1f:12:38:0f:d2
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Statistics last cleared: 2011-09-14 17:43:15 UTC (00:00:18 ago)
  Traffic statistics:
   Input  bytes  :             5600636                    0 bps
   Output bytes  :             5600636                    0 bps
   Input  packets:               20007                    0 pps
   Output packets:               20007                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0

  Logical interface gr-2/0/15.0 (Index 75) (SNMP ifIndex 847) (HW Token 4093)
  (Generation 140)
    Flags: Point-To-Point SNMP-Traps 0x0
    IP-Header 180.20.30.2:180.20.20.3:47:df:64:0000000000000000
    Encapsulation: GRE-NULL
    Copy-tos-to-outer-ip-header: Off
    Gre keepalives configured: Off, Gre keepalives adjacency state: down
    Traffic statistics:
     Input  bytes  :             5600886
     Output bytes  :             2881784
     Input  packets:               20010
     Output packets:               10018
    Local statistics:
     Input  bytes  :                 398
     Output bytes  :                 264
     Input  packets:                   5
     Output packets:                   3
    Transit statistics:
     Input  bytes  :             5600488                    0 bps
     Output bytes  :             2881520                    0 bps
     Input  packets:               20005                    0 pps
     Output packets:               10015                    0 pps
```



```
  Protocol inet, Generation: 159, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 90.90.90/24, Local: 90.90.90.10, Broadcast: 90.90.90.255,
      Generation: 144

Logical interface gr-2/0/15.1 (Index 80) (SNMP ifIndex 848) (HW Token 4088)
(Generation 150)
  Flags: Point-To-Point SNMP-Traps 0x0
  IP-Header 160.20.40.2:160.20.30.1:47:df:64:0000000000000000
  Encapsulation: GRE-NULL
  Copy-tos-to-outer-ip-header: Off
  Gre keepalives configured: Off, Gre keepalives adjacency state: down
  Traffic statistics:
   Input  bytes  :                 260
   Output bytes  :             2880148
   Input  packets:                   4
   Output packets:               10002
  Local statistics:
   Input  bytes  :                 112
   Output bytes  :                   0
   Input  packets:                   2
   Output packets:                   0
  Transit statistics:
   Input  bytes  :                 148                    0 bps
   Output bytes  :             2880148                    0 bps
   Input  packets:                   2                    0 pps
   Output packets:               10002                    0 pps
  Protocol inet, Generation: 171, Route table: 0
    Flags: None
    Addresses, Flags: Is-Preferred Is-Primary
      Destination: 70.70.70/24, Local: 70.70.70.10, Broadcast: 70.70.70.255,
      Generation: 160
```

show interfaces extensive (GRE)

The output for the **show interfaces extensive** command is identical to that for the **show interfaces detail** command. For sample output, see show interfaces detail (GRE) on page 250 and show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch on page 251.

show interfaces irb

Syntax

show interfaces irb
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance *instance-name*>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 12.3R2.
Command introduced in Junos OS Release 12.3R2 for EX Series switches.
Command introduced in Junos OS Release 13.2 for the QFX Series

Description

Display integrated routing and bridging interfaces information.

Options

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

routing-instance *instance-name*—(Optional) Display information for the interface with the specified SNMP index.

snmp-index *snmp-index*—(Optional) Display information for the interface with the specified SNMP index.

statistics—(Optional) Display static interface statistics.

Additional Information

Integrated routing and bridging (IRB) provides simultaneous support for Layer 2 bridging and Layer 3 IP routing on the same interface. IRB enables you to route local packets to another routed interface or to another VLAN that has a Layer 3 protocol configured.

Required Privilege Level

view

List of Sample Output

show interfaces irb extensive on page 257
show interfaces irb snmp-index on page 258

Output Fields

Table 35 on page 253 lists the output fields for the **show interfaces irb** command. Output fields are listed in the approximate order in which they appear.

Table 35: show interfaces irb Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the physical interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.	All levels

Table 35: show interfaces irb Output Fields *(continued)*

Field Name	Field Description	Level of Output
Proto	Protocol configured on the interface.	**terse**
Interface index	Physical interface index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Type	Physical interface type.	**detail extensive** none
Link-level type	Encapsulation being used on the physical interface.	**detail extensive brief** none
MTU	MTU size on the physical interface.	**detail extensive brief** none
Clocking	Reference clock source: **Internal** or **External**. Always unspecified on IRB interfaces.	**detail extensive brief**
Speed	Speed at which the interface is running. Always unspecified on IRB interfaces.	**detail extensive brief**
Device flags	Information about the physical device. Possible values are described in the "Device Flags" section under *Common Output Fields Description*.	**detail extensive brief** none
Interface flags	Information about the interface. Possible values are described in the "Interface Flags" section under *Common Output Fields Description*.	**detail extensive brief** none
Link type	Physical interface link type: **full duplex** or **half duplex**.	**detail extensive** none
Link flags	Information about the link. Possible values are described in the "Links Flags" section under *Common Output Fields Description*.	**detail extensive** none
Physical Info	Physical interface information.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Current address	Configured MAC address.	**detail extensive** none
Hardware address	MAC address of the hardware.	**detail extensive** none
Alternate link address	Backup address of the link.	**detail extensive**
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped: year-month-day hours:minutes:seconds timezone (hours:minutes:seconds ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)**.	**detail extensive** none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**

Table 35: show interfaces irb Output Fields *(continued)*

Field Name	Field Description	Level of Output
Traffic statistics	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
IPv6 transit statistics	Number of IPv6 transit bytes and packets received and transmitted on the physical interface if IPv6 statistics tracking is enabled. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
Input errors	Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Giants**—Number of frames received that are larger than the giant threshold. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • **Resource errors**—Sum of transmit drops.	**detail extensive**
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the DPC is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**detail extensive**
Logical Interface		

Table 35: show interfaces irb Output Fields *(continued)*

Field Name	Field Description	Level of Output
Logical interface	Name of the logical interface.	All levels
Index	Index number of the logical interface (which reflects its initialization sequence).	**detail extensive** none
SNMP ifIndex	SNMP interface index number of the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Flags	Information about the logical interface. Possible values are described in the "Logical Interface Flags" section under *Common Output Fields Description*.	**detail extensive**
Encapsulation	Encapsulation on the logical interface.	**detail extensive**
Bandwidth	Speed at which the interface is running.	**detail extensive**
Routing Instance	Routing instance IRB is configured under.	**detail extensive**
Bridging Domain	Bridging domain IRB is participating in.	**detail extensive**
Traffic statistics	Number and rate of bytes and packets received and transmitted on the logical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
IPv6 transit statistics	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface.	**detail extensive**
Local statistics	Statistics for traffic received from and transmitted to the Routing Engine.	**detail extensive**
Transit statistics	Statistics for traffic transiting the router.	**detail extensive**
Protocol	Protocol family configured on the local interface. Possible values are described in the "Protocol Field" section under *Common Output Fields Description*.	**detail extensive**
MTU	Maximum transmission unit size on the logical interface.	**detail extensive**
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	**detail extensive** none

Table 35: show interfaces irb Output Fields *(continued)*

Field Name	Field Description	Level of Output
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route table	Routing table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive**
Addresses, Flags	Information about address flags. Possible values are described in the "Addresses Flags" section under *Common Output Fields Description*.	**detail extensive**
Policer	The policer that is to be evaluated when packets are received or transmitted on the interface.	**detail extensive**
Flags	Information about the logical interface. Possible values are described in the "Logical Interface Flags" section under *Common Output Fields Description*.	**detail extensive**

Sample Output

show interfaces irb extensive

```
user@host> show interfaces irb extensive
Physical interface: irb, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 23, Generation: 130
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 02:00:00:00:00:30, Hardware address: 02:00:00:00:00:30
  Alternate link address: Unspecified
  Last flapped   : Never
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                     0
   Output bytes  :                     0
   Input  packets:                     0
   Output packets:                     0
   IPv6 transit statistics:
    Input  bytes  :                    0
    Output bytes  :                    0
    Input  packets:                    0
    Output packets:                    0
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
 0, Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, MTU errors: 0, Resource errors:
 0

  Logical interface irb.0 (Index 68) (SNMP ifIndex 70) (Generation 143)
    Flags: Hardware-Down SNMP-Traps 0x4000 Encapsulation: ENET2
    Bandwidth: 1000mbps
    Routing Instance: customer_0 Bridging Domain: bd0
```



```
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
      Output packets:                  0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                   0                    0 pps
     Output packets:                   0                    0 pps
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
      Output packets:                  0
    Protocol inet, MTU: 1500, Generation: 154, Route table: 0
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.51.1/24, Local: 10.51.1.2, Broadcast: 10.51.1.255,
        Generation: 155
    Protocol multiservice, MTU: 1500, Generation: 155, Route table: 0
      Flags: Is-Primary
      Policer: Input: __default_arp_policer
```

show interfaces irb snmp-index

```
user@host> show interfaces irb snmp-index 25
Physical interface: irb, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 25
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
  Current address: 02:00:00:00:00:30, Hardware address: 02:00:00:00:00:30
  Last flapped   : Never
    Input packets : 0
    Output packets: 0

  Logical interface irb.0 (Index 68) (SNMP ifIndex 70)
    Flags: Hardware-Down SNMP-Traps 0x4000 Encapsulation: ENET2
    Bandwidth: 1000mbps
    Routing Instance: customer_0 Bridging Domain: bd0
    Input packets : 0
    Output packets: 0
    Protocol inet, MTU: 1500
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.51.1/24, Local: 10.51.1.2, Broadcast: 10.51.1.255
    Protocol multiservice, MTU: 1500
      Flags: Is-Primary
```

show interfaces queue

Syntax

show interfaces queue
<aggregate | remaining-traffic>
<both-ingress-egress>
<egress>
<forwarding-class *forwarding-class*>
<ingress>
<interface-name *interface-name*>
<l2-statistics>

Release Information

Command introduced before Junos OS Release 7.4.
both-ingress-egress, **egress**, and **ingress** options introduced in Junos OS Release 7.6.
Command introduced in Junos OS Release 11.1 for the QFX Series.
l2-statistics option introduced in Junos OS Release 12.1.

Description

Display class-of-service (CoS) queue information for physical interfaces.

Options

none—Show detailed CoS queue statistics for all physical interfaces.

aggregate—(Optional) Display the aggregated queuing statistics of all logical interfaces that have traffic-control profiles configured. (Not on the QFX Series.)

both-ingress-egress—(Optional) On Gigabit Ethernet Intelligent Queuing 2 (IQ2) PICs, display both ingress and egress queue statistics. (Not on the QFX Series.)

egress—(Optional) Display egress queue statistics.

forwarding-class *forwarding-class*—(Optional) Forwarding class name for this queue. Shows detailed CoS statistics for the queue associated with the specified forwarding class.

ingress—(Optional) On Gigabit Ethernet IQ2 PICs, display ingress queue statistics. (Not on the QFX Series.)

interface-name *interface-name*—(Optional) Show detailed CoS queue statistics for the specified interface.

l2-statistics—(Optional) Display Layer 2 statistics for MLPPP, FRF.15, and FRF.16 bundles

remaining-traffic—(Optional) Display the remaining-traffic queue statistics of all logical interfaces that have traffic-control profiles configured.

Overhead for Layer 2 Statistics

Transmitted packets and transmitted byte counts are displayed for the Layer 2 level with the addition of encapsulation overheads applied for fragmentation, as shown in Table 36 on page 260. Others counters, such as packets and bytes queued (input) and drop counters, are displayed at the Layer 3 level. In the case of link fragmentation and interleaving (LFI) for which fragmentation is not applied, corresponding Layer 2 overheads are added, as shown in Table 36 on page 260.

Table 36: Layer 2 Overhead, Transmitted Packets/Bytes

Protocol	Fragmentation		LFI
	First fragmentation	Second to n fragmentations	
	Bytes	Bytes	
MLPPP (Long)	13	12	8
MLPPP (short)	11	10	8
MLFR (FRF15)	12	10	8
MFR (FRF16)	10	8	-
MCMLPPP(Long)	13	12	-
MCMLPPP(Short)	11	10	-

Layer 2 Statistics - Fragmentation Overhead Calculation

```
MLPPP/MC-MLPPP Overhead details:
   ===============================
   Fragment 1:

    Outer PPP header                          : 4 bytes
    Long or short sequence MLPPP header       : 4 bytes or 2 bytes
    Inner PPP header                          : 1 byte
    HDLC flag and FCS bytes                   : 4 bytes

   Fragments 2 .. n :

    Outer PPP header                          : 4 bytes
    Long or short sequence MLPPP header       : 4 bytes or 2 bytes
    HDLC flag and FCS bytes                   : 4 bytes


   MLFR (FRF15) Overhead details:
   =============================
   Fragment 1:
       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       Fragmentaion header   :  2 bytes
       Inner proto           :  2 bytes
       HDLC flag and  FCS    :  4 bytes

   Fragments 2 ...n :

       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       Fragmentaion header   :  2 bytes
       HDLC flag and  FCS    :  4 bytes


   MFR (FRF16) Overhead details:
   ==============================
```



```
   Fragment 1:
      Fragmentaion header   :  2 bytes
      Framerelay header     :  2 bytes
      Inner proto           :  2 bytes
      HDLC flag and  FCS    :  4 bytes

   Fragments 2 ...n :
      Fragmentaion header   :  2 bytes
      Framerelay header     :  2 bytes
      HDLC flag and  FCS    :  4 bytes
```

Overhead with LFI

```
MLPPP(Long & short sequence):
   ============================
       Outer PPP header      :  4 bytes
       HDLC flag and  FCS    :  4 bytes

  MLFR (FRF15):
  =============
       Framerelay header     :  2 bytes
       Control,NLPID         :  2 bytes
       HDLC flag and  FCS    :  4 bytes
```

The following examples show overhead for different cases:

- A 1000-byte packet is sent to a mlppp bundle without any fragmentation. At the Layer 2 level, bytes transmitted is 1013 in 1 packet. This overhead is for MLPPP long sequence encap.
- A 1000-byte packet is sent to a mlppp bundle with a fragment threshold of 250byte. At the Layer 2 level, bytes transmitted is 1061 bytes in 5 packets.
- A 1000-byte LFI packet is sent to an mlppp bundle. At the Layer 2 level, bytes transmitted is 1008 in 1 packet.

remaining-traffic—(Optional) Display the queuing statistics of all logical interfaces that do not have traffic-control profiles configured. (Not on the QFX Series.)

Additional Information

For rate-limited interfaces hosted on Modular Interface Cards (MICs) or Modular Port Concentrators (MPCs), rate-limit packet-drop operations occur *before* packets are queued for transmission scheduling. For such interfaces, the statistics for queued traffic do not include the packets that have already been dropped due to rate limiting, and consequently the displayed statistics for queued traffic are the same as the displayed statistics for transmitted traffic.

NOTE: For rate-limited interfaces hosted on other types of hardware, rate-limit packet-drop operations occur *after* packets are queued for transmission scheduling. For these other interface types, the statistics for queued traffic include the packets that are later dropped due to rate limiting, and consequently the displayed statistics for queued traffic equals the sum of the statistics for transmitted and rate-limited traffic.

On M Series routers (except for the M320 and M120 routers), this command is valid only for a PIC installed on an enhanced Flexible PIC Concentrator (FPC).

Queue statistics for aggregated interfaces are supported on the M Series and T Series routers only. Statistics for an aggregated interface are the summation of the queue statistics of the child links of that aggregated interface. You can view the statistics for a child interface by using the **show interfaces statistics** command for that child interface.

When you configure tricolor marking on a 10-port 1-Gigabit Ethernet PIC, for queues 6 and 7 only, the output does not display the number of queued bytes and packets, or the number of bytes and packets dropped because of RED. If you do not configure tricolor marking on the interface, these statistics are available for all queues.

For the 4-port Channelized OC12 IQE PIC and 1-port Channelized OC48 IQE PIC, the **Packet Forwarding Engine Chassis Queues** field represents traffic bound for a particular physical interface on the PIC. For all other PICs, the **Packet Forwarding Engine Chassis Queues** field represents the total traffic bound for the PIC.

For Gigabit Ethernet IQ2 PICs, the **show interfaces queue** command output does not display the number of tail-dropped packets. This limitation does not apply to Packet Forwarding Engine chassis queues.

When fragmentation occurs on the egress interface, the first set of packet counters shows the postfragmentation values. The second set of packet counters (under the **Packet Forwarding Engine Chassis Queues** field) shows the prefragmentation values.

The behavior of the **egress** queues for the **Routing Engine-Generated Traffic** is not same as the configured queue for MLPPP and MFR configurations.

For information about how to configure CoS, see the *Junos OS Network Interfaces Library for Routing Devices*. For related CoS operational mode commands, see the CLI Explorer.

Required Privilege Level view

List of Sample Output

Output Fields Table 37 on page 263 lists the output fields for the **show interfaces queue** command. Output fields are listed in the approximate order in which they appear.

Table 37: show interfaces queue Output Fields

Field Name	Field Description
Physical interface	Name of the physical interface.
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.
Interface index	Physical interface's index number, which reflects its initialization sequence.
SNMP ifIndex	SNMP index number for the interface.
Forwarding classes supported	Total number of forwarding classes supported on the specified interface.
Forwarding classes in use	Total number of forwarding classes in use on the specified interface.
Ingress queues supported	On Gigabit Ethernet IQ2 PICs only, total number of ingress queues supported on the specified interface.
Ingress queues in use	On Gigabit Ethernet IQ2 PICs only, total number of ingress queues in use on the specified interface.
Output queues supported	Total number of output queues supported on the specified interface.
Output queues in use	Total number of output queues in use on the specified interface.
Egress queues supported	Total number of egress queues supported on the specified interface.
Egress queues in use	Total number of egress queues in use on the specified interface.
Queue counters (Ingress)	CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.
Burst size	(Logical interfaces on IQ PICs only) Maximum number of bytes up to which the logical interface can burst. The burst size is based on the shaping rate applied to the interface.
The following output fields are applicable to both interface component and Packet Forwarding component in the **show interfaces queue** command:	
Queue	Queue number.
Forwarding classes	Forwarding class name.

Table 37: show interfaces queue Output Fields *(continued)*

Field Name	Field Description
Queued Packets	Number of packets queued to this queue. NOTE: For Gigabit Ethernet IQ2 interfaces, the Queued Packets count is calculated by the Junos OS interpreting one frame buffer as one packet. If the queued packets are very large or very small, the calculation might not be completely accurate for transit traffic. The count is completely accurate for traffic terminated on the router. For rate-limited interfaces hosted on MICs or MPCs only, this statistic does not include traffic dropped due to rate limiting. For more information, see "Additional Information" on page 261.
Queued Bytes	Number of bytes queued to this queue. The byte counts vary by interface hardware. For more information, see Table 38 on page 266. For rate-limited interfaces hosted on MICs or MPCs only, this statistic does not include traffic dropped due to rate limiting. For more information, see "Additional Information" on page 261.
Transmitted Packets	Number of packets transmitted by this queue. When fragmentation occurs on the egress interface, the first set of packet counters shows the postfragmentation values. The second set of packet counters (displayed under the **Packet Forwarding Engine Chassis Queues** field) shows the prefragmentation values. NOTE: For Layer 2 statistics, see "Overhead for Layer 2 Statistics" on page 259
Transmitted Bytes	Number of bytes transmitted by this queue. The byte counts vary by interface hardware. For more information, see Table 38 on page 266. NOTE: On MX Series routers, this number can be inaccurate when you issue the command for a physical interface repeatedly and in quick succession, because the statistics for the child nodes are collected infrequently. Wait ten seconds between successive iterations to avoid this situation. NOTE: For Layer 2 statistics, see "Overhead for Layer 2 Statistics" on page 259
Tail-dropped packets	Number of packets dropped because of tail drop.
RL-dropped packets	Number of packets dropped due to rate limiting. For rate-limited interfaces hosted on MICs or MPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 261.
RL-dropped bytes	Number of bytes dropped due to rate limiting. For rate-limited interfaces hosted on MICs or MPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 261.

Table 37: show interfaces queue Output Fields *(continued)*

Field Name	Field Description

RED-dropped packets	Number of packets dropped because of random early detection (RED).
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, the total number of dropped packets is displayed. On all other M Series routers, the output classifies dropped packets into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP packets dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP packets dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP packets dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP packets dropped because of RED.
	• (J Series routers and MX Series routers with enhanced DPCs, and T Series routers with enhanced FPCs only) The output classifies dropped packets into the following categories:
	  • **Low**—Number of low-loss priority packets dropped because of RED.
	  • **Medium-low**—Number of medium-low loss priority packets dropped because of RED.
	  • **Medium-high**—Number of medium-high loss priority packets dropped because of RED.
	  • **High**—Number of high-loss priority packets dropped because of RED.
	NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.

RED-dropped bytes	Number of bytes dropped because of RED. The byte counts vary by interface hardware. For more information, see Table 38 on page 266.
	• (M Series and T Series routers only) On M320 and M120 routers and the T Series routers, only the total number of dropped bytes is displayed. On all other M Series routers, the output classifies dropped bytes into the following categories:
	  • **Low, non-TCP**—Number of low-loss priority non-TCP bytes dropped because of RED.
	  • **Low, TCP**—Number of low-loss priority TCP bytes dropped because of RED.
	  • **High, non-TCP**—Number of high-loss priority non-TCP bytes dropped because of RED.
	  • **High, TCP**—Number of high-loss priority TCP bytes dropped because of RED.
	• (J Series routers only) The output classifies dropped bytes into the following categories:
	  • **Low**—Number of low-loss priority bytes dropped because of RED.
	  • **Medium-low**—Number of medium-low loss priority bytes dropped because of RED.
	  • **Medium-high**—Number of medium-high loss priority bytes dropped because of RED.
	  • **High**—Number of high-loss priority bytes dropped because of RED.
	NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), this field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.

Byte counts vary by interface hardware. Table 38 on page 266 shows how the byte counts on the outbound interfaces vary depending on the interface hardware. Table 38 on page 266 is based on the assumption that outbound interfaces are sending IP traffic with 478 bytes per packet.

Table 38: Byte Count by Interface Hardware

Interface Hardware	Output Level	Byte Count Includes	Comments
Gigabit Ethernet IQ and IQE PICs	Interface	Queued: 490 bytes per packet, representing 478 bytes of Layer 3 packet + 12 bytes Transmitted: 490 bytes per packet, representing 478 bytes of Layer 3 packet + 12 bytes RED dropped: 496 bytes per packet representing 478 bytes of Layer 3 packet + 18 bytes	The 12 additional bytes include 6 bytes for the destination MAC address + 4 bytes for the VLAN + 2 bytes for the Ethernet type. For RED dropped, 6 bytes are added for the source MAC address.
	Packet forwarding component	Queued: 478 bytes per packet, representing 478 bytes of Layer 3 packet Transmitted: 478 bytes per packet, representing 478 bytes of Layer 3 packet	–
Non-IQ PIC	Interface	T Series, TX Series, T1600, and MX Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet. T4000 routers with Type 5 FPCs : • Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead 8 bytes preamble + 12 bytes Inter frame Gap. • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead 8 bytes preamble + 12 bytes Interframe Gap. M Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead. PTX Series Packet Transport Routers: • Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes FCS + the full Layer 1 overhead of the MAC header DA + SA + EtherType (non-VLAN). • Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including 4 bytes CRC + the full Layer 1 overhead of the MAC header DA + SA + EtherType (non-VLAN). • RED dropped: 478 bytes of Layer 3 packet + 22 bytes special header. To the TQ, this packet has 4 bytes more than queued or transmitted.	The Layer 2 overhead is 14 bytes for non-VLAN traffic and 18 bytes for VLAN traffic.

Table 38: Byte Count by Interface Hardware *(continued)*

Interface Hardware	Output Level	Byte Count Includes	Comments
IQ and IQE PICs with a SONET/SDH interface	Interface	Queued: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes Transmitted: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes RED dropped: 482 bytes per packet, representing 478 bytes of Layer 3 packet + 4 bytes	The additional 4 bytes are for the Layer 2 Point-to-Point Protocol (PPP) header.
	Packet forwarding component	Queued: 478 bytes per packet, representing 478 bytes of Layer 3 packet Transmitted: 486 bytes per packet, representing 478 bytes of Layer 3 packet + 8 bytes	For transmitted packets, the additional 8 bytes includes 4 bytes for the PPP header and 4 bytes for a cookie.
Non-IQ PIC with a SONET/SDH interface	Interface	T Series, TX Series, T1600, and MX Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 478 bytes of Layer 3 packet. M Series routers: • Queued: 478 bytes of Layer 3 packet. • Transmitted: 483 bytes per packet, representing 478 bytes of Layer 3 packet + 5 bytes • RED dropped: 478 bytes per packet, representing 478 bytes of Layer 3 packet	For transmitted packets, the additional 5 bytes includes 4 bytes for the PPP header and 1 byte for the packet loss priority (PLP).
Interfaces configured with Frame Relay Encapsulation	Interface	The default Frame Relay overhead is 7 bytes. If you configure the Frame Check Sequence (FCS) to 4 bytes, then the overhead increases to 10 bytes.	
1-port 10-Gigabit Ethernet IQ2 and IQ2–E PICs 4-port 1G IQ2 and IQ2-E PICs 8-port 1G IQ2 and IQ2-E PICs	Interface	Queued: 478 bytes of Layer 3 packet + the full Layer 2 overhead including CRC. Transmitted: 478 bytes of Layer 3 packet + the full Layer 2 overhead including CRC.	The Layer 2 overhead is 18 bytes for non-VLAN traffic and 22 bytes for VLAN traffic.
	Packet forwarding component	Queued: 478 bytes of Layer 3 packet. Transmitted: 478 bytes of Layer 3 packet.	–

Sample Output

show interfaces queue (Rate-Limited Interface on a Gigabit Ethernet MIC in an MPC)

The following example shows queue information for the rate-limited interface ge-4/2/0 on a Gigabit Ethernet MIC in an MPC. For rate-limited queues for interfaces hosted on MICs or MPCs, rate-limit packet drops occur prior to packet output queuing. In the command output, the nonzero statistics displayed in the **RL-dropped packets** and **RL-dropped bytes** fields quantify the traffic dropped to rate-limit queue 0 output to 10 percent of 1 gigabyte (100 megabits) per second. Because the RL-dropped traffic is not included in the **Queued** statistics, the statistics displayed for queued traffic are the same as the statistics for transmitted traffic.

```
user@host> show interfaces queue ge-4/2/0
Physical interface: ge-4/2/0, Enabled, Physical link is Up
  Interface index: 203, SNMP ifIndex: 1054
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :           131300649                141751 pps
    Bytes                :         11287964840              99793248 bps
  Transmitted:
    Packets              :           131300649                141751 pps
    Bytes                :         11287964840              99793248 bps
    Tail-dropped packets :                   0                     0 pps
    RL-dropped packets   :           205050862                602295 pps
    RL-dropped bytes     :         13595326612             327648832 bps
    RED-dropped packets  :                   0                     0 pps
     Low                 :                   0                     0 pps
     Medium-low          :                   0                     0 pps
     Medium-high         :                   0                     0 pps
     High                :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
     Low                 :                   0                     0 bps
     Medium-low          :                   0                     0 bps
     Medium-high         :                   0                     0 bps
     High                :                   0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
```

show interfaces queue (Aggregated Ethernet on a T320 Router)

The following example shows that the aggregated Ethernet interface, **ae1**, has traffic on queues **af1** and **af12**:

```
user@host> show interfaces queue ae1
Physical interface: ae1, Enabled, Physical link is Up
Interface index: 158, SNMP ifIndex: 33 Forwarding classes: 8 supported, 8 in use
Output queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: be
  Queued:
    Packets              :                   5                     0 pps
    Bytes                :                 242                     0 bps
  Transmitted:
    Packets              :                   5                     0 pps
    Bytes                :                 242                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
Queue: 1, Forwarding classes: af1
  Queued:
    Packets              :            42603765                595484 pps
```



```
    Bytes              :          5453281920           609776496 bps
  Transmitted:
    Packets            :            42603765              595484 pps
    Bytes              :          5453281920           609776496 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 2, Forwarding classes: ef1
  Queued:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
  Transmitted:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 3, Forwarding classes: nc
  Queued:
    Packets            :                  45                   0 pps
    Bytes              :                3930                   0 bps
  Transmitted:
    Packets            :                  45                   0 pps
    Bytes              :                3930                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 4, Forwarding classes: af11
  Queued:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
  Transmitted:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 5, Forwarding classes: ef11
  Queued:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
  Transmitted:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 6, Forwarding classes: af12
  Queued:
    Packets            :            31296413              437436 pps
    Bytes              :          4005940864           447935200 bps
  Transmitted:
    Packets            :            31296413              437436 pps
    Bytes              :          4005940864           447935200 bps
    Tail-dropped packets :                 0                   0 pps
    RED-dropped packets  :                 0                   0 pps
    RED-dropped bytes    :                 0                   0 bps
Queue: 7, Forwarding classes: nc2
  Queued:
    Packets            :                   0                   0 pps
    Bytes              :                   0                   0 bps
```

```
  Transmitted:
    Packets             :                    0                     0 pps
    Bytes               :                    0                     0 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
```

show interfaces queue (Fast Ethernet on a J4300 Router)

```
user@host> show interfaces queue fe-4/0/0.0
Logical interface fe-4/0/0.0 (Index 71) (SNMP ifIndex 42)
Forwarding classes: 8 supported, 8 in use
Output queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: be
  Queued:
    Packets             :              5240762                  3404 pps
    Bytes               :           3020710354              15934544 bps
  Transmitted:
    Packets             :              5240762                  3404 pps
    Bytes               :           3020710354              15934544 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                   0                     0 pps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                    0                     0 pps
Queue: 1, Forwarding classes: af1
  Queued:
    Packets             :              2480391                  1650 pps
    Bytes               :           1304685666               6945704 bps
  Transmitted:
    Packets             :              2478740                  1650 pps
    Bytes               :           1303817240               6945704 bps
    Tail-dropped packets :                   0                     0 pps
    RED-dropped packets  :                1651                     0 pps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :                 1651                     0 pps
    RED-dropped bytes    :              868426                     0 bps
     Low                :                    0                     0 pps
     Medium-low         :                    0                     0 pps
     Medium-high        :                    0                     0 pps
     High               :               868426                     0 pps
```

show interfaces queue (Gigabit Ethernet on a T640 Router)

```
user@host> show interfaces queue
Physical interface: ge-7/0/1, Enabled, Physical link is Up
   Interface index: 150, SNMP ifIndex: 42
 Forwarding classes: 8 supported, 8 in use
 Output queues: 8 supported, 8 in use
 Queue: 0, Forwarding classes: be
   Queued:
```



```
      Packets             :                   13                    0 pps
      Bytes               :                  622                    0 bps
    Transmitted:
      Packets             :                   13                    0 pps
      Bytes               :                  622                    0 bps
      Tail-dropped packets :                   0                    0 pps
      RED-dropped packets  :                   0                    0 pps
      RED-dropped bytes    :                   0                    0 bps
  Queue: 1, Forwarding classes: af1
    Queued:
      Packets             :           1725947945               372178 pps
      Bytes               :         220921336960            381110432 bps
    Transmitted:
      Packets             :           1725947945               372178 pps
      Bytes               :         220921336960            381110432 bps
      Tail-dropped packets :                   0                    0 pps
      RED-dropped packets  :                   0                    0 pps
      RED-dropped bytes    :                   0                    0 bps
  Queue: 2, Forwarding classes: ef1
    Queued:
      Packets             :                    0                    0 pps
      Bytes               :                    0                    0 bps
    Transmitted:
      Packets             :                    0                    0 pps
      Bytes               :                    0                    0 bps
      Tail-dropped packets :                   0                    0 pps
      RED-dropped packets  :                   0                    0 pps
      RED-dropped bytes    :                   0                    0 bps
  Queue: 3, Forwarding classes: nc
    Queued:
      Packets             :                  571                    0 pps
      Bytes               :                49318                  336 bps
    Transmitted:
      Packets             :                  571                    0 pps
      Bytes               :                49318                  336 bps
      Tail-dropped packets :                   0                    0 pps
      RED-dropped packets  :                   0                    0 pps
      RED-dropped bytes    :                   0                    0 bps
```

show interfaces queue aggregate (Gigabit Ethernet Enhanced DPC)

```
user@host> show interfaces queue ge-2/2/9 aggregate
Physical interface: ge-2/2/9, Enabled, Physical link is Up
  Interface index: 238, SNMP ifIndex: 71
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets             :            148450735               947295 pps
    Bytes               :           8016344944            409228848 bps
  Transmitted:
    Packets             :             76397439               487512 pps
    Bytes               :           4125461868            210602376 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :             72053285               459783 pps
     Low                :             72053285               459783 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                    0                    0 pps
    RED-dropped bytes    :           3890877444            198626472 bps
```

```
      Low               :          3890877444            198626472 bps
      Medium-low        :                   0                    0 bps
      Medium-high       :                   0                    0 bps
      High              :                   0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                  0                    0 pps
     Low                :                   0                    0 pps
     Medium-low         :                   0                    0 pps
     Medium-high        :                   0                    0 pps
     High               :                   0                    0 pps
    RED-dropped bytes   :                   0                    0 bps
     Low                :                   0                    0 bps
     Medium-low         :                   0                    0 bps
     Medium-high        :                   0                    0 bps
     High               :                   0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets             :           410278257               473940 pps
    Bytes               :         22156199518            204742296 bps
  Transmitted:
    Packets             :             4850003                 4033 pps
    Bytes               :           261900162              1742256 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :          405425693               469907 pps
     Low                :           405425693               469907 pps
     Medium-low         :                   0                    0 pps
     Medium-high        :                   0                    0 pps
     High               :                   0                    0 pps
    RED-dropped bytes   :         21892988124            203000040 bps
     Low                :         21892988124            203000040 bps
     Medium-low         :                   0                    0 bps
     Medium-high        :                   0                    0 bps
     High               :                   0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
  Transmitted:
    Packets             :                   0                    0 pps
    Bytes               :                   0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                  0                    0 pps
     Low                :                   0                    0 pps
     Medium-low         :                   0                    0 pps
     Medium-high        :                   0                    0 pps
     High               :                   0                    0 pps
    RED-dropped bytes   :                   0                    0 bps
     Low                :                   0                    0 bps
     Medium-low         :                   0                    0 bps
     Medium-high        :                   0                    0 bps
     High               :                   0                    0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
```



```
  Queued:
    Packets              :            76605230                485376 pps
    Bytes                :          5209211400             264044560 bps
  Transmitted:
    Packets              :            76444631                484336 pps
    Bytes                :          5198235612             263478800 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :              160475                  1040 pps
     Low                 :              160475                  1040 pps
     Medium-low          :                   0                     0 pps
     Medium-high         :                   0                     0 pps
     High                :                   0                     0 pps
    RED-dropped bytes    :            10912300                565760 bps
     Low                 :            10912300                565760 bps
     Medium-low          :                   0                     0 bps
     Medium-high         :                   0                     0 bps
     High                :                   0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
  Transmitted:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                   0                     0 pps
     Low                 :                   0                     0 pps
     Medium-low          :                   0                     0 pps
     Medium-high         :                   0                     0 pps
     High                :                   0                     0 pps
    RED-dropped bytes    :                   0                     0 bps
     Low                 :                   0                     0 bps
     Medium-low          :                   0                     0 bps
     Medium-high         :                   0                     0 bps
     High                :                   0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :             4836136                  3912 pps
    Bytes                :           333402032               2139056 bps
  Transmitted:
    Packets              :             3600866                  1459 pps
    Bytes                :           244858888                793696 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :             1225034                  2450 pps
     Low                 :             1225034                  2450 pps
     Medium-low          :                   0                     0 pps
     Medium-high         :                   0                     0 pps
     High                :                   0                     0 pps
    RED-dropped bytes    :            83302312               1333072 bps
     Low                 :            83302312               1333072 bps
     Medium-low          :                   0                     0 bps
     Medium-high         :                   0                     0 bps
     High                :                   0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
  Transmitted:
    Packets              :                   0                     0 pps
    Bytes                :                   0                     0 bps
    Tail-dropped packets : Not Available
```

```
    RED-dropped packets  :                0                   0 pps
     Low                 :                0                   0 pps
     Medium-low          :                0                   0 pps
     Medium-high         :                0                   0 pps
     High                :                0                   0 pps
    RED-dropped bytes    :                0                   0 bps
     Low                 :                0                   0 bps
     Medium-low          :                0                   0 bps
     Medium-high         :                0                   0 bps
     High                :                0                   0 bps

Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :         77059796              486384 pps
    Bytes                :       3544750624           178989576 bps
  Transmitted:
    Packets              :         77059797              486381 pps
    Bytes                :       3544750670           178988248 bps
    Tail-dropped packets :                0                   0 pps
    RED-dropped packets  :                0                   0 pps
     Low                 :                0                   0 pps
     Medium-low          :                0                   0 pps
     Medium-high         :                0                   0 pps
     High                :                0                   0 pps
    RED-dropped bytes    :                0                   0 bps
     Low                 :                0                   0 bps
     Medium-low          :                0                   0 bps
     Medium-high         :                0                   0 bps
     High                :                0                   0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                0                   0 pps
    Bytes                :                0                   0 bps
  Transmitted:
    Packets              :                0                   0 pps
    Bytes                :                0                   0 bps
    Tail-dropped packets :                0                   0 pps
    RED-dropped packets  :                0                   0 pps
     Low                 :                0                   0 pps
     Medium-low          :                0                   0 pps
     Medium-high         :                0                   0 pps
     High                :                0                   0 pps
    RED-dropped bytes    :                0                   0 bps
     Low                 :                0                   0 bps
     Medium-low          :                0                   0 bps
     Medium-high         :                0                   0 bps
     High                :                0                   0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :          4846580                3934 pps
    Bytes                :        222942680             1447768 bps
  Transmitted:
    Packets              :          4846580                3934 pps
    Bytes                :        222942680             1447768 bps
    Tail-dropped packets :                0                   0 pps
    RED-dropped packets  :                0                   0 pps
     Low                 :                0                   0 pps
     Medium-low          :                0                   0 pps
     Medium-high         :                0                   0 pps
```



```
     High              :                  0                     0 pps
    RED-dropped bytes  :                  0                     0 bps
     Low               :                  0                     0 bps
     Medium-low        :                  0                     0 bps
     Medium-high       :                  0                     0 bps
     High              :                  0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
  Transmitted:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
    Tail-dropped packets :                0                     0 pps
    RED-dropped packets  :                0                     0 pps
     Low               :                  0                     0 pps
     Medium-low        :                  0                     0 pps
     Medium-high       :                  0                     0 pps
     High              :                  0                     0 pps
    RED-dropped bytes  :                  0                     0 bps
     Low               :                  0                     0 bps
     Medium-low        :                  0                     0 bps
     Medium-high       :                  0                     0 bps
     High              :                  0                     0 bps
```

show interfaces queue (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-7/1/3
Physical interface: ge-7/1/3, Enabled, Physical link is Up
  Interface index: 170, SNMP ifIndex: 70 Forwarding classes: 16 supported, 4 in
use Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets            :          418390039                    10 pps
    Bytes              :        38910269752                  7440 bps
  Transmitted:
    Packets            :          418390039                    10 pps
    Bytes              :        38910269752                  7440 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                     0 pps
    RED-dropped bytes  :                  0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
  Transmitted:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                     0 pps
    RED-dropped bytes  :                  0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
  Transmitted:
    Packets            :                  0                     0 pps
    Bytes              :                  0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                     0 pps
```

```
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                 7055                    1 pps
    Bytes                :               451552                  512 bps
  Transmitted:
    Packets              :                 7055                    1 pps
    Bytes                :               451552                  512 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Forwarding classes: 16 supported, 4 in use Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                 1031                    0 pps
    Bytes                :               143292                    0 bps
  Transmitted:
    Packets              :                 1031                    0 pps
    Bytes                :               143292                    0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                77009                   11 pps
    Bytes                :              6894286                 7888 bps
  Transmitted:
    Packets              :                77009                   11 pps
    Bytes                :              6894286                 7888 bps
    Tail-dropped packets : Not Available
    RL-dropped packets   :                    0                    0 pps
    RL-dropped bytes     :                    0                    0 bps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
```



```
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                  1031                     0 pps
    Bytes                :                147328                     0 bps
  Transmitted:
    Packets              :                  1031                     0 pps
    Bytes                :                147328                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
     Low, non-TCP        :                     0                     0 pps
     Low, TCP            :                     0                     0 pps
     High, non-TCP       :                     0                     0 pps
     High, TCP           :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
     Low, non-TCP        :                     0                     0 bps
     Low, TCP            :                     0                     0 bps
     High, non-TCP       :                     0                     0 bps
     High, TCP           :                     0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                 94386                    12 pps
    Bytes                :              13756799                  9568 bps
  Transmitted:
```

```
    Packets              :                94386               12 pps
    Bytes                :             13756799             9568 bps
    Tail-dropped packets :                    0                0 pps
    RED-dropped packets  :                    0                0 pps
     Low, non-TCP        :                    0                0 pps
     Low, TCP            :                    0                0 pps
     High, non-TCP       :                    0                0 pps
     High, TCP           :                    0                0 pps
    RED-dropped bytes    :                    0                0 bps
     Low, non-TCP        :                    0                0 bps
     Low, TCP            :                    0                0 bps
     High, non-TCP       :                    0                0 bps
     High, TCP           :                    0                0 bps
```

show interfaces queue both-ingress-egress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 both-ingress-egress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :                    0                0 bps
  Transmitted:
    Packets              :                  254                0 pps
    Bytes                :                16274                0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                0 pps
    RED-dropped bytes    :                    0                0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                0 bps
  Transmitted:
    Packets              :                    0                0 pps
    Bytes                :                    0                0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                0 pps
    RED-dropped bytes    :                    0                0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                0 bps
  Transmitted:
    Packets              :                    0                0 pps
    Bytes                :                    0                0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                0 pps
    RED-dropped bytes    :                    0                0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                0 bps
  Transmitted:
    Packets              :                    0                0 pps
    Bytes                :                    0                0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                0 pps
```



```
    RED-dropped bytes    :                    0                    0 bps
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    3                    0 pps
    Bytes                :                  126                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :             80564692                    0 pps
    Bytes                :           3383717100                    0 bps
  Transmitted:
    Packets              :             80564692                    0 pps
    Bytes                :           3383717100                    0 bps
    Tail-dropped packets :                    0                    0 pps
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :             80564685                    0 pps
    Bytes                :           3383716770                    0 bps
  Transmitted:
    Packets              :             80564685                    0 pps
```



```
      Bytes                :           3383716770                    0 bps
      Tail-dropped packets :                    0                    0 pps
      RED-dropped packets  :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
  Transmitted:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
      Tail-dropped packets :                    0                    0 pps
      RED-dropped packets  :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
      Packets              :                 9397                    0 pps
      Bytes                :              3809052                  232 bps
  Transmitted:
      Packets              :                 9397                    0 pps
      Bytes                :              3809052                  232 bps
      Tail-dropped packets :                    0                    0 pps
      RED-dropped packets  :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
```

show interfaces queue ingress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 ingress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
      Packets              : Not Available
      Bytes                :                    0                    0 bps
  Transmitted:
      Packets              :                  288                    0 pps
      Bytes                :                18450                    0 bps
      Tail-dropped packets : Not Available
      RED-dropped packets  :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
      Packets              : Not Available
      Bytes                :                    0                    0 bps
  Transmitted:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
      Tail-dropped packets : Not Available
      RED-dropped packets  :                    0                    0 pps
      RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
      Packets              : Not Available
      Bytes                :                    0                    0 bps
  Transmitted:
      Packets              :                    0                    0 pps
      Bytes                :                    0                    0 bps
      Tail-dropped packets : Not Available
```

```
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
```

show interfaces queue egress (Gigabit Ethernet IQ2 PIC)

```
user@host> show interfaces queue ge-6/2/0 egress
Physical interface: ge-6/2/0, Enabled, Physical link is Up
  Interface index: 175, SNMP ifIndex: 121
Forwarding classes: 8 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    3                    0 pps
    Bytes                :                  126                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              : Not Available
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
```



```
Packet Forwarding Engine Chassis Queues:
Queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :             80564692                     0 pps
    Bytes                :           3383717100                     0 bps
  Transmitted:
    Packets              :             80564692                     0 pps
    Bytes                :           3383717100                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :             80564685                     0 pps
    Bytes                :           3383716770                     0 bps
  Transmitted:
    Packets              :             80564685                     0 pps
    Bytes                :           3383716770                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                 9538                     0 pps
    Bytes                :              3819840                     0 bps
  Transmitted:
    Packets              :                 9538                     0 pps
    Bytes                :              3819840                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RED-dropped packets  :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
```

show interfaces queue remaining-traffic (Gigabit Ethernet Enhanced DPC)

```
user@host> show interfaces queue ge-2/2/9 remaining-traffic
Physical interface: ge-2/2/9, Enabled, Physical link is Up
  Interface index: 238, SNMP ifIndex: 71
Forwarding classes: 16 supported, 4 in use
Ingress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :            110208969                472875 pps
    Bytes                :           5951284434             204282000 bps
  Transmitted:
    Packets              :            110208969                472875 pps
    Bytes                :           5951284434             204282000 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
```

```
      Medium-low         :                    0                    0 pps
      Medium-high        :                    0                    0 pps
      High               :                    0                    0 pps
     RED-dropped bytes   :                    0                    0 bps
      Low                :                    0                    0 bps
      Medium-low         :                    0                    0 bps
      Medium-high        :                    0                    0 bps
      High               :                    0                    0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
     Low                 :                    0                    0 pps
     Medium-low          :                    0                    0 pps
     Medium-high         :                    0                    0 pps
     High                :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
     Low                 :                    0                    0 bps
     Medium-low          :                    0                    0 bps
     Medium-high         :                    0                    0 bps
     High                :                    0                    0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
     Low                 :                    0                    0 pps
     Medium-low          :                    0                    0 pps
     Medium-high         :                    0                    0 pps
     High                :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
     Low                 :                    0                    0 bps
     Medium-low          :                    0                    0 bps
     Medium-high         :                    0                    0 bps
     High                :                    0                    0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                    0 pps
     Low                 :                    0                    0 pps
     Medium-low          :                    0                    0 pps
     Medium-high         :                    0                    0 pps
     High                :                    0                    0 pps
    RED-dropped bytes    :                    0                    0 bps
     Low                 :                    0                    0 bps
     Medium-low          :                    0                    0 bps
     Medium-high         :                    0                    0 bps
```

```
     High              :                  0                      0 bps
Forwarding classes: 16 supported, 4 in use
Egress queues: 4 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets            :          109355853                 471736 pps
    Bytes              :         7436199152              256627968 bps
  Transmitted:
    Packets            :          109355852                 471736 pps
    Bytes              :         7436198640              256627968 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                      0 pps
     Low               :                  0                      0 pps
     Medium-low        :                  0                      0 pps
     Medium-high       :                  0                      0 pps
     High              :                  0                      0 pps
    RED-dropped bytes  :                  0                      0 bps
     Low               :                  0                      0 bps
     Medium-low        :                  0                      0 bps
     Medium-high       :                  0                      0 bps
     High              :                  0                      0 bps
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets            :                  0                      0 pps
    Bytes              :                  0                      0 bps
  Transmitted:
    Packets            :                  0                      0 pps
    Bytes              :                  0                      0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                      0 pps
     Low               :                  0                      0 pps
     Medium-low        :                  0                      0 pps
     Medium-high       :                  0                      0 pps
     High              :                  0                      0 pps
    RED-dropped bytes  :                  0                      0 bps
     Low               :                  0                      0 bps
     Medium-low        :                  0                      0 bps
     Medium-high       :                  0                      0 bps
     High              :                  0                      0 bps
Queue: 2, Forwarding classes: assured-forwarding
  Queued:
    Packets            :                  0                      0 pps
    Bytes              :                  0                      0 bps
  Transmitted:
    Packets            :                  0                      0 pps
    Bytes              :                  0                      0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                0                      0 pps
     Low               :                  0                      0 pps
     Medium-low        :                  0                      0 pps
     Medium-high       :                  0                      0 pps
     High              :                  0                      0 pps
    RED-dropped bytes  :                  0                      0 bps
     Low               :                  0                      0 bps
     Medium-low        :                  0                      0 bps
     Medium-high       :                  0                      0 bps
     High              :                  0                      0 bps
Queue: 3, Forwarding classes: network-control
  Queued:
    Packets            :                  0                      0 pps
    Bytes              :                  0                      0 bps
```



```
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets : Not Available
    RED-dropped packets  :                    0                     0 pps
     Low                 :                    0                     0 pps
     Medium-low          :                    0                     0 pps
     Medium-high         :                    0                     0 pps
     High                :                    0                     0 pps
    RED-dropped bytes    :                    0                     0 bps
     Low                 :                    0                     0 bps
     Medium-low          :                    0                     0 bps
     Medium-high         :                    0                     0 bps
     High                :                    0                     0 bps
```

show interfaces queue (Channelized OC12 IQE Type 3 PIC in SONET Mode)

```
user@host> show interfaces queue t3-1/1/0:7
 Physical interface: t3-1/1/0:7, Enabled, Physical link is Up

   Interface index: 192, SNMP ifIndex: 1948

   Description: full T3 interface connect to 6ce13 t3-3/1/0:7 for FR testing -
Lam

 Forwarding classes: 16 supported, 9 in use

 Egress queues: 8 supported, 8 in use

 Queue: 0, Forwarding classes: DEFAULT

   Queued:

     Packets              :               214886                 13449 pps

     Bytes                :              9884756               5164536 bps

   Transmitted:

     Packets              :               214886                 13449 pps

     Bytes                :              9884756               5164536 bps

     Tail-dropped packets :                    0                     0 pps

     RED-dropped packets  :                    0                     0 pps

      Low                 :                    0                     0 pps

      Medium-low          :                    0                     0 pps

      Medium-high         :                    0                     0 pps

      High                :                    0                     0 pps

     RED-dropped bytes    :                    0                     0 bps

      Low                 :                    0                     0 bps

      Medium-low          :                    0                     0 bps
```

```
     Medium-high        :                    0                    0 bps
     High               :                    0                    0 bps
Queue: 1, Forwarding classes: REALTIME
  Queued:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
  Transmitted:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                   0                    0 pps
     Low                :                    0                    0 pps
     Medium-low         :                    0                    0 pps
     Medium-high        :                    0                    0 pps
     High               :                    0                    0 pps
    RED-dropped bytes   :                    0                    0 bps
     Low                :                    0                    0 bps
     Medium-low         :                    0                    0 bps
     Medium-high        :                    0                    0 bps
     High               :                    0                    0 bps
Queue: 2, Forwarding classes: PRIVATE
  Queued:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
  Transmitted:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
    Tail-dropped packets :                   0                    0 pps
    RED-dropped packets  :                   0                    0 pps
     Low                :                    0                    0 pps
```



```
      Medium-low          :                    0                     0 pps
      Medium-high         :                    0                     0 pps
      High                :                    0                     0 pps
     RED-dropped bytes    :                    0                     0 bps
      Low                 :                    0                     0 bps
      Medium-low          :                    0                     0 bps
      Medium-high         :                    0                     0 bps
      High                :                    0                     0 bps
Queue: 3, Forwarding classes: CONTROL
  Queued:
     Packets              :                   60                     0 pps
     Bytes                :                 4560                     0 bps
  Transmitted:
     Packets              :                   60                     0 pps
     Bytes                :                 4560                     0 bps
     Tail-dropped packets :                    0                     0 pps
     RED-dropped packets  :                    0                     0 pps
      Low                 :                    0                     0 pps
      Medium-low          :                    0                     0 pps
      Medium-high         :                    0                     0 pps
      High                :                    0                     0 pps
     RED-dropped bytes    :                    0                     0 bps
      Low                 :                    0                     0 bps
      Medium-low          :                    0                     0 bps
      Medium-high         :                    0                     0 bps
      High                :                    0                     0 bps
Queue: 4, Forwarding classes: CLASS_B_OUTPUT
  Queued:
     Packets              :                    0                     0 pps
     Bytes                :                    0                     0 bps
  Transmitted:
```



```
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
    Tail-dropped packets :                0                    0 pps
    RED-dropped packets  :                0                    0 pps
     Low                :                 0                    0 pps
     Medium-low         :                 0                    0 pps
     Medium-high        :                 0                    0 pps
     High               :                 0                    0 pps
    RED-dropped bytes   :                 0                    0 bps
     Low                :                 0                    0 bps
     Medium-low         :                 0                    0 bps
     Medium-high        :                 0                    0 bps
     High               :                 0                    0 bps
Queue: 5, Forwarding classes: CLASS_C_OUTPUT
  Queued:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
  Transmitted:
    Packets             :                 0                    0 pps
    Bytes               :                 0                    0 bps
    Tail-dropped packets :                0                    0 pps
    RED-dropped packets  :                0                    0 pps
     Low                :                 0                    0 pps
     Medium-low         :                 0                    0 pps
     Medium-high        :                 0                    0 pps
     High               :                 0                    0 pps
    RED-dropped bytes   :                 0                    0 bps
     Low                :                 0                    0 bps
     Medium-low         :                 0                    0 bps
     Medium-high        :                 0                    0 bps
```

```
     High              :                0                     0 bps
Queue: 6, Forwarding classes: CLASS_V_OUTPUT
  Queued:
    Packets            :                0                     0 pps
    Bytes              :                0                     0 bps
  Transmitted:
    Packets            :                0                     0 pps
    Bytes              :                0                     0 bps
    Tail-dropped packets :              0                     0 pps
    RED-dropped packets  :              0                     0 pps
     Low               :                0                     0 pps
     Medium-low        :                0                     0 pps
     Medium-high       :                0                     0 pps
     High              :                0                     0 pps
    RED-dropped bytes  :                0                     0 bps
     Low               :                0                     0 bps
     Medium-low        :                0                     0 bps
     Medium-high       :                0                     0 bps
     High              :                0                     0 bps
Queue: 7, Forwarding classes: CLASS_S_OUTPUT, GETS
  Queued:
    Packets            :                0                     0 pps
    Bytes              :                0                     0 bps
  Transmitted:
    Packets            :                0                     0 pps
    Bytes              :                0                     0 bps
    Tail-dropped packets :              0                     0 pps
    RED-dropped packets  :              0                     0 pps
     Low               :                0                     0 pps
     Medium-low        :                0                     0 pps
     Medium-high       :                0                     0 pps
```



```
     High                :                  0                   0 pps
    RED-dropped bytes    :                  0                   0 bps
     Low                 :                  0                   0 bps
     Medium-low          :                  0                   0 bps
     Medium-high         :                  0                   0 bps
     High                :                  0                   0 bps

Packet Forwarding Engine Chassis Queues:
Queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: DEFAULT
  Queued:
    Packets              :             371365               23620 pps
    Bytes                :           15597330             7936368 bps
  Transmitted:
    Packets              :             371365               23620 pps
    Bytes                :           15597330             7936368 bps
    Tail-dropped packets :                  0                   0 pps
    RED-dropped packets  :                  0                   0 pps
     Low                 :                  0                   0 pps
     Medium-low          :                  0                   0 pps
     Medium-high         :                  0                   0 pps
     High                :                  0                   0 pps
    RED-dropped bytes    :                  0                   0 bps
     Low                 :                  0                   0 bps
     Medium-low          :                  0                   0 bps
     Medium-high         :                  0                   0 bps
     High                :                  0                   0 bps
Queue: 1, Forwarding classes: REALTIME
  Queued:
    Packets              :                  0                   0 pps
```



```
    Bytes                :                0                 0 bps
  Transmitted:
    Packets              :                0                 0 pps
    Bytes                :                0                 0 bps
    Tail-dropped packets :                0                 0 pps
    RED-dropped packets  :                0                 0 pps
     Low                 :                0                 0 pps
     Medium-low          :                0                 0 pps
     Medium-high         :                0                 0 pps
     High                :                0                 0 pps
    RED-dropped bytes    :                0                 0 bps
     Low                 :                0                 0 bps
     Medium-low          :                0                 0 bps
     Medium-high         :                0                 0 bps
     High                :                0                 0 bps
Queue: 2, Forwarding classes: PRIVATE
  Queued:
    Packets              :                0                 0 pps
    Bytes                :                0                 0 bps
  Transmitted:
    Packets              :                0                 0 pps
    Bytes                :                0                 0 bps
    Tail-dropped packets :                0                 0 pps
    RED-dropped packets  :                0                 0 pps
     Low                 :                0                 0 pps
     Medium-low          :                0                 0 pps
     Medium-high         :                0                 0 pps
     High                :                0                 0 pps
    RED-dropped bytes    :                0                 0 bps
     Low                 :                0                 0 bps
     Medium-low          :                0                 0 bps
```



```
      Medium-high        :                    0                    0 bps
      High               :                    0                    0 bps
  Queue: 3, Forwarding classes: CONTROL
    Queued:
     Packets             :                32843                    0 pps
     Bytes               :              2641754                   56 bps
    Transmitted:
     Packets             :                32843                    0 pps
     Bytes               :              2641754                   56 bps
     Tail-dropped packets :                   0                    0 pps
     RED-dropped packets  :                   0                    0 pps
      Low                :                    0                    0 pps
      Medium-low         :                    0                    0 pps
      Medium-high        :                    0                    0 pps
      High               :                    0                    0 pps
     RED-dropped bytes   :                    0                    0 bps
      Low                :                    0                    0 bps
      Medium-low         :                    0                    0 bps
      Medium-high        :                    0                    0 bps
      High               :                    0                    0 bps
  Queue: 4, Forwarding classes: CLASS_B_OUTPUT
    Queued:
     Packets             :                    0                    0 pps
     Bytes               :                    0                    0 bps
    Transmitted:
     Packets             :                    0                    0 pps
     Bytes               :                    0                    0 bps
     Tail-dropped packets :                   0                    0 pps
     RED-dropped packets  :                   0                    0 pps
      Low                :                    0                    0 pps
```



```
      Medium-low          :                    0                    0 pps
      Medium-high         :                    0                    0 pps
      High                :                    0                    0 pps
     RED-dropped bytes    :                    0                    0 bps
      Low                 :                    0                    0 bps
      Medium-low          :                    0                    0 bps
      Medium-high         :                    0                    0 bps
      High                :                    0                    0 bps
Queue: 5, Forwarding classes: CLASS_C_OUTPUT
  Queued:
     Packets              :                    0                    0 pps
     Bytes                :                    0                    0 bps
  Transmitted:
     Packets              :                    0                    0 pps
     Bytes                :                    0                    0 bps
     Tail-dropped packets :                    0                    0 pps
     RED-dropped packets  :                    0                    0 pps
      Low                 :                    0                    0 pps
      Medium-low          :                    0                    0 pps
      Medium-high         :                    0                    0 pps
      High                :                    0                    0 pps
     RED-dropped bytes    :                    0                    0 bps
      Low                 :                    0                    0 bps
      Medium-low          :                    0                    0 bps
      Medium-high         :                    0                    0 bps
      High                :                    0                    0 bps
Queue: 6, Forwarding classes: CLASS_V_OUTPUT
  Queued:
     Packets              :                    0                    0 pps
     Bytes                :                    0                    0 bps
  Transmitted:
```



```
    Packets             :                 0                 0 pps
    Bytes               :                 0                 0 bps
    Tail-dropped packets :                0                 0 pps
    RED-dropped packets  :                0                 0 pps
     Low                :                 0                 0 pps
     Medium-low         :                 0                 0 pps
     Medium-high        :                 0                 0 pps
     High               :                 0                 0 pps
    RED-dropped bytes   :                 0                 0 bps
     Low                :                 0                 0 bps
     Medium-low         :                 0                 0 bps
     Medium-high        :                 0                 0 bps
     High               :                 0                 0 bps
Queue: 7, Forwarding classes: CLASS_S_OUTPUT, GETS
  Queued:
    Packets             :                 0                 0 pps
    Bytes               :                 0                 0 bps
  Transmitted:
    Packets             :                 0                 0 pps
    Bytes               :                 0                 0 bps
    Tail-dropped packets :                0                 0 pps
    RED-dropped packets  :                0                 0 pps
     Low                :                 0                 0 pps
     Medium-low         :                 0                 0 pps
     Medium-high        :                 0                 0 pps
     High               :                 0                 0 pps
    RED-dropped bytes   :                 0                 0 bps
     Low                :                 0                 0 bps
     Medium-low         :                 0                 0 bps
     Medium-high        :                 0                 0 bps
```

```
            High                :                   0                     0 bps
```

show interfaces queue (QFX Series)

```
user@switch> show interfaces queue xe-0/0/15
   Physical interface: xe-0/0/15, Enabled, Physical link is Up
     Interface index: 49165, SNMP ifIndex: 539
   Forwarding classes: 12 supported, 8 in use
   Egress queues: 12 supported, 8 in use
   Queue: 0, Forwarding classes: best-effort
     Queued:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
     Transmitted:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                   0                     0 pps
       Total-dropped bytes  :                   0                     0 bps
   Queue: 3, Forwarding classes: fcoe
     Queued:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
     Transmitted:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                   0                     0 pps
       Total-dropped bytes  :                   0                     0 bps
0 bps
   Queue: 4, Forwarding classes: no-loss
     Queued:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
     Transmitted:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                   0                     0 pps
       Total-dropped bytes  :                   0                     0 bps
   Queue: 7, Forwarding classes: network-control
     Queued:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
     Transmitted:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
       Tail-dropped packets : Not Available
       Total-dropped packets:                   0                     0 pps
       Total-dropped bytes  :                   0                     0 bps
   Queue: 8, Forwarding classes: mcast
     Queued:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
     Transmitted:
       Packets              :                   0                     0 pps
       Bytes                :                   0                     0 bps
       Tail-dropped packets : Not Available
```

```
        Total-dropped packets:                    0                     0 pps
        Total-dropped bytes  :                    0                     0 bps
```

show interfaces queue l2-statistics (lsq interface)

```
user@switch> show interfaces queue lsq-2/2/0.2 l2-statistics
Logical interface lsq-2/2/0.2 (Index 69) (SNMP ifIndex 1598)
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Burst size: 0
Queue: 0, Forwarding classes: be
  Queued:
    Packets              :                     1                     0 pps
    Bytes                :                  1001                     0 bps
  Transmitted:
    Packets              :                     5                      0 pps
    Bytes                :                  1062                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Queue: 1, Forwarding classes: ef
  Queued:
    Packets              :                     1                     0 pps
    Bytes                :                  1500                     0 bps
  Transmitted:
    Packets              :                     6                      0 pps
    Bytes                :                  1573                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Queue: 2, Forwarding classes: af
  Queued:
    Packets              :                     1                     0 pps
    Bytes                :                   512                     0 bps
  Transmitted:
    Packets              :                     3                      0 pps
    Bytes                :                   549                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
Queue: 3, Forwarding classes: nc
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
    Packets              :                     0                      0 pps
    Bytes                :                     0                     0 bps
    Tail-dropped packets :                     0                     0 pps
    RED-dropped packets  :                     0                     0 pps
    RED-dropped bytes    :                     0                     0 bps
=========
```


show interfaces xe

Syntax

show interfaces *device-name*:*type-fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 11.1 for the QFX Series.

Description

Display status information about the specified 10-Gigabit Ethernet interface. This command does not display statistics for routed VLAN interfaces.

Options

device-name*:*type-fpc/pic/port—(QFabric systems only) The device name is either the serial number or the alias of the QFabric system component, such as a Node device, Interconnect device, or QFabric infrastructure. The name must contain a maximum of 128 characters and not contain any colons.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

routing-instance (all | *instance-name*)—(Optional) Display the name of an individual routing instance or display all routing instances.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level

view

Related Documentation

- Monitoring Interface Status and Traffic on page 199
- Troubleshooting Network Interfaces on page 329
- Troubleshooting an Aggregated Ethernet Interface on page 329

- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces on page 305
show interfaces (Asymmetric Flow Control) on page 306
show interfaces brief on page 306
show interfaces detail on page 306
show interfaces detail (Asymmetric Flow Control) on page 308
show interfaces extensive on page 309
show interfaces extensive (Asymmetric Flow Control) on page 311

show interfaces terse on page 313
show interfaces (QFabric System) on page 313

Output Fields Table 39 on page 298 lists the output fields for the **show interfaces xe** command. Output fields are listed in the approximate order in which they appear.

Table 39: show interfaces xe Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface.	All levels
Interface index	Index number of the physical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Speed	Speed at which the interface is running.	All levels
Duplex	Duplex mode of the interface, either **Full-Duplex** or **Half-Duplex**.	All levels
Loopback	Loopback status: **Enabled** or **Disabled**. If loopback is enabled, type of loopback: **Local** or **Remote**.	All levels
Source filtering	Source filtering status: **Enabled** or **Disabled**.	All levels
LAN-PHY mode	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
Unidirectional	Unidirectional link mode status for 10-Gigabit Ethernet interface: **Enabled** or **Disabled** for parent interface; **Rx-only** or **Tx-only** for child interfaces.	All levels
Flow control	Flow control status: **Enabled** or **Disabled**. NOTE: This field is only displayed if asymmetric flow control is not configured.	All levels

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Configured-flow-control	Configured flow control for the interface transmit buffers (**tx-buffers**) and receive buffers (**rx-buffers**): • **tx-buffers—On** if the interface is configured to respond to Ethernet PAUSE messages received from the connected peer. **Off** if the interface is not configured to respond to received PAUSE messages. • **rx-buffers—On** if the interface is configured to generate and send Ethernet PAUSE messages to the connected peer. **Off** if the interface is not configured to generate and send PAUSE messages. NOTE: This field is only displayed if asymmetric flow control is configured.	All levels
Auto-negotiation	Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	Remote fault status: • **Online**—Autonegotiation is manually configured as online. • **Offline**—Autonegotiation is manually configured as offline.	All levels
Device flags	Information about the physical device.	All levels
Interface flags	Information about the interface.	All levels
Link flags	Information about the link.	All levels
Wavelength	Configured wavelength, in nanometers (nm).	All levels
Frequency	Frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Schedulers	Number of CoS schedulers configured.	**extensive**
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Current address	Configured MAC address.	**detail extensive** none
Hardware address	Hardware MAC address.	**detail extensive** none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is **Last flapped:** ***year-month-day hour:*** **:*minute*:*second*:*timezone* (*hour*:*minute*:*second* ago)**. For example, **Last flapped: 2008–01–16 10:52:40 UTC (3d 22:58 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output Rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Traffic statistics	Number and rate of bytes and packets received and transmitted on the physical interface. • **Input bytes**—Number of bytes received on the interface. • **Output bytes**—Number of bytes transmitted on the interface. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface. NOTE: The bandwidth bps counter is not enabled.	**detail extensive**
Input errors	Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Errors**—Sum of the incoming frame aborts and FCS errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Framing errors**—Number of packets received with an invalid frame checksum (FCS). • **Runts**—Number of frames received that are smaller than the runt threshold. • **Policed discards**—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. L3 incomplete errors can be ignored if you configure the **ignore-l3-incompletes** statement. • **L2 channel errors**—Number of times the software did not find a valid logical interface for an incoming frame. • **L2 mismatch timeouts**—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • **FIFO errors**—Number of FIFO errors in the receive direction that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Output errors	Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious: • **Carrier transitions**—Number of times the interface has gone from **down** to **up**. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • **Errors**—Sum of the outgoing frame aborts and FCS errors. • **Drops**—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • **Collisions**—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug. • **Aged packets**—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • **FIFO errors**—Number of FIFO errors in the send direction as reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **HS link CRC errors**—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues	Total number of egress queues supported on the specified interface.	**detail extensive**
Queue counters (Egress)	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**detail extensive**
Queue Number	The CoS queue number and the forwarding classes mapped to the queue number. The **Mapped forwarding class** column lists the forwarding classes mapped to each CoS queue.	**detail extensive**
Ingress queues	Total number of ingress queues supported on the specified interface.	**extensive**
Queue counters (Ingress)	CoS queue number and its associated user-configured forwarding class name. • **Queued packets**—Number of queued packets. • **Transmitted packets**—Number of transmitted packets. • **Dropped packets**—Number of packets dropped by the ASIC's RED mechanism.	**extensive**

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Active alarms and Active defects	Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the switch configuration, an alarm can ring the red or yellow alarm bell on the switch, or turn on the red or yellow alarm LED on the craft interface. These fields can contain the value **None** or **Link**. • **None**—There are no active defects or alarms. • **Link**—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning.	**detail extensive** none
PCS statistics	Physical Coding Sublayer (PCS) fault conditions from the LAN PHY device.	**detail extensive**
MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem. • **Total octets** and **total packets**—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. • **Unicast packets, Broadcast packets,** and **Multicast packets**—Number of unicast, broadcast, and multicast packets. • **CRC/Align errors**—Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error). • **FIFO error**—Number of FIFO errors that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • **MAC control frames**—Number of MAC control frames. • **MAC pause frames**—Number of MAC control frames with **pause** operational code. • **Oversized frames**—Number of packets that exceeds the configured MTU. • **Jabber frames**—Number of frames that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition in which any packet exceeds 20 ms. The allowed range to detect jabber is from 20 ms to 150 ms. • **Fragment frames**—Total number of packets that were less than 64 octets in length (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. Fragment frames normally increment because both runts (which are normal occurrences caused by collisions) and noise hits are counted. • **VLAN tagged frames**—Number of frames that are VLAN tagged. The system uses the TPID of 0x8100 in the frame to determine whether a frame is tagged or not. This counter is not supported on EX Series switches and is always displayed as 0. • **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."	**extensive**
Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem.	**extensive**

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output

Autonegotiation information	Information about link autonegotiation.
	• **Negotiation status:**
	  ◦ **Incomplete**—Ethernet interface has the speed or link mode configured.
	  ◦ **No autonegotiation**—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.
	  ◦ **Complete**—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner status**—**OK** when the Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner:**
	  ◦ **Link mode**—Depending on the capability of the attached Ethernet device, either **Full-duplex** or **Half-duplex**.
	  ◦ **Flow control**—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is **None**. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), and **Symmetric/Asymmetric** (link partner supports both **PAUSE** on receive and transmit or only **PAUSE** receive).
	  ◦ **Remote fault**—Remote fault information from the link partner—**Failure** indicates a receive link error. **OK** indicates that the link partner is receiving. **Negotiation error** indicates a negotiation error. **Offline** indicates that the link partner is going offline.
	• **Local resolution**:
	  ◦ **Flow control**—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), and **Symmetric/Asymmetric** (link partner supports both **PAUSE** on receive and transmit or only **PAUSE** receive).
	  For asymmetric **PAUSE**, shows if the PAUSE transmit and **PAUSE** receive states on the interface are **enable** or **disable**.
	  ◦ **Remote fault**—Remote fault information. **Link OK** (no error detected on receive), **Offline** (local interface is offline), and **Link Failure** (link error detected on receive).
		extensive

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number. • **CoS transmit queue**—Queue number and its associated user-configured forwarding class name. • **Bandwidth %**—Percentage of bandwidth allocated to the queue. • **Bandwidth bps**—Bandwidth allocated to the queue (in bps). • **Buffer %**—Percentage of buffer space allocated to the queue. • **Buffer usec**—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time. • **Priority**—Queue priority: **low** or **high**. • **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.	**extensive**
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Index number of the logical interface, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	SNMP interface index number for the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Flags	Information about the logical interface.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received (input) and transmitted (output) on the specified interface.	**detail extensive**
IPv6 transit statistics	If IPv6 statics tracking is enabled, number of IPv6 bytes and packets received and transmitted on the logical interface.	**extensive**
Local statistics	Number and rate of bytes and packets destined to and from the switch.	**extensive**
Transit statistics	Number and rate of bytes and packets transiting the switch.	**extensive**
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
Route Table	Route table in which the logical interface address is located. For example, **0** refers to the routing table inet.0.	**detail extensive** none

Table 39: show interfaces xe Output Fields *(continued)*

Field Name	Field Description	Level of Output
Input Filters	Names of any input filters applied to this interface.	**detail extensive**
Output Filters	Names of any output filters applied to this interface.	**detail extensive**
Flags	Information about protocol family flags. If unicast Reverse Path Forwarding (uRPF) is explicitly configured on the specified interface, the uRPF flag appears. If uRPF was configured on a different interface (and therefore is enabled on all switch interfaces) but was not explicitly configured on the specified interface, the uRPF flag does not appear even though uRPF is enabled.	**detail extensive**
Addresses, Flags	Information about the address flags.	**detail extensive** none
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the IP address of the interface is also displayed.	**brief**
Flags	Information about the address flag.	**detail extensive** none
Destination	IP address of the remote side of the connection.	**detail extensive** none
Local	IP address of the logical interface.	**detail extensive** none
Broadcast	Broadcast address of the logical interlace.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Sample Output

show interfaces

```
user@switch> show interfaces xe-0/0/1
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
  Last flapped   : 2011-06-01 00:42:03 PDT (00:02:42 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
```



```
    Output packets: 0
    Protocol eth-switch, MTU: 0
      Flags: Trunk-Mode
```

show interfaces (Asymmetric Flow Control)

```
user@switch> show interfaces xe-0/0/1
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Configured-flow-control  tx-buffers: off  rx-buffers: on
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
  Last flapped   : 2011-06-01 00:42:03 PDT (00:02:42 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0
      Flags: Trunk-Mode
```

show interfaces brief

```
user@switch> show interfaces xe-0/0/1 brief
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None

  Logical interface xe-0/0/1.0
    Flags: SNMP-Traps Encapsulation: ENET2
    eth-switch
```

show interfaces detail

```
user@switch> show interfaces xe-0/0/1 detail
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591, Generation: 169
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
```



```
Last flapped   : 2011-06-01 00:42:03 PDT (00:02:50 ago)
Statistics last cleared: 2011-06-01 00:44:39 PDT (00:00:14 ago)
Traffic statistics:
 Input  bytes  :                   0                    0 bps
 Output bytes  :                   0                    0 bps
 Input  packets:                   0                    0 pps
 Output packets:                   0                    0 pps
 IPv6 transit statistics:
  Input  bytes  :                  0
  Output bytes  :                  0
  Input  packets:                  0
  Output packets:                  0
Egress queues: 12 supported, 9 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort                  0                    0                    0

  1 fc7                          0                    0                    0

  2 no-loss                      0                    0                    0

  3 fcoe                         0                    0                    0

  4 fc4                          0                    0                    0

  5 fc5                          0                    0                    0

  6 fc6                          0                    0                    0

  7 network-cont                 0                    0                    0

  8 mcast                        0                    0                    0

Queue number:         Mapped forwarding classes
  0                   best-effort
  1                   fc7
  2                   no-loss
  3                   fcoe
  4                   fc4
  5                   fc5
  6                   fc6
  7                   network-control
  8                   mcast
Active alarms  : None
Active defects : None

Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523) (Generation 143)
  Flags: SNMP-Traps 0x0 Encapsulation: ENET2
  Traffic statistics:
   Input  bytes  :                   0
   Output bytes  :                   0
   Input  packets:                   0
   Output packets:                   0
  Local statistics:
   Input  bytes  :                   0
   Output bytes  :                   0
   Input  packets:                   0
   Output packets:                   0
  Transit statistics:
   Input  bytes  :                   0                    0 bps
   Output bytes  :                   0                    0 bps
```

```
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol eth-switch, MTU: 0, Generation: 170, Route table: 0
      Flags: Trunk-Mode
```

show interfaces detail (Asymmetric Flow Control)

```
user@switch> show interfaces xe-0/0/1 detail
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591, Generation: 169
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Configured-flow-control  tx-buffers: off  rx-buffers: on
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
  Last flapped   : 2011-06-01 00:42:03 PDT (00:02:50 ago)
  Statistics last cleared: 2011-06-01 00:44:39 PDT (00:00:14 ago)
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Egress queues: 12 supported, 9 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 fc7                            0                    0                    0

    2 no-loss                        0                    0                    0

    3 fcoe                           0                    0                    0

    4 fc4                            0                    0                    0

    5 fc5                            0                    0                    0

    6 fc6                            0                    0                    0

    7 network-cont                   0                    0                    0

    8 mcast                          0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   fc7
    2                   no-loss
    3                   fcoe
    4                   fc4
    5                   fc5
    6                   fc6
```



```
    7                   network-control
    8                   mcast
  Active alarms  : None
  Active defects : None

  Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523) (Generation 143)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Local statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Transit statistics:
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol eth-switch, MTU: 0, Generation: 170, Route table: 0
      Flags: Trunk-Mode
```

show interfaces extensive

```
user@switch> show interfaces xe-0/0/1 extensive
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591, Generation: 169
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
  Last flapped   : 2011-06-01 00:42:03 PDT (00:03:08 ago)
  Statistics last cleared: 2011-06-01 00:44:39 PDT (00:00:32 ago)
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
 FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
  Egress queues: 12 supported, 9 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
```

```
  0 best-effort                 0                    0                    0

  1 fc7                         0                    0                    0

  2 no-loss                     0                    0                    0

  3 fcoe                        0                    0                    0

  4 fc4                         0                    0                    0

  5 fc5                         0                    0                    0

  6 fc6                         0                    0                    0

  7 network-cont                0                    0                    0

  8 mcast                       0                    0                    0

Queue number:         Mapped forwarding classes
  0                   best-effort
  1                   fc7
  2                   no-loss
  3                   fcoe
  4                   fc4
  5                   fc5
  6                   fc6
  7                   network-control
  8                   mcast
Active alarms  : None
Active defects : None
MAC statistics:                      Receive         Transmit
  Total octets                             0                0
  Total packets                            0                0
  Unicast packets                          0                0
  Broadcast packets                        0                0
  Multicast packets                        0                0
  CRC/Align errors                         0                0
  FIFO errors                              0                0
  MAC control frames                       0                0
  MAC pause frames                         0                0
  Oversized frames                         0
  Jabber frames                            0
  Fragment frames                          0
  VLAN tagged frames                       0
  Code violations                          0
MAC Priority Flow Control Statistics:
  Prioity :  0                             0                0
  Prioity :  1                             0                0
  Prioity :  2                             0                0
  Prioity :  3                             0                0
  Prioity :  4                             0                0
  Prioity :  5                             0                0
  Prioity :  6                             0                0
  Prioity :  7                             0                0
Filter statistics:
  Input packet count                       0
  Input packet rejects                     0
  Input DA rejects                         0
  Input SA rejects                         0
  Output packet count                                       0
```



```
    Output packet pad count                                  0
    Output packet error count                                0
    CAM destination filters: 1, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                            %            bps     %            usec
    0 best-effort          75     7500000000    75               0       low
none
    7 network-control       5      500000000     5               0       low
none
    8 mcast                20     2000000000    20               0       low
none

  Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523) (Generation 143)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Local statistics:
     Input  bytes  :                    0
     Output bytes  :                    0
     Input  packets:                    0
     Output packets:                    0
    Transit statistics:
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol eth-switch, MTU: 0, Generation: 170, Route table: 0
      Flags: Trunk-Mode
```

show interfaces extensive (Asymmetric Flow Control)

```
user@switch> show interfaces xe-0/0/1 extensive
Physical interface: xe-0/0/1, Enabled, Physical link is Up
  Interface index: 49195, SNMP ifIndex: 591, Generation: 169
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering:
Disabled,
  Configured-flow-control  tx-buffers: off  rx-buffers: on
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1d:b5:f7:4e:e1, Hardware address: 00:1d:b5:f7:4e:e1
  Last flapped   : 2011-06-01 00:42:03 PDT (00:03:08 ago)
  Statistics last cleared: 2011-06-01 00:44:39 PDT (00:00:32 ago)
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
```

```
    Output bytes  :                  0
    Input  packets:                  0
    Output packets:                  0
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
 FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
  Egress queues: 12 supported, 9 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                  0                    0                    0

    1 fc7                          0                    0                    0

    2 no-loss                      0                    0                    0

    3 fcoe                         0                    0                    0

    4 fc4                          0                    0                    0

    5 fc5                          0                    0                    0

    6 fc6                          0                    0                    0

    7 network-cont                 0                    0                    0

    8 mcast                        0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   fc7
    2                   no-loss
    3                   fcoe
    4                   fc4
    5                   fc5
    6                   fc6
    7                   network-control
    8                   mcast
  Active alarms  : None
  Active defects : None
  MAC statistics:                      Receive         Transmit
    Total octets                             0                0
    Total packets                            0                0
    Unicast packets                          0                0
    Broadcast packets                        0                0
    Multicast packets                        0                0
    CRC/Align errors                         0                0
    FIFO errors                              0                0
    MAC control frames                       0                0
    MAC pause frames                         0                0
    Oversized frames                         0
    Jabber frames                            0
    Fragment frames                          0
    VLAN tagged frames                       0
    Code violations                          0
  MAC Priority Flow Control Statistics:
    Prioity :  0                             0                0
    Prioity :  1                             0                0
```



```
    Prioity :  2                            0                0
    Prioity :  3                            0                0
    Prioity :  4                            0                0
    Prioity :  5                            0                0
    Prioity :  6                            0                0
    Prioity :  7                            0                0
  Filter statistics:
    Input packet count                      0
    Input packet rejects                    0
    Input DA rejects                        0
    Input SA rejects                        0
    Output packet count                                      0
    Output packet pad count                                  0
    Output packet error count                                0
    CAM destination filters: 1, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth            Buffer Priority   Limit
                            %              bps     %        usec
    0 best-effort          75       7500000000    75           0      low    none
    7 network-control       5        500000000     5           0      low    none
    8 mcast                20       2000000000    20           0      low    none

  Logical interface xe-0/0/1.0 (Index 73) (SNMP ifIndex 523) (Generation 143)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                   0                    0 pps
     Output packets:                   0                    0 pps
    Protocol eth-switch, MTU: 0, Generation: 170, Route table: 0
      Flags: Trunk-Mode
```

show interfaces terse

```
user@switch> show interfaces xe-0/0/1 terse
Interface               Admin Link Proto    Local                 Remote

xe-0/0/1               up    up
xe-0/0/1.0             up    up   eth-switch
```

show interfaces (QFabric System)

```
user@switch> show interfaces node1:xe-0/0/0
Physical interface: node1:xe-0/0/0, Enabled, Physical link is Down
  Interface index: 129, SNMP ifIndex: 2884086
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Duplex: Full-Duplex, BPDU
 Error: None, MAC-REWRITE Error: None,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
```



```
Interface flags: Internal: 0x4000
CoS queues     : 8 supported, 8 maximum usable queues
Current address: 02:00:09:03:00:00, Hardware address: 02:00:09:03:00:00
Last flapped   : Never
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
```


show lacp interfaces

Syntax

show lacp interfaces
<*interface-name*>

Release Information

Command introduced in Junos OS Release 10.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description

Display Link Aggregation Control Protocol (LACP) information about the specified aggregated Ethernet or Gigabit Ethernet interface.

Options

none—Display LACP information for all interfaces.

interface-name—(Optional) Display LACP information for the specified interface:

- Aggregated Ethernet—**ae*x***
- Gigabit Ethernet—**ge-*fpc/pic/port***
- 10-Gigabit Ethernet—**xe-*fpc/pic/port***

Required Privilege Level

view

Related Documentation

- *Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch*
- *Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch*
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- *Configuring Aggregated Ethernet Links (CLI Procedure)*
- Configuring Link Aggregation on page 85
- *Configuring Aggregated Ethernet LACP (CLI Procedure)*
- Configuring Aggregated Ethernet LACP on page 81
- *Configuring LACP Link Protection of Aggregated Ethernet Interfaces (CLI Procedure)*
- *Understanding Aggregated Ethernet Interfaces and LACP*
- Understanding Aggregated Ethernet Interfaces and LACP on page 7
- *Junos OS Interfaces Fundamentals Configuration Guide*

List of Sample Output

show lacp interfaces (EX Series Switches) on page 317
show lacp interfaces (QFX Series) on page 318

Output Fields

Table 40 on page 316 lists the output fields for the **show lacp interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 40: show lacp interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated Ethernet interface name.

LACP State	LACP state information for each aggregated Ethernet interface:
	• For a child interface configured with the **force-up** statement, LACP state displays **FUP** along with the interface name.
	• **Role**—Role played by the interface. It can be one of the following:
	  ◦ **Actor**—Local device participating in the LACP negotiation.
	  ◦ **Partner**—Remote device participating in the LACP negotiation.
	• **Exp**—Expired state. **Yes** indicates that the actor or partner is in an expired state. **No** indicates that the actor or partner is not in an expired state.
	• **Def**—Default. **Yes** indicates that the actor's receive machine is using the default operational partner information, which is administratively configured for the partner. **No** indicates that the operational partner information in use has been received in an LACP PDU.
	• **Dist**—Distribution of outgoing frames. **No** indicates that the distribution of outgoing frames on the link is currently disabled and is not expected to be enabled. Otherwise, the value is **Yes**.
	• **Col**—Collection of incoming frames. **Yes** indicates that the collection of incoming frames on the link is currently enabled and is not expected to be disabled. Otherwise, the value is **No**.
	• **Syn**—Synchronization. If the value is **Yes**, the link is considered to be synchronized. The link has been allocated to the correct link aggregation group, the group has been associated with a compatible aggregator, and the identity of the link aggregation group is consistent with the system ID and operational key information transmitted. If the value is **No**, the link is not synchronized. The link is currently not in the right aggregation.
	• **Aggr**—Ability of the aggregation port to aggregate (**Yes**) or to operate only as an individual link (**No**).
	• **Timeout**—LACP timeout preference. Periodic transmissions of LACP PDUs occur at either a slow or a fast transmission rate, depending upon the expressed LACP timeout preference (**Long Timeout** or **Short Timeout**).
	• **Activity**—Actor's or partner's port activity. **Passive** indicates the port's preference for not transmitting LAC PDUs unless its partner's control value is **Active**. **Active** indicates the port's preference to participate in the protocol regardless of the partner's control value.

Table 40: show lacp interfaces Output Fields *(continued)*

Field Name	Field Description
LACP Protocol	LACP protocol information for each aggregated interface: • Link state (active or standby) indicated in parentheses next to the interface when link protection is configured. • **Receive State**—One of the following values: ◦ **Current**—The state machine receives an LACP PDU and enters the **Current** state. ◦ **Defaulted**—If no LACP PDU is received before the timer for the **Current** state expires a second time, the state machine enters the **Defaulted** state. ◦ **Expired**—If no LACP PDU is received before the timer for the **Current** state expires once, the state machine enters the **Expired** state. ◦ **Initialize**—When the physical connectivity of a link changes or a Begin event occurs, the state machine enters the **Initialize** state. ◦ **LACP Disabled**—If the port is operating in half duplex, the operation of LACP is disabled on the port, forcing the state to **LACP Disabled**. This state is similar to the **Defaulted** state, except that the port is forced to operate as an individual port. ◦ **Port Disabled**—If the port becomes inoperable and a Begin event has not occurred, the state machine enters the **Port Disabled** state. • **Transmit State**—Transmit state of the state machine. The transmit state is one of the following values: ◦ **Fast periodic**—Periodic transmissions are enabled at a fast transmission rate. ◦ **No periodic**—Periodic transmissions are disabled. ◦ **Periodic timer**—Transitory state entered when the periodic timer expires. ◦ **Slow periodic**—Periodic transmissions are enabled at a slow transmission rate. • **Mux State**—State of the multiplexer state machine for the aggregation port. The state is one of the following values: ◦ **Attached**—The multiplexer state machine initiates the process of attaching the port to the selected aggregator. ◦ **Collecting**—**Yes** indicates that the receive function of this link is enabled with respect to its participation in an aggregation. Received frames are passed to the aggregator for collection. **No** indicates the receive function of this link is not enabled. ◦ **Collecting distributing**—Collecting and distributing states are merged together to form a combined state (coupled control). Because independent control is not possible, the coupled control state machine does not wait for the partner to signal that collection has started before enabling both collection and distribution. ◦ **Detached**—Process of detaching the port from the aggregator is in progress. ◦ **Distributing**—**Yes** indicates that the transmit function of this link is enabled with respect to its participation in an aggregation. Frames can be passed down from the aggregator's distribution function for transmission. **No** indicates the transmit function of this link is not enabled. ◦ **Waiting**—The multiplexer state machine is in a holding process, awaiting an outcome.

Sample Output

show lacp interfaces (EX Series Switches)

```
user@switch> show lacp interfaces ae5
Aggregated interface: ae5
    LACP state:        Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      xe-2/0/7        Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-2/0/7      Partner    No    No   Yes  Yes  Yes   Yes     Fast   Passive
```



```
xe-4/0/7        Actor     No     No     No    No    No    Yes      Fast     Active
xe-4/0/7      Partner     No     No     No   Yes   Yes    Yes      Fast     Passive


LACP protocol:        Receive State  Transmit State          Mux State
xe-2/0/7(Active)          Current    Fast periodic Collecting distributing
xe-34/0/7(Standby)        Current    Fast periodic            Waiting
```

show lacp interfaces (QFX Series)

```
user@switch> show lacp interfaces nodegroup1:ae0 extensive
 Aggregated interface: nodegroup1:ae0
    LACP state:       Role    Exp   Def  Dist  Col  Syn  Aggr  Timeout    Activity

      node1:xe-0/0/1FUP    Actor     No    Yes     No    No    No    Yes      Fast
 Active
      node1xe-0/0/1FUP  Partner     No    Yes     No    No    No    Yes      Fast
Passive
      node2:xe-0/0/2       Actor     No    Yes     No    No    No    Yes      Fast
 Active
      node2:xe-0/0/2     Partner     No    Yes     No    No    No    Yes      Fast
 Passive
```

```
      LACP protocol:            Receive State    Transmit State      Mux State
      node1:xe-0/0/1FUP            Current       Fast periodic     Collecting
distributing
      node2:xe-0/0/2               Current       Fast periodic     Collecting
distributing
      node1:xe-0/0/1 (active)      Current       Fast periodic     Collecting
distributing
      node2:xe-0/0/2 (standby)     Current       Fast periodic     WAITING
```


show lacp statistics interfaces (View)

Syntax **show lacp statistics interfaces** *interface-name*

Release Information Command modified in Release 10.2 of Junos OS.
Command introduced in Release 11.1 of Junos OS for the QFX Series.

Description Display Link Aggregation Control Protocol (LACP) statistics about the specified aggregated Ethernet interface or redundant Ethernet interface. If you do not specify an interface name, LACP statistics for all interfaces are displayed.

Options *interface-name*—(Optional) Name of an interface.

Required Privilege Level view

Related Documentation

- Configuring Link Aggregation on page 85
- Verifying the Status of a LAG Interface on page 200
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 201
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 67

List of Sample Output show lacp statistics interfaces on page 321
show lacp statistics interfaces (QFX Series) on page 321
show lacp statistics interfaces (QFabric Systems) on page 321

Output Fields Table 41 on page 320 lists the output fields for the **show lacp statistics interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 41: show lacp statistics interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated interface value.
LACP Statistics	LACP statistics provide the following information: • **LACP Rx**—LACP received counter that increments for each normal hello. • **LACP Tx**—Number of LACP transmit packet errors logged. • **Unknown Rx**—Number of unrecognized packet errors logged. • **Illegal Rx**—Number of invalid packets received.

Sample Output

show lacp statistics interfaces

```
user@host> show lacp statistics interfaces ae0
Aggregated interface: ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-2/0/0                1352        2035            0            0
      ge-2/0/1                1352        2056            0            0
      ge-2/2/0                1352        2045            0            0
      ge-2/2/1                1352        2043            0            0
```

show lacp statistics interfaces (QFX Series)

```
user@host> show lacp statistics interfaces ae0
Aggregated interface: ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      xe-0/0/2                1352        2035            0            0
      xe-0/0/3                1352        2056            0            0
```

show lacp statistics interfaces (QFabric Systems)

```
user@host> show lacp statistics interfaces nodegroup1:ae0
Aggregated interface: nodegroup1:ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      node1:xe-0/0/2                1352        2035            0            0
      node2:xe-0/0/3                1352        2056            0            0
```


show redundant-trunk-group

Syntax **show redundant-trunk-group <group-name *group-name*>**

Release Information Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 13.2X50-D15 for the QFX Series.

Description Display information about redundant trunk groups.

Options **group-name** ***group-name***—Display information about the specified redundant trunk group.

Required Privilege Level view

Related Documentation

- *Example: Configuring Redundant Trunk Links for Faster Recovery*
- Example: Configuring Redundant Trunk Links for Faster Recovery on page 72
- Understanding Redundant Trunk Links on page 51

List of Sample Output show redundant-trunk-group group-name Group1 on page 322

Output Fields Table 42 on page 322 lists the output fields for the **show redundant-trunk-group** command. Output fields are listed in the approximate order in which they appear.

Table 42: show redundant-trunk-group Output Fields

Field Name	Field Description
Group name	Name of the redundant trunk port group.
Interface	Name of an interface belonging to the trunk port group.
State	Operating state of the interface. • **Up** denotes the interface is up. • **Down** denotes the interface is down. • **Pri** denotes a primary interface. • **Act** denotes an active interface.
Time of last flap	Date and time at which the advertised link became unavailable, and then, available again.
Flap count	Total number of flaps since the last switch reboot.

Sample Output

show redundant-trunk-group group-name Group1

```
user@switch> show redundant-trunk-group group-name Group1

Group      Interface       State          Time of last flap        Flap
name                                                               Count
```



```
Group1     ge-0/0/45.0     UP/Pri/Act     Never                    0
           ge-0/0/47.0     UP             Never                    0
```

show uplink-failure-detection

Syntax

show uplink-failure-detection
<group *group-name*>

Release Information

Command introduced in Junos OS Release 11.1 for EX Series switches.

Description

Display information about the uplink-failure-detection group, the member interfaces, and their status.

Options

none—Display information about all groups configured for uplink failure detection.

group *group-name*—(Optional) Display information about the specified group only.

Required Privilege Level

view

Related Documentation

- Overview of Uplink Failure Detection on page 6
- Configuring Interfaces for Uplink Failure Detection on page 84
- Example: Configuring Interfaces for Uplink Failure Detection on page 59

List of Sample Output

show uplink-failure-detection on page 324

Output Fields

Table 43 on page 324 lists the output fields for the **show uplink-failure-detection** command. Output fields are listed in the approximate order in which they appear.

Table 43: show uplink-failure-detection Output Fields

Field Name	Field Description
Group	Name of the group.
Uplink	The uplink interface or interfaces configured as link-to-monitor. NOTE: The asterisk (*) indicates that the link is up.
Downlink	The downlink interface or interfaces configured as link-to-disable. NOTE: The asterisk (*) indicates that the link is up.
Failure Action	Status of uplink failure detection: • Active—The switch has detected an uplink failure and has brought the downlink down. • Inactive—The uplink or uplinks are up.

Sample Output

show uplink-failure-detection

```
user@switch> show uplink-failure-detection
```



```
Group            : group1
Uplink           :  ge-0/0/0*
Downlink         :  ge-0/0/1*
Failure Action   :  Inactive

Group            : group2
Uplink           :  ge-0/0/3.0
Downlink         :  ge-0/0/4.0
Failure Action   :  Active
```


PART 4

Troubleshooting

CHAPTER 8

Troubleshooting Procedures

Troubleshooting an Aggregated Ethernet Interface

Problem **Description:** The **show interfaces terse** command shows that the LAG is down.

Solution Check the following:

- Verify that there is no configuration mismatch.
- Verify that all member ports are up.
- Verify that a LAG is part of family ethernet-switching (Layer 2 LAG) or family inet (Layer 3 LAG).
- Verify that the LAG member is connected to the correct LAG at the other end.
- Verify that the LAG members belong to the same switch.

Related Documentation

- Verifying the Status of a LAG Interface on page 200
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 63

Troubleshooting Network Interfaces

The interface on the port in which an SFP or SFP+ transceiver is installed in an SFP or SFP+ module is down

Problem **Description:** The QFX Series has an SFP or SFP+ module installed. The interface on the port in which an SFP or SFP+ transceiver is installed is down.

Symptoms: When you check the status with the CLI command **show interfaces** ***interface-name*** , the disabled port is not listed.

Cause By default, the SFP or SFP+ module operates in the 10-Gigabit Ethernet mode and supports only SFP or SFP+ transceivers. The operating mode for the module is incorrectly set.

Solution Only SFP or SFP+ transceivers can be installed in SFP or SFP+ modules. You must configure the operating mode of the SFP or SFP+ module to match the type of transceiver you want to use. For SFP+ transceivers, configure 10-Gigabit Ethernet operating mode.