Ethernet Interfaces Feature Guide for Switches

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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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Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at https://www.juniper.net/documentation/.

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

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at https://www.juniper.net/books.

Using the Examples in This Manual

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

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

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

   ```
   [edit]
   ```



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

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

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

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

Documentation Conventions

Table 1 on page xxvii 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 xxvii 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**.

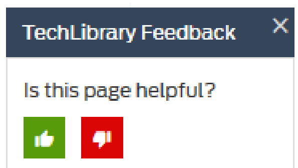
Table 2: Text and Syntax Conventions (continued)

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 so that we can improve our documentation. You can use either of the following methods:

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



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

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

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 Partner Support Service 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 https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit https://www.juniper.net/support/warranty/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: https://www.juniper.net/customers/support/
- Search for known bugs: https://prsearch.juniper.net/
- Find product documentation: https://www.juniper.net/documentation/
- Find solutions and answer questions using our Knowledge Base: https://kb.juniper.net/
- Download the latest versions of software and review release notes: https://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: https://kb.juniper.net/InfoCenter/
- Join and participate in the Juniper Networks Community Forum: https://www.juniper.net/company/communities/
- Open a case online in the CSC Case Management tool: https://www.juniper.net/cm/

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

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 https://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 https://www.juniper.net/support/requesting-support.html.

PART 1

Ethernet Interfaces

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CHAPTER 1

Interfaces

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Interfaces Overview for Switches

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 for EX Series on page 4
- Special Interfaces for EX Series on page 4
- Network Interfaces for EX4600, NFX Series, QFX Series, QFabric System on page 6
- Special Interfaces for EX4600, NFX Series, QFX Series, QFabric System on page 7
- Network Interfaces for OCX Series on page 8
- Special Interfaces for OCX Series on page 8

Network Interfaces for EX Series

Network interfaces connect to the network and carry network traffic. Table 3 on page 4 lists the types of network interfaces supported on EX Series switches.

Table 3: Network Interfaces Types and Purposes for EX Series

Type	Purpose
Aggregated Ethernet interfaces	All EX Series switches allow you to 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. See "Understanding Aggregated Ethernet Interfaces and LACP for Switches" on page 92.
LAN access interfaces	Use these EX Series switch interfaces to connect a personal computer, laptop, file server, or printer to the network. When you power on an EX Series switch and use the factory-default configuration, the software automatically configures interfaces in access mode for each of the network ports. The default configuration also enables autonegotiation for both speed and link mode.
Power over Ethernet (PoE) interfaces	EX Series switches provide PoE network ports with various switch models. These ports can be used to connect voice over IP (VoIP) telephones, wireless access points, video cameras, and point-of-sale devices to safely receive power from the same access ports that are used to connect personal computers to the network. PoE interfaces are enabled by default in the factory configuration. See *Understanding PoE on EX Series Switches*.
Trunk interfaces	EX Series access switches can be connected to a distribution switch or customer-edge (CE) switches or routers. To use a port for this type of connection, you must explicitly configure the network interface for trunk mode. The interfaces from the distribution switch or CE switch to the access switches must also be configured for trunk mode.

Special Interfaces for EX Series

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

Table 4: Special Interfaces Types and Purposes for EX Series

Type	Purpose
Console port	Each EX Series switch 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 since it provides access to the switch. On an EX3300 Virtual Chassis, an EX4200 Virtual Chassis, or an EX4500 Virtual Chassis, you can access the master and configure all members of the Virtual Chassis through any member's console port. For more information about the console port in a Virtual Chassis, see *Understanding Global Management of a Virtual Chassis*.
Loopback	All EX Series switches 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 operating system (Junos OS) for EX Series switches automatically creates the switch's management Ethernet interface, me0. The management Ethernet interface provides an out-of-band method for connecting to the switch. To use me0 as a management port, you must configure its logical port, me0.0, with a valid IP address. You can connect to the management interface over the network using utilities such as SSH or Telnet. SNMP can use the management interface to gather statistics from the switch. (The management interface me0 is analogous to the fxp0 interfaces on routers running Junos OS.) See “Understanding Management Interfaces” on page 45.
Integrated Routing and Bridging (IRB) Interface or Routed VLAN Interface (RVI)	EX Series switches use an integrated routing and bridging (IRB) interface or Routed VLAN Interface (RVI) 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 IRB interface or RVI functions as a logical router, eliminating the need for having both a switch and a router. These interfaces must be configured as part of a broadcast domain or virtual private LAN service (VPLS) routing instance for Layer 3 traffic to be routed from. See *Understanding Integrated Routing and Bridging*.

Table 4: Special Interfaces Types and Purposes for EX Series (continued)

Type	Purpose
Virtual Chassis port (VCP) interfaces	Virtual Chassis ports (VCPs) are used to interconnect switches in a Virtual Chassis: • EX3300 switches—Port 2 and port 3 of the SFP+ uplink ports are preconfigured as VCPs and can be used to interconnect up to six EX3300 switches in an EX3300 Virtual Chassis. See *Setting an Uplink Port on an EX Series or QFX Series Switch as a Virtual Chassis Port*. • EX4200 and EX4500 switches—Each EX4200 switch or each EX4500 switch with a Virtual Chassis module installed has two dedicated VCPs on its rear panel. These ports can be used to interconnect up to ten EX4200 switches in an EX4200 Virtual Chassis, up to ten EX4500 switches in an EX4500 Virtual Chassis, and up to ten switches in a mixed EX4200 and EX4500 Virtual Chassis. When you power on switches that are interconnected in this manner, the software automatically configures the VCP interfaces for the dedicated ports that have been interconnected. These VCP interfaces are not configurable or modifiable. You can also interconnect EX4200 and EX4500 switches by using uplink module ports. Using uplink ports allows you to connect switches over longer distances than you can by using the dedicated VCPs. To use the uplink ports as VCPs, you must explicitly configure the uplink module ports on the members you want to connect as VCPs. See *Setting an Uplink Port on an EX Series or QFX Series Switch as a Virtual Chassis Port* . • EX4300 switches—All QSFP+ ports are configured as VCPs, by default. See *Understanding EX4300 Virtual Chassis*. You can also interconnect EX4300 switches into a Virtual Chassis by using SFP+ uplink module ports as VCPs. Using uplink ports as VCPs allows you to connect switches over longer distances than you can by using the QSFP+ ports as VCPs. To use the uplink ports as VCPs, you must explicitly configure the uplink module ports on the members you want to connect as VCPs. See *Setting an Uplink Port on an EX Series or QFX Series Switch as a Virtual Chassis Port*. • EX8200 switches—EX8200 switches can be connected to an XRE200 External Routing Engine to create an EX8200 Virtual Chassis. The XRE200 External Routing Engine has dedicated VCPs that connect to ports on the internal Routing Engines of the EX8200 switches and can connect to another XRE200 External Routing Engine for redundancy. These ports require no configuration. See *XRE200 External Routing Engine Hardware Overview*. You can also connect two members of an EX8200 Virtual Chassis so that they can exchange Virtual Chassis Control Protocol (VCCP) traffic. To do so, you explicitly configure network ports on the EX8200 switches as VCPs.
Virtual management Ethernet (VME) interface	EX3300, EX4200, EX4300, and EX4500 switches have a VME interface. This is a logical interface that is used for Virtual Chassis configurations and allows you to manage all the members of the Virtual Chassis through the master. For more information about the VME interface, see *Understanding Global Management of a Virtual Chassis*. EX8200 switches do not use a VME interface. An EX8200 Virtual Chassis is managed through the management Ethernet (me0) interface on the XRE200 External Routing Engine.

Network Interfaces for EX4600, NFX Series, QFX Series, QFabric System

Network interfaces connect to the network and carry network traffic. Table 5 on page 6 lists the types of network interfaces supported.

Table 5: Network Interfaces Types and Purposes for EX4600, NFX Series, QFX Series, QFabric System

Type	Purpose
Aggregated Ethernet interfaces	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 5: Network Interfaces Types and Purposes for EX4600, NFX Series, QFX Series, QFabric System (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	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	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. See *Overview of Fibre Channel*.
LAN access interfaces	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	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	Use 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	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, QFX5110, QFX5200, 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. QFX5110 switches also support configuring 100-Gigabit QSFP28 ports as VCPs.

Special Interfaces for EX4600, NFX Series, QFX Series, QFabric System

Table 6 on page 8 lists the types of special interfaces supported.

Table 6: Special Interfaces Types and Purposes supported on EX4600, NFX Series, QFX Series, QFabric System

Type	Purpose
Console port	Each device has a serial console port, labeled **CON** or **CONSOLE**, for connecting tty-type terminals to the switch. 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	A 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 management Ethernet interface provides an out-of-band method for connecting to a standalone switch and QFabric system. NOTE: On OCX Series switches, the em0 management interface always has the status **up** in **show** command outputs, even if the physical port is empty. The me0 interface is a virtual interface between Junos and the host operating system, therefore its status is independent from the status of the physical port.
Routed VLAN interfaces (RVI and IRB interfaces)	Layer 3 routed VLAN interfaces (called RVI in the original CLI, and called IRB in Enhanced Layer 2 Software) route traffic from one broadcast domain to another and 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.

Network Interfaces for OCX Series

Network interfaces connect to the network and carry network traffic. Table 7 on page 8 lists the types of network interfaces supported.

Table 7: Network Interfaces Types and Purposes for OCX Series

Type	Purpose
Aggregated Ethernet interfaces	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.
Ethernet Interfaces	Configure Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet interfaces to connect to other servers, storage, and switches.

Special Interfaces for OCX Series

Table 8 on page 8 lists the types of special interfaces supported.

Table 8: Special Interfaces Types and Purposes for OCX Series

Type	Purpose
Console port	Each device has a serial console port, labeled **CON** or **CONSOLE**, for connecting tty-type terminals to the switch. 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	A software-only virtual interface that is always up. The loopback interface provides a stable and consistent interface and IP address on the switch.

Table 8: Special Interfaces Types and Purposes for OCX Series (continued)

Type	Purpose
Management interface	The management Ethernet interface provides an out-of-band method for connecting to a standalone switch and QFabric system. NOTE: On OCX Series switches, the em0 management interface always has the status **up** in **show** command outputs, even if the physical port is empty. The me0 interface is a virtual interface between Junos and the host operating system, therefore its status is independent from the status of the physical port.

Related Documentation

- *EX2200 Switches Hardware Overview*
- *EX3200 Switches Hardware Overview*
- *EX3300 Switches Hardware Overview*
- *EX4200 Switches Hardware Overview*
- *EX4300 Switches Hardware Overview*
- *EX4500 Switches Hardware Overview*
- *EX6210 Switch Hardware Overview*
- *EX8208 Switch Hardware Overview*
- *EX8216 Switch Hardware Overview*
- Understanding Interface Naming Conventions on page 9
- Understanding Layer 3 Logical Interfaces on page 269
- Understanding Layer 3 Subinterfaces on page 266

Understanding Interface Naming Conventions

The EX Series, QFX Series, NFX Series, OCX1100, QFabric System, and EX4600 devices use a naming convention for defining the interfaces that are 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 for EX Series on page 10
- Logical Part of an Interface Name for EX Series on page 11
- Wildcard Characters in Interface Names for EX Series on page 11
- Physical Part of an Interface Name for QFX series, NFX Series, EX4600, QFabric System on page 11
- Logical Part of an Interface Name on a Switch Running QFabric Software Package for QFX series, NFX Series, EX4600, QFabric System on page 20

- Logical Part of a Channelized Interface Name on a Switch Running Enhanced Layer 2 Software for QFX series, NFX Series, EX4600, QFabric System on page 20
- Wildcard Characters in Interface Names for QFX series, NFX Series, EX4600, QFabric System on page 21
- Physical Part of an Interface Name for OCX1100 on page 21
- Wildcard Characters in Interface Names for OCX1100 on page 21

Physical Part of an Interface Name for EX Series

Network interfaces in Junos OS are specified as follows:

type-fpc / pic / port

EX Series switches apply this convention as follows:

- *type*—EX Series interfaces use the following media types:
  - ge—Gigabit Ethernet interface
  - xe—10 Gigabit Ethernet interface
  - et—40 Gigabit Ethernet interface
- *fpc*—Flexible PIC Concentrator. EX Series interfaces use the following convention for the FPC number in interface names:
  - On an EX2200 switch, an EX3200 switch, a standalone EX3300 switch, a standalone EX4200 switch, a standalone EX4300 switch, a standalone EX4500, and a standalone EX4550 switch, FPC refers to the switch itself. The FPC number is **0** by default on these switches.
  - On an EX3300 Virtual Chassis, an EX4200 Virtual Chassis, an EX4300 Virtual Chassis, an EX4500 Virtual Chassis, an EX4550 Virtual Chassis, or a mixed Virtual Chassis, the FPC number indicates the member ID of the switch in the Virtual Chassis.
  - On an EX6200 switch and a standalone EX8200 switch, the FPC number indicates the slot number of the line card that contains the physical interface. On an EX6200 switch, the FPC number also indicates the slot number of the Switch Fabric and Routing Engine (SRE) module that contains the uplink port.
  - On an EX8200 Virtual Chassis, the FPC number indicates the slot number of the line card on the Virtual Chassis. The line card slots on Virtual Chassis member 0 are numbered 0 through 15; on member 1, they are numbered 16 through 31, and so on.
- *pic*—EX Series interfaces use the following convention for the PIC (Physical Interface Card) number in interface names:
  - On EX2200, EX3200, EX3300, EX4200, EX4500 switch, and EX4550 switches, the PIC number is **0** for all built-in interfaces (interfaces that are not uplink ports).
  - On EX2200, EX3200, EX3300, and EX4200 switches, the PIC number is **1** for uplink ports.
  - On EX4300 switches, the PIC number is **0** for built-in network ports, **1** for built-in QSFP+ ports (located on the rear panel of the switch), and **2** for uplink module ports.

  - On EX4500 switches, the PIC number is **1** for ports on the left-hand uplink module and **2** for ports on the right-hand uplink module.
  - On EX4550 switches, the PIC number is **1** for ports in the expansion module or Virtual Chassis module installed in the module slot on the front panel of the switch and **2** for those in the expansion module or Virtual Chassis module installed in the module slot on the rear panel of the switch.
  - On EX6200 and EX8200 switches, the PIC number is always **0**.
- *port*—EX Series interfaces use the following convention for port numbers:
  - On EX2200, EX3200, EX3300, EX4200, EX4300, EX4500, and EX4550 switches, built-in network ports are numbered from left to right. On models that have two rows of ports, the ports on the top row start with **0** followed by the remaining even-numbered ports, and the ports on the bottom row start with **1** followed by the remaining odd-numbered ports.
  - Uplink ports in EX2200, EX3200, EX3300, EX4200, EX4300, EX4500, and EX4550 switches are labeled from left to right, starting with **0**.
  - On EX6200 and EX8200 switches, the network ports are numbered from left to right on each line card. On line cards that have two rows of ports, the ports on the top row start with **0** followed by the remaining even-numbered ports, and the ports on the bottom row start with **1** followed by the remaining odd-numbered ports.
  - Uplink ports on an SRE module in an EX6200 switch are labeled from left to right, starting with **0**.

Logical Part of an Interface Name for EX Series

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: *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
ge-0/0/0.0   down     remote-analyzer        unblocked
ge-0/0/1.0   down     default                unblocked
ge-0/0/10.0  down     default                unblocked
```

Wildcard Characters in Interface Names for EX Series

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 (" ").

Physical Part of an Interface Name for QFX series, NFX Series, EX4600, QFabric System

Interfaces in Junos OS are specified as follows:

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

The convention is as follows (and platform support depends on the Junos OS release in your installation):

- *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
  - *sxe*—10-Gigabit Service interface. *sxe* is an internal interface and user must not configure this interface. It supports L2 and L3 configurations like VLANs and IP address.
  - **xle**—40-Gigabit Ethernet interface (QFX3500, QFX3600, and QFX5100 switches running a QFabric software package)
  - **et**—40-Gigabit Ethernet interface (QFX3500, QFX3600, QFX5100, QFX5200, QFX10000, and EX4600 switches running Enhanced Layer 2 Software)
  - **et**—100-Gigabit Ethernet interface (QFX5200 and QFX10000 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, QFX5100 devices running a QFabric software package, and QFX10002 switches, 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, QFX5200, EX4600, QFX10002, QFX10008, and QFX10016 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, EX4600, and QFX10002 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:

Table 9: Naming Conventions for PICs

Device with Software Package	Convention
QFX3500 switch with 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.
QFX3500 switch with 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.
QFX3500 Node device with a QFabric software package	PIC **0** can support 48 ports and PIC **1** can support four 40-Gigabit data plane uplink ports.
QFX3600 switch with a QFabric software package	PIC **0** can support 64 10-Gigabit Ethernet ports, and PIC **1** can support 16 40-Gigabit Ethernet ports.
QFX3600 switch with Enhanced Layer 2 software	PIC **0** can support 64 10-Gigabit Ethernet ports and can also support 16 40-Gigabit Ethernet ports.
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.
QFX5100-48S switch with Enhanced Layer 2 software	PIC **0** provides six 40-Gbps QSFP+ ports and 48 10-Gigabit Ethernet interfaces.
EX4600 device with 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 10-Gbps SFP+ 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.
QFX5100-48S switch with a QFabric software package	PIC **1** provides six 40-Gbps QSFP+ ports, and PIC **0** provides 48 10-Gigabit Ethernet interfaces.
QFX5100-24Q switch with 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
QFX5100-96S switch with Enhanced Layer 2 software	PIC **0** provides 96 10-Gigabit Ethernet interfaces and 8 40-Gbps QSFP+ ports .
QFX5110-48S switch with Enhanced Layer 2 software	PIC **0** can support 48 10-Gigabit Ethernet ports labeled 0 through 47, and 4 QSFP28 ports labeled 48 through 51. Ports 0 through 47 support either 1-Gbps small form-factor pluggable (SFP) or 10-Gbps small form-factor pluggable plus (SFP+) transceivers. You can also use SFP+ DAC cables and 10-Gbps active optical cables (AOC) in any access port. The default 100-Gigabit Ethernet ports can be configured as 40-Gigabit Ethernet, and in this configuration can either operate as dedicated 40-Gigabit Ethernet ports or can be channelized to 4 independent 10-Gigabit Ethernet ports using copper or fiber breakout cables.

Table 9: Naming Conventions for PICs (continued)

Device with Software Package	Convention
QFX5200-32C switch with Enhanced Layer 2 software	PIC **0** provides 32 QSFP28 ports. The 100-Gigabit Ethernet ports can be channelized to two 50-Gigabit Ethernet or four 25-Gigabit Ethernet ports. The default 100-Gigabit Ethernet ports can be configured as 40-Gigabit Ethernet and operate as 40-Gigabit Ethernet or be channelized to four 10-Gigabit Ethernet ports.
QFX10002-36Q switch with Enhanced Layer 2 software	PIC **0** provides 144 10-Gigabit Ethernet interfaces, and 36 40-Gbps QSFP+ ports, and 12 100-Gigabit Ethernet interfaces.
QFX10002-72Q switch with Enhanced Layer 2 software	PIC **0** provides 288 10-Gigabit Ethernet interfaces, and 72 40-Gbps QSFP+ ports, and 24 100-Gigabit Ethernet interfaces.
QFX10008 switch with Enhanced Layer 2 software	PIC **0** provides one-thousand, one-hundred fifty two 10-Gigabit Ethernet interfaces, two-hundred eighty-eight 40-Gbps QSFP+ ports, or two-hundred forty 100-Gigabit Ethernet interfaces.
QFX10016 switch with Enhanced Layer 2 software	PIC **0** provides two-thousand, three-hundred and four 10-Gigabit Ethernet interfaces, five-hundred seventy-six 40-Gbps QSFP+ ports, or four-hundred eighty 100-Gigabit Ethernet interfaces.

- *port*—Interfaces use the following convention for port numbers:

Table 10: Naming Conventions for PORTs

Device with Software Package	Convention
QFX3500 switch with 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 page 239).
QFX3500 switch with 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 Overview" on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
QFX3600 switch with 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" on page 238) and use QSFP+ to four SFP+ copper breakout cables to connect the 10-Gigabit Ethernet ports to other servers, storage, and switches.

Table 10: Naming Conventions for PORTs (continued)

Device with Software Package	Convention
QFX3600 Node device with 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. 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*).
QFX3600 switch with 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 Overview" on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
QFX5100-48S switch with 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 Overview" on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
EX4600 switch with 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 10-Gbps SFP+ 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 Overview" on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
QFX5100-48S switch with 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 Devices" on page 241 for information on how to configure the port mode of 40-Gbps QSFP+ ports.
QFX5100-24Q switch with 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 Overview" on page 190 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 225 for information on how to configure the system mode.

Table 10: Naming Conventions for PORTs (continued)

Device with Software Package	Convention
QFX5100-96S switch with 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 Overview” on page 190 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 225 for information on how to configure the system mode.
QFX5110-48S switch with Enhanced Layer 2 software	PIC **0** can support 48 10-Gigabit Ethernet ports labeled 0 through 47, and 4 QSFP28 ports labeled 48 through 51. These data ports (0 through 47) support either 1-Gbps small form-factor pluggable (SFP) or 10-Gbps small form-factor pluggable plus (SFP+) transceivers. You can also use SFP+ DAC cables and 10-Gbps active optical cables (AOC) in any access port.The default 100-Gigabit Ethernet ports can be configured as 40-Gigabit Ethernet, and in this configuration can either operate as dedicated 40-Gigabit Ethernet ports or can be channelized to 4 independent 10-Gigabit Ethernet ports using copper or fiber breakout cables.
QFX5200-32C switch with Enhanced Layer 2 software	There is support for both quad small-form-factor pluggable (QSFP+) and 28-Gbps QSFP+ (QSFP28) transceivers in the 32 QSFP28 sockets. The QSFP28 ports are configured as 100-Gigabit Ethernet ports by default, but can also be configured to speeds of 50, 40, 25, or 10 Gigabit Ethernet. The 100 Gigabit Ethernet ports can be channelized using breakout cables either to 2 independent downstream 50 Gigabit Ethernet or to 4 independent 25 Gigabit Ethernet ports. The default 100 Gigabit Ethernet ports can also be configured as 40 Gigabit Ethernet and in this configuration can either operate as dedicated 40 Gigabit Ethernet ports or can be channelized to 4 independent 10 Gigabit Ethernet ports using breakout cables. See “Channelizing Interfaces on QFX5200 Switches” on page 231 for information on how to configure and channelize the interfaces. NOTE: Autochannelization is not supported.

Table 10: Naming Conventions for PORTs (continued)

<table>
<tr><th>Device with Software Package</th><th>Convention</th></tr>
<tr><td>QFX10002-36Q switch with Enhanced Layer 2 software</td><td>There are 36 quad small-form factor pluggable plus (QSFP+) ports that support 40-Gigabit Ethernet optical transceivers. Out of these 36 ports, 12 ports are QSFP28 capable, which are dual speed 40- or 100-Gigabit Ethernet optical transceivers.

Each QSFP28 socket can be configured to support:
100-Gigabit Ethernet using 28-Gbps QSFP28 optical transceivers. When a QSFP28 transceiver is inserted into the ports marked with a fine black line underneath the socket and the port is configured for 100-Gigabit Ethernet, the two adjacent ports are disabled and the QSFP28 is enabled for 100-Gigabit Ethernet.
40-Gigabit Ethernet using QSFP+ optical transceivers.
10-Gigabit Ethernet using breakout cables. When configured for channelization, a breakout cable converts the 40-Gigabit Ethernet port into 4 independent 10-Gigabit Ethernet ports.
Any of the 36 ports 0 through 35 can be configured as either uplink or access ports. See “Channelizing Interfaces Overview” on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
Each of the 12 QSFP28 ports support:
100-Gigabit Ethernet QSFP28 transceivers
40-Gigabit Ethernet QSFP+ transceivers
Each of the 36 QSFP+ ports support:
40-Gigabit Ethernet QSFP+ transceivers
Access ports</td></tr>
<tr><td>QFX10002-72Q switch with Enhanced Layer 2 software</td><td>There are 72 quad small-form factor pluggable plus (QSFP+) ports that support 40-Gigabit Ethernet optical transceivers. Out of these 72 ports, 24 ports are QSFP28 capable, which are dual speed 40- or 100-Gigabit Ethernet optical transceivers.

Each QSFP28 socket can be configured to support:
100-Gigabit Ethernet using 28-Gbps QSFP28 optical transceivers. When a QSFP28 transceiver is inserted into the ports marked with a fine black line underneath the socket and the port is configured for 100-Gigabit Ethernet, the two adjacent ports are disabled and the QSFP28 is enabled for 100-Gigabit Ethernet.
40-Gigabit Ethernet using QSFP+ optical transceivers.
10-Gigabit Ethernet using breakout cables. When configured for channelization, a breakout cable converts the 40-Gigabit Ethernet port into 4 independent 10-Gigabit Ethernet ports.
Any of the 72 ports 0 through 71 can be configured as either uplink or access ports. See “Channelizing Interfaces Overview” on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
Each of the 24 QSFP28 ports support:
100-Gigabit Ethernet QSFP28 transceivers
Each of the 72 QSFP+ ports support:
40-Gigabit Ethernet QSFP+ transceivers
Each of the 36 QSFP+ ports support:
40-Gigabit Ethernet QSFP+ transceivers
Access ports
Uplink ports</td></tr>
</table>

Table 10: Naming Conventions for PORTs (continued)

Device with Software Package	Convention

On a QFX10008 switch with Enhanced Layer 2 software, there are two line cards available:
 	
QFX10008 with Line Card QFX10000-36Q (ELS)
	QFX10000-36Q, a 36-port 40-Gigabit Ethernet quad small form-factor pluggable plus transceiver (QSFP+) or 12-port 100GbE QSFP28 line card
	
	The QFX10000-36Q line cards supports
	
	Each QSFP28 socket can be configured to support:
	
	• 100-Gigabit Ethernet using QSFP28 optical transceivers. When a QSFP28 transceiver is inserted into the ports marked with a fine black line underneath the socket and the port is configured for 100-Gigabit Ethernet, the two adjacent ports are disabled and the QSFP28 socket is enabled for 100-Gigabit Ethernet.
	  • 40-Gigabit Ethernet using QSFP+ optical transceivers.
	  • 10-Gigabit Ethernet using breakout cabling and attached optical transceivers. When configured for channelization, the system converts the 40-Gigabit Ethernet port into 4 independent 10-Gigabit Ethernet ports.
	  Any of the 36 ports 0 through 35 can be configured as either uplink or access ports. See “Channelizing Interfaces Overview” on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
	
	Each of the 12 QSFP28 ports supports:
	
	• 100-Gigabit Ethernet QSFP28 transceivers
	• 40-Gigabit Ethernet QSFP+ transceivers
	
	Each of the 12 QSFP28 ports supports:
	
	• 100-Gigabit Ethernet QSFP28 transceivers
	  • 40-Gigabit Ethernet QSFP+ transceivers
	  Each of the 36 QSFP+ ports support:
	  • 40-Gigabit Ethernet QSFP+ transceivers
	  • Access ports
	  • Uplink ports

QFX10008 with Line Card QFX10000-30C and QFX10000-30C-M (ELS)	QFX10000-30C and QFX10000-30C-M, a 30-port 100-Gigabit or 40-Gigabit Ethernet QSFP28 line card
	
	• The QFX10000-30C and QFX10000-30C-M line cards support:
	  Thirty 28-Gbps QSFP+ Pluggable Solution (QSFP28) cages that support either 40-Gigabit Ethernet or 100-Gigabit Ethernet optical transceivers. The QFX10000-30C and QFX10000-30C-M ports auto detect the type of transceiver installed and set the configuration to the appropriate speed.
	  Each QSFP28 socket can be configured to support:
	  • 100-Gigabit Ethernet using QSFP28 optical transceivers. When a QSFP28 transceiver is inserted into the ports marked with a fine black line underneath the socket and the port is configured for 100-Gigabit Ethernet, the two adjacent ports are disabled and the QSFP28 socket is enabled for 100-Gigabit Ethernet.
	  • 40-Gigabit Ethernet using QSFP+ optical transceivers.
	  See “Channelizing Interfaces Overview” on page 190 for information on how to configure and channelize the 40-Gbps QSFP+ ports.
	  Each of the 30 QSFP28 ports supports:
	  • 100-Gigabit Ethernet QSFP28 transceivers
	  • 40-Gigabit Ethernet QSFP+ transceivers
	  • Access ports
	  • Uplink ports

Table 10: Naming Conventions for PORTs (continued)

Device with Software Package	Convention
On a QFX10016 switch running Enhanced Layer 2 software, there are 16 slots, which you can populate with two types line cards: QFX10016 with Line Card QFX10000-36Q (ELS)	• QFX10000-36Q, a 36-port 40-Gigabit Ethernet quad small form-factor pluggable plus transceiver (QSFP+) or 12-port 100GbE QSFP28 line card The QFX10000-36Q line card consists of 36 quad small form-factor pluggable plus (QSFP+) ports that support 40-Gigabit Ethernet optical transceivers. Out of these 36 ports, 12 ports are QSFP28 capable. The QSFP+ ports are dual speed and can support either 40-Gigabit or 100-Gigabit Ethernet optical transceivers. The line card can support 10-Gigabit Ethernet by channelizing the 40-Gigabit ports. Channelization is supported on fiber break-out cable using standard structured cabling techniques. With 100-Gigabit Ethernet using QSFP28 optical transceivers, when a QSFP28 transceiver is inserted into the ports marked with a fine black line underneath the socket and the port is configured for 100-Gigabit Ethernet, the two adjacent ports are disabled and the QSFP28 socket is enabled for 100-Gigabit Ethernet. You can use 40-Gigabit Ethernet using QSFP+ optical transceivers. With 10-Gigabit Ethernet using breakout cabling and attached optical transceivers, when configured for channelization, the system converts the 40-Gigabit Ethernet port into 4 independent 10-Gigabit Ethernet ports. Any of the 36 ports 0 through 35 can be configured as either uplink or access ports. Each of the 12 QSFP28 ports supports: • 100-Gigabit Ethernet QSFP28 transceivers • 40-Gigabit Ethernet QSFP+ transceivers Each of the 36 QSFP+ ports supports: • 40-Gigabit Ethernet QSFP+ transceivers • Access ports You can use 40-Gigabit Ethernet QSFP+ transceivers in any downstream port. • Uplink ports You can configure all the QSFP+ ports as uplinks. Every second and sixth port in a 6XQSFP cage on a QFX10000-36Q supports 100-Gigabit Ethernet using QSFP28 transceivers. These 100-Gigabit Ethernet ports work either as 100-Gigabit Ethernet or as 40-Gigabit Ethernet, but are recognized as 40-Gigabit Ethernet by default. When a 40-Gigabit Ethernet transceiver is inserted into a 100-Gigabit Ethernet port, the port recognizes the 40-Gigabit Ethernet port speed. When a 100-Gigabit Ethernet transceiver is inserted into the port and enabled in the CLI, the port recognizes the 100-Gigabit Ethernet speed and disables two adjacent 40-Gigabit Ethernet ports. You can also use an 100-Gigabit Ethernet transceiver and run it at 40-Gigabit Ethernet by using the CLI to set the port speed to 40-Gigabit Ethernet. The 40-Gigabit Ethernet ports can operate independently, be channelized into four 10-Gigabit Ethernet ports, or bundled with the next two consecutive ports and channelized into twelve 10-Gigabit Ethernet ports as a port range. Only the first and fourth port in each 6XQSFP cage are available to channelize a port range. The port range must be configured using the set chassis fpc pic port channel-speed command. For example, to channelize the first switch port, use the **set chassis fpc 0 pic 0port 1channel-speed 10g** command.

Table 10: Naming Conventions for PORTs (continued)

Device with Software Package	Convention

QFX10016 with Line Card QFX10000-30C and QFX10000-30C-M (ELS)	The QFX10000-30C and QFX10000-30C-M line cards consist of thirty 28-Gbps QSFP+ Pluggable Solution (QSFP28) cages that support either 40-Gigabit Ethernet or 100-Gigabit Ethernet optical transceivers. The QFX10000-30C and QFX10000-30C-M ports auto detect the type of transceiver installed and set the configuration to the appropriate speed.
	
	Each QSFP28 socket supports:
	
	• 100-Gigabit Ethernet using QSFP28 optical transceivers. When a QSFP28 transceiver is inserted into any of the ports, the QSFP28 socket is enabled for 100-Gigabit Ethernet.
	• 40-Gigabit Ethernet using QSFP+ optical transceivers. When a QSFP+ transceiver is inserted into any of the ports, the QSFP+ socket is enabled for 40-Gigabit.
	Any of the 30 ports 0 through 29 can be configured as either uplink or access ports, and of the 30 QSFP28 ports supports:
	  • 100-Gigabit Ethernet QSFP28 transceivers
	  • 40-Gigabit Ethernet QSFP+ transceivers

Logical Part of an Interface Name on a Switch Running QFabric Software Package for QFX series, NFX Series, EX4600, QFabric System

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 for QFX series, NFX Series, EX4600, QFabric System

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 for QFX series, NFX Series, EX4600, QFabric System

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 (" ").

Physical Part of an Interface Name for OCX1100

Interfaces in Junos OS are specified as follows:

type-fpc/pic/port

The convention is as follows:

- *type*—The OCX Series device interfaces use the following media types:
  - **xe**—10-Gigabit Ethernet interface
  - **et**—40-Gigabit Ethernet interface
  - **em**—Management interface
- *fpc*—Flexible PIC Concentrator. OCX Series interfaces use the following convention for the FPC number in interface names:
  - On standalone OCX Series switches, the FPC number is always **0**.

    The FPC number indicates the slot number of the line card that contains the physical interface.
- *pic*—The OCX Series interfaces use the following convention for the PIC (Physical Interface Card) number in interface names:
  - PIC **0** provides six 40-Gbps QSFP+ ports and 48 10-Gigabit Ethernet interfaces.
- *port*—Interfaces use the following convention for port numbers:
  - PIC **0** can support 48 network access ports (10-Gigabit Ethernet ports) labeled 1 through 48 and 6 40-Gbps QSFP+ ports labeled 49 through 54.

Wildcard Characters in Interface Names for OCX1100

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 for Switches on page 4
- Channelizing Interfaces Overview on page 190
- Configuring the System Mode on page 225

- Understanding Management Interfaces on page 45
- Understanding Port Ranges and System Modes on page 200
- *Rear Panel of a QFX3500 Device*
- *Front Panel of a QFX3600 Device*
- *Junos OS Network Interfaces Library for Routing Devices*
- Interfaces Overview for Switches on page 4
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- Interfaces Overview for Switches on page 4
- Understanding Management Interfaces on page 45
- *Junos OS Network Interfaces Library for Routing Devices*

Understanding Interface Ranges for Switches

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 on Juniper Networks EX Series Ethernet switches. 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, 10-Gigabit, and Fast Ethernet interfaces. OCX Series switches do not support 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 node is used in the following configuration hierarchies:

Table 11 on page 23 lists the configuration hierarchies for the EX Series, NFX, OCX, QFX Series, and QFabric Series.

Table 11: Configuration hierarchies for EX Series

Configuration Hierarchies for EX Series	Configuration Hierarchies for EX4600, NFX, QFX Series, and QFabric Systems	Configuration Hierarchies for EX Series with ELS
• 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 • poe interface • protocols dot1x authentication interface • protocols gvrp interface • protocols igmp 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 lldp-med interface • protocols mpls interface • protocols mstp interface • protocols mstp msti-*id* interface • protocols mstp msti-*id* vlan *vlan-id* interface • protocols oam ethernet link-fault-management interface • protocols ospf area • protocols pim interface • protocols rip group *group-name* neighbor • protocols ripng group *group-name* neighbor • protocols router-advertisement interface • protocols router-discovery interface • protocols rsvp interface • protocols sflow interfaces • protocols stp interface • protocols vstp vlan *vlan-id* interface • vlans *vlan-name* interface	• protocols isis interface • protocols sflow interfaces NOTE: These statements are not supported on OCX Series switches.	• forwarding-options analyzer *name* input egress interface • forwarding-options analyzer *name* input ingress interface • poe interface • protocols dot1x authenticator interface • protocols igmp interface • protocols isis interface • protocols layer2-control bpdu-block interface • protocols link-management peer *name* lmp-control-channel • protocols link-management te-link *name* interface • protocols lldp interface • protocols lldp-med interface • protocols mstp interface • protocols oam ethernet link-fault-management interface • protocols ospf area *area-id* interface • protocols pim interface • protocols router-advertisement interface • protocols router-discovery interface • protocols rsvp interface • protocols sflow interfaces • protocols vstp vlan *vlan-id* interface • switch-options redundant-trunk-group *group-name* interface • switch-options voip interface For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

Related Documentation

- Interfaces Overview for Switches on page 4
- Configuring Interface Ranges on page 32
- Interfaces Overview for Switches on page 4
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring a Layer 3 Subinterface (CLI Procedure) on page 266
- *interface-range*
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80
- Configuring Link Aggregation on page 153
- Configuring a Layer 3 Logical Interface on page 270
- *Junos OS Network Interfaces Library for Routing Devices*

Configuring Interface Ranges for EX Series Switches with ELS

NOTE: This task uses Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see "Configuring Interface Ranges" on page 32. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

Junos OS allows you to group a range of identical interfaces into an *interface range*. You first specify the group of identical interfaces in the interface range. Then you can apply a common configuration to the specified interface range, reducing the number of configuration statements required and saving time while producing a compact configuration.

- Configuring Interface Ranges on Switches on page 24
- Expanding Interface Range Member and Member Range Statements on page 27
- Configuration Inheritance for Member Interfaces on page 28
- Member Interfaces Inheriting Configuration from Configuration Groups on page 29
- Interfaces Inheriting Common Configuration on page 30
- Configuring Inheritance Range Priorities on page 30
- Configuration Expansion Where Interface Range Is Used on page 31

Configuring Interface Ranges on Switches

To configure an interface range, include the **interface-range** statement at the **[edit interfaces]** hierarchy level.

The **interface-range** statement accepts only physical networking interface names in its definition.

Interfaces can be grouped either as a range of interfaces or using a number range under the **interface-range** statement definition.

Interfaces in an **interface-range** definition can be added as part of a member range or as individual members or multiple members using a number range.

To specify a member range, use the **member-range** statement at the **[edit interfaces interface-range *name*]** hierarchy level.

To specify interfaces in lexical order, use the **member-range *start-range* to *end-range*** statement.

A range for a member statement must contain the following:

- *****—All, specifies sequential interfaces from 0 through 47.

> CAUTION: The wildcard * in a member statement does not take into account the interface numbers supported by a specific interface type. Irrespective of the interface type, * includes interface numbers ranging from 0 through 47 to the interface group. Therefore, use * in a member statement with caution.

- **num**—Number; specifies one specific interface by its number.
- **[low-high]**—Numbers between low to high; specifies a range of sequential interfaces.
- **[num1, num2, num3]**—Numbers **num1**, **num2**, and **num3** specify multiple specific interfaces.

Example: Specifying an Interface Range Member Range

```
member-range ge-0/0/0 to ge-4/0/40;
```

To specify one or multiple members, use the **member** statement at the **[edit interfaces interface-range *name*]** hierarchy level.

To specify the list of interface range members individually or for multiple interfaces using regex, use the **member *list of interface names*** statement.

Example: Specifying an Interface Range Member

```
member ge-0/0/0;
member ge-0/*/*
member ge-0/[1-10]/0;
member ge-0/[1,2,3]/3;
```

Regex or wildcards are not supported for interface-type prefixes. For example, prefixes **ge**, **fe**, and **xe** must be mentioned explicitly.

An **interface-range** definition can contain both **member** and **member-range** statements within it. There is no maximum limit on the number of **member** or **member-range** statements within an interface-range. However, at least one **member** or **member-range** statement must exist within an **interface-range** definition.

Example: Interface Range Common Configuration

Configuration common to an interface range can be added as a part of the **interface-range** definition, as follows:

```
[edit]
interfaces {
   + interface-range foo {
   + member-range ge-1/0/0 to ge-4/0/40;
   + member ge-0/1/1;
   + member ge-5/[1-10]/*;
     /*Common configuration is added as part of interface-range definition*/
     mtu 256;
     hold-time up 10;
     ether-options {
        flow-control;
        speed {
           100m;
        }
        802.3ad primary;
     }
   }
}
```

An **interface-range** definition having just **member** or **member-range** statements and no common configurations statements is valid.

These defined interface ranges can be used in other configuration hierarchies, in places where an **interface** node exists.

Example: Interface-Range foo Used Under the Protocols Hierarchy

```
protocols {
   dot1x {
      authenticator {
         interface foo{
            retries 1;
         }
      }
   }
}
```

foo should be an **interface-range** defined at the **[interfaces]** hierarchy level. In the above example, the **interface** node can accept both individual interfaces and interface ranges.

TIP: **To view an interface range in expanded configuration, use the (show | display inheritance) command. For more information, see the *CLI User Guide*.**

The defined interface ranges can be used at places where the interface node is used. To view the configuration hierarchies, see "Understanding Interface Ranges for Switches" on page 22.

See Also

- Understanding Interface Ranges for Switches on page 22

Expanding Interface Range Member and Member Range Statements

All **member** and **member-range** statements in an interface range definition are expanded to generate the final list of interface names for the specified interface range.

Example: Expanding Interface Range Member and Member Range Statements

```
[edit]
  interfaces {
  interface-range range-1 {
    member-range ge-0/0/0 to ge-4/0/20;
    member ge-10/1/1;
    member ge-5/[0-5]/*;
    /*Common configuration is added part of the interface-range definition*/
    mtu 256;
    hold-time up 10;
    ether-options {
      flow-control;
      speed {
        100m;
      }
      802.3ad primary;
    }
  }
}
```

For the **member-range** statement, all possible interfaces between **start-range** and **end-range** are considered in expanding the members. For example, the following **member-range** statement:

member-range ge-0/0/0 to ge-4/0/20

expands to:

```
[ge-0/0/0, ge-0/0/1 ... ge-0/0/max_ports
 ge-0/1/0  ge-0/1/1 ... ge-0/1/max_ports
 ge-0/2/0  ge-0/2/1 ... ge-0/2/max_ports
                     .
                     .
 ge-0/MAX_PICS/0 ... ge-0/max_pics/max_ports
 ge-1/0/0  ge-1/0/1 ... ge-1/0/max_ports
                     .
 ge-1/MAX_PICS/0 ... ge-1/max_pics/max_ports
                     .
                     .
 ge-4/0/0 ge-4/0/1  ... ge-4/0/max_ports]
```

The following **member** statement:

ge-5/[0-5]/*

expands to:

```
ge-5/0/0 ... ge-5/0/max_ports
ge-5/1/0 ... ge-5/0/max_ports
    .
     .
ge-5/5/0 ... ge-5/5/max_ports
```

The following **member** statement:

ge-5/1/[2,3,6,10]

expands to:

```
ge-5/1/2
ge-5/1/3
ge-5/1/6
ge-5/1/10
```

See Also

- *Physical Interfaces*

Configuration Inheritance for Member Interfaces

When the Junos OS expands the **member** and **member-range** statements present in an **interface-range**, it creates *interface objects* if they are not explicitly defined in the configuration. The common configuration is copied to all its member interfaces in the **interface-range**.

Example: Configuration Priorities

Foreground interface configuration takes priority compared to configuration inherited by the interface through the **interface-range**.

```
interfaces {
  interface-range range-1 {
    member-range ge-1/0/0/ to ge-10/0/47;
    mtu 256;
    }
    ge-1/0/1 {
      mtu 1024;
    }
}
```

In the preceding example, interface **ge-1/0/1** will have an MTU value of 1024.

This can be verified with output of the **show interfaces | display inheritance** command, as follows:

```
user@host: # show interfaces | display inheritance
## 'ge-1/0/0' was expanded from interface-range 'range-1'
##
ge-1/0/0 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
ge-1/0/1 {
    mtu 1024;
}
##
## 'ge-1/0/2' was expanded from interface-range 'range-1'
##
ge-1/0/2 {
    ##
    ## '256' was expanded from interface-range 'range-1'
```



```
    ##
    mtu 256;
}
      .........
      .........
##
## 'ge-10/0/47' was expanded from interface-range 'range-1'
##
ge-10/0/47 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
```

See Also

- *Physical Interfaces*

Member Interfaces Inheriting Configuration from Configuration Groups

Interface range member interfaces inherit the config-groups configuration like any other foreground configuration. **interface-range** is similar to any other foreground configuration statement. The only difference is that the **interface-range** goes through a member interfaces expansion before Junos OS reads this configuration.

```
groups {
  global {
    interfaces {
      <*> {
        hold-time up 10;
      }
    }
  }
  apply-groups [global];
  interfaces {
    interface-range range-1 {
      member-range ge-1/0/0 to ge-10/0/47;
      mtu 256;
    }
  }
}
```

The **hold-time** configuration is applied to all members of **interface-range** ***range-1***.

This can be verified with **show interfaces | display inheritance** as follows:

```
user@host# show interfaces | display inheritance
ge-1/0/0 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
    ##
    ## 'hold-time' was inherited from group 'global'
    ## '10' was inherited from group 'global'
    ##
    hold-time up 10;
}
```

```
ge-1/0/1 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
    ##
    ## 'hold-time' was inherited from group 'global'
    ## '10' was inherited from group 'global'
    ##
    hold-time up 10;
}
ge-10/0/47 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
    ##
    ## 'hold-time' was inherited from group 'global'
    ## '10' was inherited from group 'global'
    ##
    hold-time up 10;
}
```

See Also

- *Using Wildcards with Configuration Groups*

Interfaces Inheriting Common Configuration

If an interface is a member of several interface ranges, that interface will inherit the common configuration from all of those interface ranges.

```
[edit]
interfaces {
  interface-range range-1 {
    member-range ge-1/0/0 to ge-10/0/47;
    mtu 256;
  }
  }
  interfaces {
    interface-range range-1 {
      member-range ge-10/0/0 to ge-10/0/47;
      hold-time up 10;
    }
  }
```

In this example, interfaces **ge-10/0/0** through **ge-10/0/47** will have both **hold-time** and **mtu**.

Configuring Inheritance Range Priorities

The interface ranges are defined in the order of inheritance priority, with the first interface range configuration data taking priority over subsequent interface ranges.

```
[edit]
interfaces {
  interface-range int-grp-one {
    member-range ge-0/0/0 to ge-4/0/40;
    member ge-1/1/1;
```

```
    /*Common config is added part of the interface-range definition*/
    mtu 256;
    hold-time up 10;
  }
  }
  interfaces {
    interface-range int-grp-two {
      member-range ge-5/0/0 to ge-10/0/40;
      member ge-1/1/1;
      mtu 1024;
    }
  }
```

Interface **ge-1/1/1** exists in both **interface-range** ***int-grp-one*** and **interface-range** ***int-grp-two***. This interface inherits **mtu** ***256*** from **interface-range** ***int-grp-one*** because it was defined first.

See Also

- *Physical Interfaces*

Configuration Expansion Where Interface Range Is Used

In this example, **interface-range** ***range-1*** is used under the **protocols** hierarchy:

```
[edit]
interfaces {
  interface-range range-1 {
    member ge-10/1/1;
    member ge-5/5/1;
    mtu 256;
    hold-time up 10;
    ether-options {
      flow-control;
      speed {
        100m;
      }
      802.3ad primary;
    }
  }
  protocols {
    dot1x {
      authenticator {
        interface range-1 {
          retries 1;
        }
      }
    }
  }
}
```

The **interface** node present under **authenticator** is expanded into member interfaces of the **interface-range** ***range-1*** as follows:

```
protocols {
  dot1x {
    authenticator {
```

```
            interface ge-10/1/1 {
                retries 1;
            }
            interface ge-5/5/1 {
                retries 1;
            }
        }
    }
}
```

The **interface** ***range-1*** statement is expanded into two interfaces, ge-10/1/1 and ge-5/5/1, and configuration **retries** ***1*** is copied under those two interfaces.

This configuration can be verified using the **show protocols dot1x | display inheritance** command.

See Also

- *Physical Interfaces*

Configuring Interface Ranges

NOTE: This task uses Junos OS for EX Series switches that does not support the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that supports ELS, see “Configuring Interface Ranges for EX Series Switches with ELS” on page 24. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

The Junos OS allows you to group a range of identical interfaces into an *interface range*. You first specify the group of identical interfaces in the interface range. Then you can apply a common configuration to the specified interface range, reducing the number of configuration statements required and saving time while producing a compact configuration.

- Configuring Interface Ranges on page 32
- Expanding Interface Range Member and Member Range Statements on page 36
- Configuration Inheritance for Member Interfaces on page 38
- Member Interfaces Inheriting Configuration from Configuration Groups on page 39
- Interfaces Inheriting Common Configuration on page 40
- Configuring Inheritance Range Priorities on page 40
- Configuration Expansion Where Interface Range Is Used on page 41

Configuring Interface Ranges

To configure an interface range, include the **interface-range** statement at the **[edit interfaces]** hierarchy level.

The **interface-range** statement accepts only physical networking interface names in its definition. The following interface types are supported and example CLI descriptors are shown:

- ATM—**at-*fpc/pic/port***
- Channelized—**(coc | cstm)*n-fpc/pic/port***
- DPC—**xe-*fpc/pic/port***
- E1/E3—**(e1 | e3)-*fpc/pic/port***
- Ethernet—**(xe | ge | fe)-*fpc/pic/port***
- ISDN—**isdn-*fpc/pic/port***
- Serial—**se-*fpc/pic/port***
- SONET/SDH—**so-*fpc/pic/port***
- T1/T3—**(t1 | t3)-*fpc/pic/port***

Interfaces can be grouped either as a range of interfaces or using a number range under the **interface-range** statement definition.

Interfaces in an **interface-range** definition can be added as part of a member range or as individual members or multiple members using a number range.

To specify a member range, use the **member-range** statement at the **[edit interfaces interface-range *name*]** hierarchy level.

To specify interfaces in lexical order, use the **member-range *start-range* to *end-range*** statement.

A range for a member statement should contain the following:

- *****—All, specifies sequential interfaces from 0 through 47.

CAUTION: The wildcard * in a member statement does not take into account the interface numbers supported by a specific interface type. Irrespective of the interface type, * includes interface numbers ranging from 0 through 47 to the interface group. Therefore, use * in a member statement with caution.

- **num**—Number, specifies one specific interface by its number.
- **[low-high]**—Numbers between low to high, specifies a range of sequential interfaces.
- **[num1, num2, num3]**—Numbers **num1**, **num2**, and **num3** specify multiple specific interfaces.

Example: Specifying an Interface Range Member Range

```
member-range ge-0/0/0 to ge-4/0/40;
```

To specify one or multiple members, use the **member** statement at the **[edit interfaces interface-range *name*]** hierarchy level.

To specify the list of interface range members individually or for multiple interfaces using regex, use the **member *list of interface names*** statement.

Example: Specifying an Interface Range Member

```
member ge-0/0/0;
member ge-0/*/*
member ge-0/[1-10]/0;
member ge-0/[1,2,3]/3;
```

Regex or wildcards are not supported for interface-type prefixes. For example, prefixes **ge**, **fe**, and **xe** must be mentioned explicitly.

An **interface-range** definition can contain both **member** and **member-range** statements within it. There is no maximum limit on the number of **member** or **member-range** statements within an interface-range. However, at least one **member** or **member-range** statement must exist within an **interface-range** definition.

Example: Interface Range Common Configuration

Configuration common to an interface range can be added as a part of the **interface-range** definition, as follows:

```
[edit]
interfaces {
   + interface-range foo {
   + member-range ge-1/0/0 to ge-4/0/40;
   + member ge-0/1/1;
   + member ge-5/[1-10]/*;
      /*Common configuration is added as part of interface-range definition*/
      mtu 256;
      hold-time up 10;
      ether-options {
         flow-control;
         speed {
            100m;
         }
         802.3ad primary;
      }
   }
}
```

An **interface-range** definition having just **member** or **member-range** statements and no common configurations statements is valid.

These defined interface ranges can be used in other configuration hierarchies, in places where an **interface** node exists.

Example: Interface-Range foo Used Under the Protocols Hierarchy

```
protocols {
   dot1x {
      authenticator {
         interface foo{
            retries 1;
         }
      }
   }
```



```
}
```

foo should be an **interface-range** defined at the **[interfaces]** hierarchy level. In the above example, the **interface** node can accept both individual interfaces and interface ranges.

TIP: To view an interface range in expanded configuration, use the **(show | display inheritance)** command. For more information, see the *CLI User Guide*.

By default, **interface-range** is not available to configure in the CLI where the **interface** statement is available. The following locations are supported; however, some of the hierarchies shown in this list are product specific:

- **protocols dot1x authentication interface**
- **protocols dvmrp interface**
- **protocols oam ethernet lmi interface**
- **protocols esis interface**
- **protocols igmp interface**
- **protocols igmp-host client *num* interface**
- **protocols mld-host client *num* interface**
- **protocols router-advertisement interface**
- **protocols isis interface**
- **protocols ldp interface**
- **protocols oam ethernet link-fault-management interface**
- **protocols lldp interface**
- **protocols link-management peer lmp-control-channel interface**
- **protocols link-management peer control-channel**
- **protocols link-management te-link *name* interface**
- **protocols mld interface**
- **protocols ospf area *id* interface**
- **protocols pim interface**
- **protocols router-discovery interface**
- **protocols rip group *name* neighbour**
- **protocols ripng group *name* neighbour**
- **protocols rsvp interface**
- **protocols snmp interface**
- **protocols layer2-control bpdu-block interface**

- **protocols layer2-control mac-rewrite interface**
- **protocols mpls interface**
- **protocols stp interface**
- **protocols rstp interface**
- **protocols mstp interface**
- **protocols vstp interface**
- **protocols mstp msti *id* interface**
- **protocols mstp msti vlan *id* interface**
- **protocols vstp vlan *name* interface**
- **protocols gvrp interface**
- **protocols igmp-snooping vlan *name* interface**
- **protocols lldp interface**
- **protocols lldp-med interface**
- **protocols sflow interfaces**
- **ethernet-switching-options analyzer *name* input [egress | ingress] interface**
- **ethernet-switching-options analyzer *name* output interface**
- **ethernet-switching-options secure-access-port interface**
- **ethernet-switching-options interfaces ethernet-switching-options voip interface**
- **ethernet-switching-options redundant-trunk-group group g1 interface**
- **ethernet-switching-options redundant-trunk-group group g1 interface**
- **ethernet-switching-options bpdu-block interface**
- **poe interface vlans pro-bng-mc1-bsd1 interface**

See Also

- Expanding Interface Range Member and Member Range Statements on page 27
- Configuration Inheritance for Member Interfaces on page 28
- Member Interfaces Inheriting Configuration from Configuration Groups on page 29
- Interfaces Inheriting Common Configuration on page 30
- Configuring Inheritance Range Priorities on page 30
- Configuration Expansion Where Interface Range Is Used on page 31

- *Physical Interfaces*

Expanding Interface Range Member and Member Range Statements

All **member** and **member-range** statements in an interface range definition are expanded to generate the final list of interface names for the specified interface range.

Example: Expanding Interface Range Member and Member Range Statements

```
[edit]
  interfaces {
  interface-range range-1 {
    member-range ge-0/0/0 to ge-4/0/20;
    member ge-10/1/1;
    member ge-5/[0-5]/*;
    /*Common configuration is added part of the interface-range definition*/
    mtu 256;
    hold-time up 10;
    ether-options {
      flow-control;
      speed {
        100m;
      }
      802.3ad primary;
    }
  }
}
```

For the **member-range** statement, all possible interfaces between **start-range** and **end-range** are considered in expanding the members. For example, the following **member-range** statement:

member-range ge-0/0/0 to ge-4/0/20

expands to:

```
[ge-0/0/0, ge-0/0/1 ... ge-0/0/max_ports
 ge-0/1/0  ge-0/1/1 ... ge-0/1/max_ports
 ge-0/2/0  ge-0/2/1 ... ge-0/2/max_ports
                     .
                     .
 ge-0/MAX_PICS/0 ... ge-0/max_pics/max_ports
 ge-1/0/0  ge-1/0/1 ... ge-1/0/max_ports
                     .
 ge-1/MAX_PICS/0 ... ge-1/max_pics/max_ports
                     .
                     .
 ge-4/0/0 ge-4/0/1  ... ge-4/0/max_ports]
```

The following **member** statement:

ge-5/[0-5]/*

expands to:

```
ge-5/0/0 ... ge-5/0/max_ports
ge-5/1/0 ... ge-5/0/max_ports
    .
     .
ge-5/5/0 ... ge-5/5/max_ports
```

The following **member** statement:

ge-5/1/[2,3,6,10]

expands to:


```
ge-5/1/2
ge-5/1/3
ge-5/1/6
ge-5/1/10
```

See Also

- *Physical Interfaces*

Configuration Inheritance for Member Interfaces

When the Junos OS expands the **member** and **member-range** statements present in an **interface-range**, it creates *interface objects* if they are not explicitly defined in the configuration. The common configuration is copied to all its member interfaces in the **interface-range**.

Example: Configuration Priorities

Foreground interface configuration takes priority compared to configuration inherited by the interface through the **interface-range**.

```
interfaces {
  interface-range range-1 {
    member-range ge-1/0/0/ to ge-10/0/47;
    mtu 256;
    }
    ge-1/0/1 {
      mtu 1024;
    }
}
```

In the preceding example, interface **ge-1/0/1** will have an MTU value of 1024.

This can be verified with output of the **show interfaces | display inheritance** command, as follows:

```
user@host: # show interfaces | display inheritance
## 'ge-1/0/0' was expanded from interface-range 'range-1'
##
ge-1/0/0 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
ge-1/0/1 {
    mtu 1024;
}
##
## 'ge-1/0/2' was expanded from interface-range 'range-1'
##
ge-1/0/2 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
      .........
      .........
##
```



```
## 'ge-10/0/47' was expanded from interface-range 'range-1'
##
ge-10/0/47 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
```

See Also

- *Physical Interfaces*

Member Interfaces Inheriting Configuration from Configuration Groups

Interface range member interfaces inherit the config-groups configuration like any other foreground configuration. **interface-range** is similar to any other foreground configuration statement. The only difference is that the **interface-range** goes through a member interfaces expansion before Junos OS reads this configuration.

```
groups {
  global {
    interfaces {
      <*> {
        hold-time up 10;
      }
    }
  }
  apply-groups [global];
  interfaces {
    interface-range range-1 {
      member-range ge-1/0/0 to ge-10/0/47;
      mtu 256;
    }
  }
}
```

The **hold-time** configuration is applied to all members of **interface-range** ***range-1***.

This can be verified with **show interfaces | display inheritance** as follows:

```
user@host# show interfaces | display inheritance
ge-1/0/0 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
    ##
    ## 'hold-time' was inherited from group 'global'
    ## '10' was inherited from group 'global'
    ##
    hold-time up 10;
}
ge-1/0/1 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
    ##
```



```
        ## 'hold-time' was inherited from group 'global'
        ## '10' was inherited from group 'global'
        ##
        hold-time up 10;
    }
    ge-10/0/47 {
        ##
        ## '256' was expanded from interface-range 'range-1'
        ##
        mtu 256;
        ##
        ## 'hold-time' was inherited from group 'global'
        ## '10' was inherited from group 'global'
        ##
        hold-time up 10;
    }
```

See Also

- *Using Wildcards with Configuration Groups*

Interfaces Inheriting Common Configuration

If an interface is a member of several interface ranges, that interface will inherit the common configuration from all of those interface ranges.

```
[edit]
interfaces {
  interface-range range-1 {
    member-range ge-1/0/0 to ge-10/0/47;
    mtu 256;
  }
  }
  interfaces {
    interface-range range-1 {
      member-range ge-10/0/0 to ge-10/0/47;
      hold-time up 10;
    }
  }
```

In this example, interfaces **ge-10/0/0** through **ge-10/0/47** will have both **hold-time** and **mtu**.

Configuring Inheritance Range Priorities

The interface ranges are defined in the order of inheritance priority, with the first interface range configuration data taking priority over subsequent interface ranges.

```
[edit]
interfaces {
  interface-range int-grp-one {
    member-range ge-0/0/0 to ge-4/0/40;
    member ge-1/1/1;
    /*Common config is added part of the interface-range definition*/
    mtu 256;
    hold-time up 10;
  }
  }
```

```
interfaces {
   interface-range int-grp-two {
      member-range ge-5/0/0 to ge-10/0/40;
      member ge-1/1/1;
      mtu 1024;
   }
}
```

Interface **ge-1/1/1** exists in both **interface-range** ***int-grp-one*** and **interface-range** ***int-grp-two***. This interface inherits **mtu** ***256*** from **interface-range** ***int-grp-one*** because it was defined first.

See Also

- *Physical Interfaces*

Configuration Expansion Where Interface Range Is Used

In this example, **interface-range** ***range-1*** is used under the **protocols** hierarchy:

```
[edit]
interfaces {
   interface-range range-1 {
      member ge-10/1/1;
      member ge-5/5/1;
      mtu 256;
      hold-time up 10;
      ether-options {
         flow-control;
         speed {
            100m;
         }
         802.3ad primary;
      }
   }
   protocols {
      dot1x {
         authenticator {
            interface range-1 {
               retries 1;
            }
         }
      }
   }
}
```

The **interface** node present under **authenticator** is expanded into member interfaces of the **interface-range** ***range-1*** as follows:

```
protocols {
   dot1x {
      authenticator {
         interface ge-10/1/1 {
            retries 1;
         }
         interface ge-5/5/1 {
            retries 1;
```

```
            }
          }
        }
      }
```

The **interface** ***range-1*** statement is expanded into two interfaces, ge-10/1/1 and ge-5/5/1, and configuration **retries** ***1*** is copied under those two interfaces.

This configuration can be verified using the **show protocols dot1x | display inheritance** command.

See Also

- *Physical Interfaces*

Related Documentation

- *Physical Interfaces*

Configuring the Interface Address

You assign an address to an interface by specifying the address when configuring the protocol family. For the **inet** or **inet6** family, configure the interface IP address. For the **iso** family, configure one or more addresses for the loopback interface. For the **ccc**, **ethernet-switching**, **tcc**, **mpls**, **tnp**, and **vpls** families, you never configure an address.

NOTE: The point-to-point (PPP) address is taken from the loopback interface address that has the primary attribute. When the loopback interface is configured as an unnumbered interface, it takes the primary address from the donor interface.

To assign an address to an interface, perform the following steps:

1. Configure the interface address at the **[edit interfaces *interface-name* unit *logical-unit-number* family *family*]** hierarchy level.

   - To configure an IPv4 address on routers and switches running Junos OS, use the **interface *interface-name* unit *number* family inet address *a.b.c.d/nn*** statement at the **[edit interfaces]** hierarchy level.

     ```
     [edit interfaces ]
     user@host# set interface-name unit logical-unit-number family inet address a.b.c.d/nn
     ```

     NOTE:
     - Juniper Networks routers and switches support /31 destination prefixes when used in point-to-point Ethernet configurations; however, they are not supported by many other devices, such as hosts, hubs, routers, or switches. You must determine if the peer system also supports /31 destination prefixes before configuration.
     - You can configure the same IPv4 address on multiple physical interfaces. When you assign the same IPv4 address to multiple physical interfaces, the operational behavior of those interfaces differs, depending on whether they are implicitly or explicitly point-to-point .
     - By default, all interfaces are assumed to be point-to-point (PPP) interfaces. For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, you can explicitly configure an interface to be a point-to-point connection.
     - If you configure the same IP address on multiple interfaces in the same routing instance, Junos OS uses only the first configuration. The remaining IP address configurations are ignored, leaving some interfaces without an assigned address. Interfaces without an assigned address cannot be used as a donor interface for an unnumbered Ethernet interface.

   - To configure an IPv6 address on routers and switches running Junos OS, use the **interface *interface-name* unit *number* family inet6 address *aaaa:bbbb:...:zzzz/nn*** statement at the **[edit interfaces]** hierarchy level.

     ```
     [edit interfaces ]
     user@host# set interface-name unit logical-unit-number family inet6 address
       aaaa:bbbb:...:zzzz/nn
     ```

     NOTE:
     - You represent IP version 6 (IPv6) addresses in hexadecimal notation using a colon-separated list of 16-bit values. The double colon (::) represents all bits set to 0.
     - You must manually configure the router or switch advertisement and advertise the default prefix for autoconfiguration to work on a specific interface.

2. [Optional] Set the broadcast address on the network or subnet .

   [edit interfaces *interface-name* unit *logical-unit-number* family *family* address *address*],
   user@host# **set broadcast *address***

   NOTE: The broadcast address must have a host portion of either all ones or all zeros. You cannot specify the addresses 0.0.0.0 or 255.255.255.255

3. [Optional] specify the remote address of the connection for the encrypted, PPP-encapsulated, and tunnel interfaces.

   [edit logical-systems *logical-system-name* interfaces *interface-name* unit
   logical-unit-number family *family* address *address*]
   user@host# **set destination *address***

4. [Optional] For interfaces that carry IP version 6 (IPv6) traffic, configure the host to assign iteslf a unique 64-Bit IP Version 6 interface identifier (EUI-64).

   [edit logical-systems *logical-system-name* interfaces *interface-name* unit
   logical-unit-number family *family* address *address*]
   user@host# **set eui-64**

Related Documentation

- *Configuring Default, Primary, and Preferred Addresses and Interfaces*

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 management interfaces, 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 (and platform support depends on the Junos OS release in your installation):

- 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, QFX5200, 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.
- On QFX10002 and QFX10008 switches, there is one RJ-45 management interface (labeled **MGMT** and one SFP management interface (labeled **MGMT**), and they correspond to em0 and em1. Although the CLI permits you to configure two management Ethernet interfaces within the same subnet, only one interface is usable and supported.
- On OCX Series switches:

  There is one RJ-45 management interface (labeled **MGMT**), which corresponds to em0. The em0 interface always has the status **up** in show command outputs, even if the physical port is empty. The me0 interface is a virtual interface between Junos and the host operating system, therefore its status is independent from the status of the physical port.

- 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 for Switches on page 4

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 for EX4600 and QFX Series Switches on page 69

Configuring Short Reach Mode

You can enable short-reach mode for individual as well as a range of copper-based 10-Gigabit Ethernet interfaces using short cable lengths (less than 10m) on the QFX5100-48T switch. Short-reach mode reduces power consumption up to 5W on these interfaces.

1. To enable short-reach mode on an individual interface, issue the following command:

   [edit chassis]
   user@switch# **set fpc *fpc-slot* pic *pic-slot* port *port-number* short-reach-mode enable**

   For example, to enable short-reach mode on port 0 on PIC 0, issue the following command:

   [edit chassis]
   user@switch# **set fpc 0 pic 0 port 0 short-reach-mode enable**

2. To enable short-reach mode on a range of interfaces, issue the following command:

   [edit chassis]
   user@switch# **set fpc *fpc-slot* pic *pic-slot* port-range *port-range-low port-range-high* short-reach-mode enable**

   For example, to enable short-reach mode on a range of interfaces between port 0 and port 47 on PIC 0, issue the following command:

   [edit chassis]
   user@switch# **set fpc 0 pic 0 port-range 0 47 short-reach-mode enable**

3. To disable short-reach mode on an individual interface, issue the following command:

   [edit chassis]
   user@switch# **set fpc *fpc-slot* pic *pic-slot* port *port-number* short-reach-mode disable**

   For example, to disable short-reach mode on port 0 on PIC 0, issue the following command:

   [edit chassis]
   user@switch# **set fpc 0 pic 0 port 0 short-reach-mode disable**

4. To disable short-reach mode on a range of interfaces, issue the following command:

   [edit chassis]
   user@switch# **set fpc *fpc-slot* pic *pic-slot* port-range *port-range-low port-range-high* short-reach-mode disable**

   For example, to disable short-reach mode on a range of interfaces between port 0 and port 47 on PIC 0, issue the following command:

   [edit chassis]
   user@switch# **set fpc 0 pic 0 port-range 0 47 short-reach-mode disable**

Related Documentation

- short-reach-mode on page 585

Configuring an LPM Table With Junos OS Release 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 12 on page 51 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 12: 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 13 on page 52 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 13: 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

- *Configuring the Unified Forwarding Table on Switches*

Adding a Logical Unit Description to the Configuration

You can include a text description of each logical unit in the configuration file. 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 impact on the interface's configuration. To add a text description, include the **description** statement:

```
description text;
```

You can include this statement at the following hierarchy levels:

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

The description can be a single line of text. If the text contains spaces, enclose it in quotation marks.

NOTE: You can configure the extended DHCP relay to include the interface description in the option 82 Agent Circuit ID suboption. See "*Using DHCP Relay Agent Option 82 Information*" in the *Junos OS Broadband Subscriber Management and Services Library*.

For information about describing physical interfaces, see *Configuring Interface Description*.

Damping Shorter Physical Interface Transitions

By default, when an interface changes from being up to being down, or from down to up, this transition is advertised immediately to the hardware and Junos OS. In some situations—for example, when an interface is connected to an add/drop multiplexer (ADM) or wavelength-division multiplexer (WDM), or to protect against SONET/SDH framer holes—you might want to damp interface transitions. This means not advertising the interface's transition until a certain period of time has passed, called the *hold-time*. When you have damped interface transitions and the interface goes from up to down, the down hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still *down*, then the router begins to advertise the interface as being down. Similarly, when an interface goes from down to up, the up hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still *up*, then the router begins to advertise the interface as being up. For information about physical interface damping, see *Physical Interface Damping Overview*.

This task applies to damping shorter physical interface transitions in milliseconds. To damp longer physical interface transitions in seconds, see *Damping Longer Physical Interface Transitions*.

To configure damping of shorter physical interface transitions:

1. Select the interface to damp, where the interface name is ***interface-type-fpc/pic/port***:

   [edit]
   user@host# **edit interfaces *interface-name***

2. Configure the hold-time for link up and link down.

   [edit interfaces *interface-name*]
   user@host# **set hold-time up *milliseconds* down *milliseconds***

The hold time can be a value from 0 through 4,294,967,295 milliseconds. The default value is 0, which means that interface transitions are not damped. Junos OS advertises the transition within 100 milliseconds of the time value you specify.

For most Ethernet interfaces, hold timers are implemented using a one-second polling algorithm. For 1-port, 2-port, and 4-port Gigabit Ethernet interfaces with small form-factor pluggable transceivers (SFPs), hold timers are interrupt-driven.

NOTE: **The hold-time option is not available for controller interfaces.**

Related Documentation

- *Physical Interface Damping Overview*
- *Damping Longer Physical Interface Transitions*
- *SONET/SDH Defect Hold Times for Damping Interface Transitions Overview*

- *Configuring SONET/SDH Defect Triggers*
- **hold-time on page 424**

Disabling a Physical Interface

- Disabling a Physical Interface on page 54
- Example: Disabling a Physical Interface on page 54
- Effect of Disabling Interfaces on T series PICs on page 55

Disabling a Physical Interface

You can disable a physical interface, marking it as being down, without removing the interface configuration statements from the configuration.

CAUTION: Dynamic subscribers and logical interfaces use physical interfaces for connection to the network. The Junos OS allows you to set the interface to disable and commit the change while dynamic subscribers and logical interfaces are still active. This action results in the loss of all subscriber connections on the interface. Use care when disabling interfaces.

To disable a physical interface:

1. In configuration mode, go to **[edit interfaces *interface-name*]** hierarchy level.

   ```
   [edit]
   user@host# edit interfaces ge-fpc/pic/port
   ```

2. Include the **disable** statement.

   ```
   [edit interfaces at-fpc/pic/port ]
   user@host# set disable
   ```

NOTE: On the router, when you use the **disable** statement at the **edit interfaces** hierarchy level, depending on the PIC type, the interface might or might not turn off the laser. Older PIC transceivers do not support turning off the laser, but newer Gigabit Ethernet PICs with SFP and XFP transceivers do support it and the laser will be turned off when the interface is disabled.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

Example: Disabling a Physical Interface

Sample interface configuration:


```
[edit interfaces]
user@host# show
ge-0/3/2 {
  unit 0 {
    description CE2-to-PE1;
    family inet {
      address 20.1.1.6/24;
    }
  }
}
```

Disabling the interface:

```
[edit interfaces ge-0/3/2]
user@host# set disable
```

Verifying the interface configuration:

```
[edit interfaces ge-0/3/2]
user@host# show
disable; # Interface is marked as disabled.
  unit 0 {
  description CE2-to-PE1;
    family inet {
      address 20.1.1.6/24;
    }
}
```

Effect of Disabling Interfaces on T series PICs

The following table describes the effect of using the **set interfaces disable** ***interface_name*** statement on T series PICs.

Table 14: Effect of set interfaces disable <interface_name> on T series PICs

PIC Model Number	PIC Description	Type of PIC	Behaviour
PF-12XGE-SFPP	10-Gigabit Ethernet LAN/WAN PIC with SFP+ (T4000 Router)	5	Tx laser disabled
PF-24XGE-SFPP	10-Gigabit Ethernet LAN/WAN PIC with Oversubscription and SFP+ (T4000 Router)	5	Tx laser disabled
PF-1CGE-CFP	100-Gigabit Ethernet PIC with CFP (T4000 Router)	5	Tx laser disabled
PD-4XGE-XFP	10-Gigabit Ethernet, 4-port LAN/WAN XFP	4	Tx laser disabled
PD-5-10XGE-SFPP	10-Gigabit LAN/WAN with SFP+	4	Tx laser disabled
PD-1XLE-CFP	40-Gigabit with CFP	4	Tx laser disabled
PD-1CE-CFP-FPC4	100-Gigabit with CFP	4	Tx laser disabled
PD-TUNNEL	40-Gigabit Tunnel Services	4	NA

Table 14: Effect of set interfaces disable <interface_name> on T series PICs (continued)

PIC Model Number	PIC Description	Type of PIC	Behaviour
PD-4OC192-SON-XFP	OC192/STM64, 4-port XFP	4	Tx laser not disabled
PD-1OC768-SON-SR	OC768c/STM256, 1-port	4	Tx laser not disabled

Related Documentation

• disable on page 413

Disabling a Logical Interface

You can unconfigure a logical interface, effectively disabling that interface, without removing the logical interface configuration statements from the configuration. To do this, include the **disable** statement:

```
disable;
```

You can include this statement at the following hierarchy levels:

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

When an interface is disabled, a route (pointing to the reserved target "**REJECT**") with the IP address of the interface and a 32–bit subnet mask is installed in the routing table. See *Routing Protocols*.

Enabling or Disabling SNMP Notifications on Physical Interfaces

By default, Simple Network Management Protocol (SNMP) notifications are sent when the state of an interface or a connection changes. You can enable or disable these notification based on you requirements.

To explicitly enable sending SNMP notifications on the physical interface, perform the following steps:

1. In configuration mode, go to the **[edit interfaces *interface-name*]** hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Configure the **traps** option to enable sending of Simple Network Management Protocol (SNMP) notifications when the state of the connection changes.

   ```
   [edit interfaces interface-name]
   user@host# set traps
   ```

To disable sending SNMP notifications on the physical interface, perform the following steps:

1. In configuration mode, go to the **[edit interfaces *interface-name*]** hierarchy level:

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Configure the **no-traps** option to disable sending of Simple Network Management Protocol (SNMP) notifications when the state of the connection changes.

   ```
   [edit interfaces interface-name]
   user@host# set no-traps
   ```

Related Documentation

- traps on page 477

Enabling or Disabling SNMP Notifications on Logical Interfaces

By default, Simple Network Management Protocol (SNMP) notifications are sent when the state of an interface or a connection changes. To explicitly enable these notifications on the logical interface, include the **traps** statement; to disable these notifications on the logical interface, include the **no-traps** statement:

```
(traps | no-traps);
```

You can include these statements at the following hierarchy levels:

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

Configuring the Interface Bandwidth

By default, the Junos OS uses the physical interface's speed for the MIB-II object, **ifSpeed**. You can configure the logical unit to populate the **ifSpeed** variable by configuring a bandwidth value for the logical interface. The **bandwidth** statement sets an informational-only parameter; you cannot adjust the actual bandwidth of an interface with this statement.

NOTE: We recommend that you be careful when setting this value. Any interface bandwidth value that you configure using the **bandwidth** statement affects how the interface cost is calculated for a dynamic routing protocol, such as OSPF. By default, the interface cost for a dynamic routing protocol is calculated using the following formula:

cost = reference-bandwidth/bandwidth,

where bandwidth is the physical interface speed. However, if you specify a value for bandwidth using the **bandwidth** statement, that value is used to calculate the interface cost, rather than the actual physical interface bandwidth.

To configure the bandwidth value for a logical interface, include the **bandwidth** statement:

```
bandwidth rate;
```

You can include this statement at the following hierarchy levels:

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

rate is the peak rate, in bps or cps. You can specify a value 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). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second using the formula 1 cps = 384 bps. The value can be any positive integer. The **bandwidth** statement is valid for all logical interfaces, except multilink interfaces.

Configuring Accounting for the Physical Interface

- Accounting Profiles Overview on page 58
- Configuring Accounting for the Physical Interface on page 59
- Displaying Accounting Profile for the Physical Interface on page 60

Accounting Profiles Overview

Juniper Networks routers and switches can collect various kinds of data about traffic passing through the router and switch. You can set up one or more *accounting profiles* that specify some common characteristics of this data, including the following:

- The fields used in the accounting records
- The number of files that the router or switch retains before discarding, and the number of bytes per file
- The polling period that the system uses to record the data

You configure the profiles and define a unique name for each profile using statements at the **[edit accounting-options]** hierarchy level. There are two types of accounting profiles: interface profiles and filter profiles. You configure interface profiles by including the **interface-profile** statement at the **[edit accounting-options]** hierarchy level. You configure filter profiles by including the **filter-profile** statement at the **[edit accounting-options]** hierarchy level. For more information, see the *Network Management and Monitoring Guide*.

You apply filter profiles by including the **accounting-profile** statement at the **[edit firewall filter *filter-name*]** and **[edit firewall family *family* filter *filter-name*]** hierarchy levels. For more information, see the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide*.

Configuring Accounting for the Physical Interface

Before you begin

You must configure a profile to collect error and statistic information for input and output packets on a particular physical interface. An accounting profile specifies what statistics should be collected and written to a log file. For more information on how to configure an accounting-data log file, see the *Configuring Accounting-Data Log Files*.

An interface profile specifies the information collected and written to a log file. You can configure a profile to collect error and statistic information for input and output packets on a particular physical interface.

1. To configure which statistics should be collected for an interface, include the **fields** statement at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level.

   [edit accounting-options interface-profile *profile-name*]
   user@host# **set fields*field-name***

2. Each accounting profile logs its statistics to a file in the **/var/log** directory. To configure which file to use, include the **file** statement at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level.

   [edit accounting-options interface-profile *profile-name*]
   user@host# **set file *filename***

   NOTE: You must specify a **file** statement for the interface profile that has already been configured at the **[edit accounting-options]** hierarchy level. For more information, see the Configuring Accounting-Data Log Files

3. Each interface with an accounting profile enabled has statistics collected once per interval time specified for the accounting profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [**edit accounting-options interface-profile *profile-name***] hierarchy level.

   [edit accounting-options interface-profile *profile-name*]

```
user@host# set interval minutes
```

NOTE: The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of interfaces might cause serious performance degradation.

4. To configure the interfaces on which the accounting needs to be performed, apply the interface profile to a physical interface by including the **accounting-profile** statement at the **[edit interfaces interface-name]** hierarchy level.

```
[edit interfaces]
user@host# set interface-name accounting-profile profile-name
```

See Also

- *Accounting Options Overview*
- *Configuring Accounting-Data Log Files*

Displaying Accounting Profile for the Physical Interface

Purpose To display the configured accounting profile a particular physical interface at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level:

- interface-name—ge-1/0/1
- Interface profile —**if_profile**
- File name—**if_stats**
- Interval—15 minutes

Action

- Run the **show** command at the **[edit edit interfaces ge-1/0/1]** hierarchy level.

```
[edit interfaces ge-1/0/1]
accounting-profile if_profile;
```

- Run the **show** command at the **[edit accounting-options]** hierarchy level.

```
interface-profile if_profile {
  interval 15;
  file if_stats {
    fields {
      input-bytes;
      output-bytes;
      input-packets;
      output-packets;
      input-errors;
      output-errors;
    }
  }
}
```


Meaning The configured accounting and its associated set options are displayed as expected.

Configuring Accounting for the Logical Interface

- Accounting Profiles Overview on page 61
- Configuring Accounting for the Logical Interface on page 61
- Displaying Accounting Profile for the Logical Interface on page 62

Accounting Profiles Overview

Juniper Networks routers and switches can collect various kinds of data about traffic passing through the router and switch. You can set up one or more *accounting profiles* that specify some common characteristics of this data, including the following:

- The fields used in the accounting records
- The number of files that the router or switch retains before discarding, and the number of bytes per file
- The polling period that the system uses to record the data

You configure the profiles and define a unique name for each profile using statements at the **[edit accounting-options]** hierarchy level. There are two types of accounting profiles: interface profiles and filter profiles. You configure interface profiles by including the **interface-profile** statement at the **[edit accounting-options]** hierarchy level. You configure filter profiles by including the **filter-profile** statement at the **[edit accounting-options]** hierarchy level. For more information, see the *Network Management and Monitoring Guide*.

You apply filter profiles by including the **accounting-profile** statement at the **[edit firewall filter *filter-name*]** and **[edit firewall family *family* filter *filter-name*]** hierarchy levels. For more information, see the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide*.

Configuring Accounting for the Logical Interface

Before you begin

You must configure a profile to collect error and statistic information for input and output packets on a particular logical interface. An accounting profile specifies what statistics should be collected and written to a log file. For more information on how to configure an accounting-data log file, see the *Configuring Accounting-Data Log Files*.

An interface profile specifies the information collected and written to a log file. You can configure a profile to collect error and statistic information for input and output packets on a particular logical interface.

1. To configure which statistics should be collected for an interface, include the **fields** statement at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level.

   [edit accounting-options interface-profile *profile-name*]
   user@host# **set fields*field-name***

2. Each accounting profile logs its statistics to a file in the **/var/log** directory. To configure which file to use, include the **file** statement at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level.

   [edit accounting-options interface-profile *profile-name*]
   user@host# **set file *filename***

   NOTE: You must specify a **file** statement for the interface profile that has already been configured at the **[edit accounting-options]** hierarchy level. For more information, see the Configuring Accounting-Data Log Files

3. Each interface with an accounting profile enabled has statistics collected once per interval time specified for the accounting profile. Statistics collection time is scheduled evenly over the configured interval. To configure the interval, include the interval statement at the [**edit accounting-options interface-profile *profile-name***] hierarchy level.

   [edit accounting-options interface-profile *profile-name*]
   user@host# **set interval *minutes***

   NOTE: The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of interfaces might cause serious performance degradation.

4. To configure the interfaces on which the accounting needs to be performed, apply the interface profile to a logial interface by including the **accounting-profile** statement at the **[edit interfaces interface-name unit *logical-unit-number*]** hierarchy level.

   [edit interfaces]
   user@host# **set *interface-name* unit *logical-unit-number*accounting-profile *profile-name***

See Also

- *Accounting Options Overview*
- *Configuring Accounting-Data Log Files*

Displaying Accounting Profile for the Logical Interface

Purpose To display the configured accounting profile a particular logical interface at the **[edit accounting-options interface-profile *profile-name*]** hierarchy level:

- interface-name—ge-1/0/1
- Logical unit number—1
- Interface profile —**if_profile**
- File name—**if_stats**
- Interval—15 minutes

Action

- Run the **show** command at the **[edit interfaces ge-1/0/1 unit 1]** hierarchy level.

```
[edit interfaces ge-1/0/1 unit 1]
accounting-profile if_profile;
```

- Run the **show** command at the **[edit accounting-options]** hierarchy level.

```
interface-profile if_profile {
  interval 15;
  file if_stats {
    fields {
      input-bytes;
      output-bytes;
      input-packets;
      output-packets;
      input-errors;
      output-errors;
    }
  }
}
```

Meaning The configured accounting and its associated set options are displayed as expected.

Configuring Flow Control

By default, the router or switch imposes flow control to regulate the amount of traffic sent out on a Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interface. Flow control is not supported on the 4-port Fast Ethernet PIC. This is useful if the remote side of the connection is a Fast Ethernet or Gigabit Ethernet switch.

You can disable flow control if you want the router or switch to permit unrestricted traffic. To disable flow control, include the **no-flow-control** statement:

```
no-flow-control;
```

To explicitly reinstate flow control, include the **flow-control** statement:

```
flow-control;
```

You can include these statements at the following hierarchy levels:

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

NOTE: On the Type 5 FPC, to prioritize control packets in case of ingress oversubscription, you must ensure that the neighboring peers support MAC flow control. If the peers do not support MAC flow control, then you must disable flow control.

Related Documentation

- *flow-control*
- *Ethernet Interfaces Overview*
- Interfaces Overview for Switches on page 4
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring the Media MTU

The media maximum transmission unit (MTU) is the largest data unit that can be forwarded without fragmentation. The default media MTU size used on a physical interface depends on the encapsulation being used on that interface. For a listing of MTU sizes for each encapsulation type, see *Media MTU Sizes by Interface Type*.

To configure the media-MTU size:

1. In configuration mode, go to the **[edit interfaces *interface-name*]** hierarchy level.

   ```
   [edit ]
   user@host# [edit interfaces interface-name]
   ```

2. Include the **mtu** statement.

   ```
   [edit interfaces interface-name]
   mtu bytes;
   ```

- If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. You configure the protocol MTU by including the **mtu** statement at the following hierarchy levels:
  - **[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*]

NOTE:

- Changing the media MTU or protocol MTU causes an interface to be deleted and added again.
- Because tunnel services interfaces are considered logical interfaces, you cannot configure the MTU setting for the physical interface. This means you cannot include the mtu statement at the [edit interfaces interface-name] hierarchy level for the following interface types: generic routing encapsulation (gr-), IP-IP (ip-), loopback (lo-), link services (ls-), multilink services (ml-), and multicast (pe-, pd-). You can, however, configure the protocol MTU on all tunnel interfaces except virtual tunnel (vt) interfaces. Starting in Junos OS Release 17.1R3, you cannot configure the maximum transmission unit (MTU) size for vt interfaces because the **mtu bytes** option is deprecated for vt interfaces. Junos OS sets the MTU size for vt interfaces by default to unlimited.
- If you configure an MTU value by including the mtu statement at the [edit interfaces interface-name unit logical-unit-number family mpls] hierarchy level, the configured value is used.

Related Documentation

- *Media MTU Overview*
- *Media MTU Sizes by Interface Type*
- *Encapsulation Overhead by Interface Encapsulation Type*
- Setting the Protocol MTU on page 65

Setting the Protocol MTU

When you initially configure an interface, the protocol maximum transmission unit (MTU) is calculated automatically. If you subsequently change the media MTU, the protocol MTU on existing address families automatically changes.

For a list of default protocol MTU values, see *Media MTU Sizes by Interface Type*.

To modify the MTU for a particular protocol family, include the **mtu** statement:

mtu *bytes*;

You can include this statement at the following hierarchy levels:

- [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*]

If you increase the size of the protocol MTU, you must ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. For a list of encapsulation overhead values, see *Encapsulation Overhead by Interface Encapsulation Type*. If you reduce the media MTU size, but there are already one or more address families configured and active on the interface, you must also reduce the protocol MTU size. (You configure the media MTU by including the **mtu** statement at the **[edit interfaces *interface-name*]** hierarchy level.)

NOTE: Changing the media MTU or protocol MTU causes an interface to be deleted and added again.

The maximum number of data-link connection identifiers (DLCIs) is determined by the MTU on the interface. If you have keepalives enabled, the maximum number of DLCIs is 1000, with the MTU set to 5012.

The actual frames transmitted also contain cyclic redundancy check (CRC) bits, which are not part of the MTU. For example, the default protocol MTU for a Gigabit Ethernet interface is 1500 bytes, but the largest possible frame size is actually 1504 bytes; you need to consider the extra bits in calculations of MTUs for interoperability.

Related Documentation

- *Media MTU Overview*
- Configuring the Media MTU on page 64

Setting the Mode on an SFP+ or SFP+ MACSec Uplink Module (CLI Procedure)

SFP+ uplink modules are supported on EX3200 and EX4200 switches, and SFP+ Media Access Control Security (MACSec) uplink modules are supported on EX4200 switches. You can use these uplink modules either for two SFP+ transceivers or four SFP transceivers. You configure the operating mode on the module to match the type of transceiver you want to use—that is, for SFP+ transceivers, you configure the 10-gigabit operating mode, and for SFP transceivers, you configure the 1-gigabit operating mode.

By default, the SFP+ uplink module operates in the 10-gigabit mode and supports only SFP+ transceivers. If you have not changed the module from the default setting and you want to use SFP+ transceivers, you do not need to configure the operating mode.

To set the operating mode of an SFP+ or SFP+ MACSec uplink module:

1. Change the operating mode to the appropriate mode for the transceiver type you want to use by using one of the following commands:

   ```
   [edit]
   user@switch# set chassis fpc 0 pic 1 sfpplus pic-mode 1g
   ```

   ```
   [edit]
   user@switch# set chassis fpc 0 pic 1 sfpplus pic-mode 10g
   ```

2. (SFP+ uplink module only) If the switch is running:

- Junos OS Release 10.1 or later, the changed operating mode takes effect immediately unless a port on the SFP+ uplink module is a Virtual Chassis port (VCP). If any port on the SFP+ uplink module is a VCP, the changed operating mode does not take effect until the next reboot of the switch.

  NOTE: During the operating mode change, the Packet Forwarding Engine is restarted. In a Virtual Chassis configuration, this means that the Flexible PIC Concentrator connection with the master is dropped and then reconnected.

- Junos OS Release 10.0 or earlier, reboot the switch.

You can see whether the operating mode has been changed to the new mode you configured by issuing the **show chassis pic fpc-slot *slot-number* pic-slot 1** command.

Related Documentation

- *Uplink Modules in EX3200 Switches*
- *Uplink Modules in EX4200 Switches*
- *Pluggable Transceivers Supported on EX3200 Switches*
- *Pluggable Transceivers Supported on EX4200 Switches*

Configuring the Media Type on Dual-Purpose Uplink Ports (CLI Procedure)

EX2200-C switches and ACX1000 routers provide two dual-purpose uplink ports. Each dual uplink port is a single interface that offers a choice of two connections: an RJ-45 connection for a copper Ethernet cable and an SFP connection for a fiber-optic Ethernet cable. You can choose to use either connection, but only one connection can be active at a time.

By default, if you plug a transceiver into the SFP connector, the port becomes a fiber-optic Gigabit Ethernet port, even if a copper Ethernet cable is plugged into the RJ-45 connection as well. If a transceiver is not plugged into the SFP connector, the port defaults to a copper 10/100/1000 Ethernet port.

You can constrain the use of the port to one connection type by configuring the media type for the port to be either copper or fiber. When you configure a media type on the port, the port will no longer accept the alternate connection type. For example, if you configure the uplink port as a fiber port and then plug a copper Ethernet cable into the RJ-45 connector, the interface will not come up.

To configure the media type for an uplink port:

```
user@switch# set interfaces interface-name media-type (Dual-Purpose Uplink Ports) media-type
```

For example, to set the media type for uplink port **ge-0/1/0** to copper:

```
user@switch# set interfaces ge-0/1/0 media-type copper
```


NOTE: When you change the media type setting for a dual-purpose uplink port, it can take up to 6 seconds for the interface to appear in operational commands.

Related Documentation

- *EX2200 Switches Hardware Overview*

CHAPTER 2

Gigabit Ethernet Interfaces

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80

Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches

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

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 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
```

This topic describes:

- Configuring Port Mode on QFX5100-48S, QFX5100-48T, QFX5100-24Q, and EX4600 Switches on page 70
- Configuring the Link Settings for Gigabit Ethernet Interfaces on QFX5100-48S, QFX5100-96S, and EX4600 Switches on page 71
- Configuring Gigabit Ethernet Interfaces on QFX5100-48T Switches on page 71
- Configuring the Link Settings for 10-Gigabit Ethernet Interfaces on QFX5100-48S, QFX5100-24Q, QFX5100-96S, and EX4600 Switches on page 73
- Configuring the Link Settings for 10-Gigabit Ethernet Interfaces on QFX5100-48T Switches on page 73
- Configuring the IP Options on QFX5100-48S, QFX5100-48T, QFX5100-24Q, and EX4600 Switches on page 74

Configuring Port Mode on QFX5100-48S, QFX5100-48T, QFX5100-24Q, and EX4600 Switches

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 on the Enhanced Layer 2 software (ELS):

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

See Also

- Monitoring Interface Status and Traffic on page 381

Configuring the Link Settings for Gigabit Ethernet Interfaces on QFX5100-48S, QFX5100-96S, and EX4600 Switches

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

The following default configurations are available on Gigabit Ethernet interfaces:

- You cannot set the speed on these interfaces.

  On QFX5100-48S and QFX5100-96S devices using 1-Gigabit Ethernet SFP interfaces, the speed is set to 1 Gbps by default and cannot be configured to operate in a different speed.

- On QFX5100 devices, the interface naming for Gigabit Ethernet interfaces changes automatically to xe-0/0/0, ge-0/0/0, or et-0/0/0 when the appropriate SFP is inserted.
- Gigabit Ethernet interfaces operate in full-duplex mode.
- Autonegotiation is supported by default. Autonegotiation is enabled by default, and will autonegotiate the speed with the link partner. We recommend that you keep autonegotiation enabled for interfaces operating at 100M, 1G, and 10G.

  If for some reason you have disabled autonegotiation, you can enable it by issuing the **set interfaces *name* ether-options auto-negotiate** command.

  To disable autonegotiation, issue the **delete interfaces *name* ether-options auto-negotiate** command.

  NOTE: Do not use the **set interfaces *name* ether-options no-auto-negoatiate** command to remove the autonegotiation configuration.

  Issue the **show interfaces *name* extensive** command to see if autonegotiation is enabled or disabled and the negotiated speed of the interface.

Configuring Gigabit Ethernet Interfaces on QFX5100-48T Switches

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

The following default configurations are available on Gigabit Ethernet interfaces:

- Gigabit Ethernet interfaces operate in full-duplex mode.
- Gigabit Ethernet interfaces must be configured as xe-*fpc/pic/port*, and not ge-*fpc/pic/port*.
- Autonegotiation is enabled by default, and will autonegotiate the speed with the link partner. We recommend that you keep autonegotiation enabled for interfaces operating at 100M, 1G, and 10G.

  To disable autonegotiation, issue the **delete interfaces *name* ether-options auto-negotiate** command.

NOTE: Do not use the **set interfaces** ***name*** **ether-options no-auto-negotiate** command to remove the autonegotiation configuration.

You can reenable autonegotiation it by issuing the **set interfaces** ***name*** **ether-options auto-negotiate** command.

Issue the **show interfaces** ***name*** **extensive** command to see if autonegotiation is enabled or disabled and the negotiated speed of the interface.

Configuring the Link Settings for 10-Gigabit Ethernet Interfaces on QFX5100-48S, QFX5100-24Q, QFX5100-96S, and EX4600 Switches

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

- All the 10-Gigabit Ethernet interfaces are set to **auto-negotiation**.
- Flow control for 10-Gigabit Ethernet interfaces is set to **enabled** by default. You can disable flow control by specifying the **no-flow-control** option.
- The speed cannot be configured.

  On QFX5100-48S, QFX5100-96S, and QFX5100-24Q devices using 10-Gigabit Ethernet SFP interfaces, the speed is set to 10 Gbps by default and cannot be configured to operate in a different speed.
- On QFX5100 devices, the interface naming for Gigabit Ethernet interfaces changes automatically to xe-0/0/0, ge-0/0/0, or et-0/0/0 when the appropriate SFP is inserted.
- 10-Gigabit Ethernet interfaces operate in full-duplex mode by default.
- Autonegotiation is enabled by default, and will autonegotiate the speed with the link partner. We recommend that you keep autonegotiation enabled for interfaces operating at 100M, 1G, and 10G.

  If for some reason you have disabled autonegotiation, you can enable it by issuing the **set interfaces *name* ether-options auto-negotiate** command.

  To disable autonegotiation, issue the **delete interfaces *name* ether-options auto-negotiate** command.

  NOTE: Do not use the **set interfaces *name* ether-options no-auto-negoatiate** command to remove the autonegotiation configuration.

  Issue the **show interfaces *name* extensive** command to see if autonegotiation is enabled or disabled and the negotiated speed of the interface.

Configuring the Link Settings for 10-Gigabit Ethernet Interfaces on QFX5100-48T Switches

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

- All the 10-Gigabit Ethernet interfaces are set to **auto-negotiation**.
- Flow control for 10-Gigabit Ethernet interfaces is set to **enabled** by default. You can disable flow control by specifying the **no-flow-control** option.
- 10-Gigabit Ethernet interfaces operate in full-duplex mode by default.
- Autonegotiation is enabled by default, and will autonegotiate the speed with the link partner. We recommend that you keep autonegotiation enabled for interfaces operating at 100M, 1G, and 10G.

NOTE: In Junos OS Release 14.1X53-D35 on QFX5100-48T-6Q devices using 10-Gigabit Ethernet Copper interfaces, autonegotiation is disabled by default on the copper ports, and the interfaces operate at a speed of 100M. You can, however, enable auto-negotiation by issuing the **set interface *name* ether-options auto-negotiation** command on the interface for which you want to change the interface speed. With autonegotiation enabled, the interface auto-detects the speed in which to operate.

If for some reason you have disabled autonegotiation, you can enable it by issuing the **set interfaces *name* ether-options auto-negotiate** command.

Issue the **show interfaces *name* extensive** command to see if autonegotiation is enabled or disabled and the negotiated speed of the interface.

Configuring the IP Options on QFX5100-48S, QFX5100-48T, QFX5100-24Q, and EX4600 Switches

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
```

Release History Table

Release	Description
14.1X53-D35	In Junos OS Release 14.1X53-D35 on QFX5100-48T-6Q devices using 10-Gigabit Ethernet Copper interfaces, autonegotiation is disabled by default on the copper ports, and the interfaces operate at a speed of 100M.

Related Documentation

- Monitoring Interface Status and Traffic on page 381
- show interfaces xe on page 1048
- show interfaces ge on page 944
- speed on page 472
- Understanding Interface Naming Conventions on page 9

Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support

NOTE: This task uses Junos OS for EX Series switches with support for the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that does not support ELS, see *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

An Ethernet interface must be configured for optimal performance in a high-traffic network. EX Series switches include a factory default configuration that:

- Enables all the network interfaces on the switch
- Sets a default interface mode (access)
- Sets default link settings
- Specifies a logical unit (**unit 0**) and assigns it to **family ethernet-switching** (except on EX8200 switches and Virtual Chassis)
- Specifies Rapid Spanning Tree Protocol (RSTP) and Link Layer Discovery Protocol (LLDP)

This topic describes:

- Configuring VLAN Options and Interface Mode on page 75
- Configuring the Link Settings on page 76
- Configuring the IP Options on page 79

Configuring VLAN Options and Interface Mode

By default, when you boot a switch and use the factory default configuration, or when you boot the switch and do not explicitly configure a port mode, all interfaces on the switch are in access mode and accept only untagged packets from the VLAN named **default**. You can optionally configure another VLAN and use that instead of **default**. You can also configure a port to accept untagged packets from the user-configured VLAN. For details on this concept (native VLAN), see *Understanding Bridging and VLANs on Switches*.

If you are connecting either a desktop phone, wireless access point or a security camera to a Power over Ethernet (PoE) port, you can configure some parameters for the PoE interface. PoE interfaces are enabled by default. For detailed information about PoE settings, see *Configuring PoE on EX Series Switches (CLI Procedure)*.

If you are connecting a device to other switches and to routers on the LAN, you need to assign the interface to a logical port and configure the logical port as a trunk port. See *Port Role Configuration with the J-Web Interface (with CLI References)* for more information about port configuration.

If you are connecting to a server that contains virtual machines and a VEPA for packet aggregation from those virtual machines, configure the port as a tagged-access port. See *Understanding Bridging and VLANs on Switches* for more information about tagged access.

To configure a 1-Gigabit, 10-Gigabit, or 40-Gigabit Ethernet interface for trunk port mode:

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

See Also

- *Monitoring Interface Status and Traffic*

Configuring the Link Settings

EX Series switches include a factory default configuration that enables interfaces with the link settings provided in Table 15 on page 76.

Table 15: Factory Default Configuration Link Settings for EX Series Switches

Ethernet Interface	Autonegotiation	Flow Control	Link Mode	Link Speed
1 gigabit	Enabled	Enabled	Autonegotiation (full duplex or half duplex) For information about EX4300, see the Note below this table.	Autonegotiation (10 Mbps, 100 Mbps, or 1 Gbps)
10 gigabit (using a DAC cable)	Enabled	Enabled	Full duplex	10 Gbps
10 gigabit (using a fiber-optic cable)	Disabled	Enabled	Full duplex	10 Gbps
40 gigabit (using a DAC cable)	Enabled	Enabled	Full duplex	40 Gbps
40 gigabit (using a fiber-optic cable)	Disabled	Enabled	Full duplex	40 Gbps

NOTE: On EX4300 switches, there is no **link-mode** configuration statement. The link-mode setting on an EX4300 switch is handled as follows:

- If the link partner is operating in half duplex, the EX4300 interface goes to half duplex.
- If the link partner is not capable of autonegotiation, the EX4300 interface goes to half duplex.
- If the link partner is capable of autonegotiation and is operating in full duplex, the EX4300 interface also works in full duplex.
- To force an EX4300 interface to stay in full-duplex mode, configure the interface's speed as 10 Mbps or 100 Mbps and also configure the interface with the **no-autonegotiation** statement.

To configure the link mode and speed settings for a 1-Gigabit, 10-Gigabit, or 40-Gigabit Ethernet interface:

NOTE: On EX4300 switches, there is no **link-mode** configuration statement. See information earlier in this document regarding how the link mode is set on EX4300 switches.

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

To configure additional link settings for a 1-Gigabit, 10-Gigabit, or 40-Gigabit Ethernet interface:

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

For detailed information about the FPC, PIC, and port numbers used for EX Series switches, see "Understanding Interface Naming Conventions" on page 9.

Configurable link settings include:

- **802.3ad**—Specify an aggregated Ethernet bundle. See "Configuring Aggregated Ethernet Links (CLI Procedure)" on page 96.
- **auto-negotiation**—Enable or disable autonegotiation of flow control, link mode, and speed.

  NOTE: Starting with Junos OS Releases 14.1X53-D40, 15.1R4, and 17.1R1, half-duplex communication is supported on all built-in network copper ports on EX4300 switches. *Half-duplex* is bidirectional communication; however, signals can flow in only one direction at a time. *Full-duplex* communication means that both ends of the communication can send and receive signals at the same time.

  Half-duplex is configured by default on EX4300 switches. If the link partner is set to autonegotiate the link, then the link is autonegotiated to full duplex or half duplex. If the link is not set to autonegotiation, then the EX4300 link defaults to half duplex unless the interface is explicitly configured for full duplex.

  To explicitly configure full duplex:

  ```
  [edit]
  user@switch# set interfaces interface-name speed 10m-or-100m
  [edit]
  user@switch# set interfaces interface-name ether-options no-auto-negotiation
  ```

  To verify a half-duplex (or a full-duplex) setting:

  ```
  user@switch> show interfaces interface-name extensive
  ```


- **flow-control**—Enable or disable flow control.
- **link-mode**—Specify full duplex, half duplex, or autonegotiation.

NOTE: On EX4300 switches, there is no **link-mode** configuration statement. See information earlier in this document regarding how the link mode is set on EX4300 switches.

- loopback—Enable or disable loopback mode.
- speed—Specify 10 Mbps, 100 Mbps, 1 Gbps, or autonegotiation.

Configuring the IP Options

To specify an IP address for the logical unit using IPv4:

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

To specify an IP address for the logical unit using IPv6:

```
[edit]
user@switch# set interfaces interface-name unit logical-unit-number family inet6 address
ip-address
```

NOTE: Access interfaces on EX4300 switches are set to **family ethernet-switching** by default. You might have to delete this or any other user-configured family setting before changing the setting to **family inet** or **family inet6**.

Release History Table

Release	Description
14.1X53-40	Starting with Junos OS Releases 14.1X53-D40, 15.1R4, and 17.1R1, half-duplex communication is supported on all built-in network copper ports on EX4300 switches.

Related Documentation

- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Monitoring Interface Status and Traffic*
- **show interfaces ge on page 944**
- **show interfaces xe on page 1048**
- Understanding Interface Naming Conventions on page 9

Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches

Devices include a factory default configuration that:

- Enables all 10-Gigabit Ethernet network interfaces on the switch
- 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

This topic describes:

- Configuring the Link Settings for Gigabit Ethernet and 10-Gigabit Ethernet Interfaces on page 80
- Configuring the IP Options on page 80

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

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

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 10-Gigabit Ethernet interfaces.
- **loopback**—Enable or disable a loopback interface for 10-Gigabit Ethernet interfaces.

To set **ether-options** for 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 381
- show interfaces xe on page 1048
- show interfaces ge on page 944

- speed on page 472

CHAPTER 3

Optical Transport Network (OTN) Interfaces

- Understanding the QFX10K-12C-DWDM Line Card on page 83
- Configuring OTN Interface Options on QFX10K-12C-DWDM on page 85

Understanding the QFX10K-12C-DWDM Line Card

The QFX10000-12C-DWDM line card provides up to 1.2 Tbps packet forwarding for cloud providers, service providers, and enterprises that need coherent dense wavelength-division multiplexing (DWDM) with MACsec security features.

The QFX10K-12C-DWDM line card is supported on Junos OS Release 17.2R1 and later.

The following sections explain the features of the QFX10K-12C-DWDM line card in detail:

- Software Features on page 83
- OTN Alarms and Defects on page 84

Software Features

The following interface features are supported on the QFX10000-12C-DWDM:

- Compliant with ITU G.709 and G.798
- Performance monitoring features such as alarms, threshold-crossing alarms, OTU/ODU error seconds, and FEC and bit error rate (BER) statistics.
- SNMP management of the MIC based on RFC 3591, Managed Objects for the Optical Interface Type, including the following:
  - Black Link MIB–jnx-bl.mib
  - IFOTN MIB–jnx-ifotn.mib
  - Optics MIB–jnx-optics.mib
  - FRU MIB–jnx-fru.mib
- User-configurable optics options:

    - Modulation format: 16QAM, 8QAM, QPSK
    - FEC mode (15% SDFEC or 25% SDFEC)
    - Differential and non-differential encoding modes
    - Transmit (TX) laser enable and disable
    - TX output power
    - Wavelength
    - Threshold crossing alarms (TCAs)

- IEEE 802.1ag OAM
- IEEE 802.3ah OAM
- IFINFO/IFMON
- IEEE 802.3ad link aggregation
- Flexible Ethernet services encapsulation
- Flexible VLAN tagging
- Source address MAC accounting per logical interface
- Source address MAC filter per port
- Source address MAC filter per logical interface
- Destination address MAC filter per port
- Up to 8000 logical interfaces shared across all ports on a single PFE

OTN Alarms and Defects

The following OTN alarms and defects are supported on the QFX10K-12C-DWDM line card:

Optical Channel(OC) Alarms and Defects

- OC-LOS—Loss Of Signal
- OC-LOF—Loss Of Frame
- OC-LOM—Loss Of Multiframe
- OC-Wavelength-Lock—Wavelength Lock

Optical Channel Data Unit (ODU) Defects

- ODU-AIS—ODU Alarm Indication Signal
- ODU-BDI—ODU Backward Defect Indication
- ODU-IAE—ODU Incoming Alignment Error
- ODU-LCK—ODU Locked
- ODU-LTC—ODU Loss of Tandem Connection

- ODU-OCI—ODU Open Connection Error
- ODU-SSF—ODU Server Signal Failure
- ODU-TSF—ODU Trail Signal Failure
- ODU-TTIM—ODU Trail Trace Identifier Mismatch

Optical Channel Transport Unit (OTU) Defects

- OTU-AIS—OTU Alarm Indication Signal
- OTU-BDI—OTU Backward Defect Indication
- OTU-BIAE—OTU Backward Incoming Alignment Error
- OTU-FEC-DEG—OTU Forward Error Correction Degrade
- OTU-FEC-EXCESS-FEC—OTU Forward Error Correction Excessive FEC Errors
- OTU-IAE—OTU Incoming Alignment Error
- OTU-SSF—OTU Server Signal Failure
- OTU-TSF—OTU Trail Signal Failure
- OTU-TTIM—OTU Trail Trace Identifier Mismatch

Threshold-Crossing Alarms

Threshold-crossing alarms (TCA) are alarms that are activated when a certain configurable threshold —near-end measurement threshold or far-end measurement threshold—is crossed and remains so until the end of the 15 minutes interval for parameters such as OTU and ODU. The following alarms are supported:

- Background block error threshold (BBE)
- Errored seconds threshold (ES)
- Severely errored seconds threshold (SES)
- Unavailable seconds threshold (UES)

Configuring OTN Interface Options on QFX10K-12C-DWDM

The QFX10000-12C-DWDM line card provides up to 1.2 Tbps packet forwarding for cloud providers, service providers, and enterprises that need coherent dense wavelength-division multiplexing (DWDM) with MACsec security features. The QFX10K-12C-DWDM line card is supported on Junos OS Release 17.2R1 and later.

Each QFX10K-12C-DWDM has 6 physical interfaces (ot-x/x/x) that connect to one of three built-in flexible rate optical transponders. Each transponder connects four 100-Gigabit Ethernet logical interfaces (et-x/x/x) to one of three forwarding ASICs.

To configure the optics-specific options on the interface:

1. Specify the modulation format at the [**edit interface** ***interface-name*** **optics-options**] hierarchy level.

[edit interfaces *interface-name* optics-options]
user@host# set modulation-format *(qpsk|8qam|16qam)*

2. Specify encoding.

   [edit interfaces *interface-name* optics-options]
   user@host# set encoding *(differential|non-differential)*

3. Specify the optical transmit laser output power in dBm. The default transmit laser output value is 0 dBm.

   [edit interfaces *interface-name* optics-options]
   user@host# set tx-power *value*

4. Specify the wavelength of the optics in nanometers. For a list of wavelengths supported, see **wavelength**.

   [edit interfaces *interface-name* optics-options]
   user@host# set wavelength nm

To configure the OTN-specific options on the interface:

1. At the [**edit interfaces *interface-name* otn-options**] enable the laser on the OTN interface. The laser is disabled by default for all OTN interfaces.

   [edit interfaces *interface-name* otn-options]
   user@host# set laser-enable

2. Set an trail trace identifier for the source access point and for the destination access point for ODU and OTU on the OTN interface.

   [edit interfaces *interface-name* otn-options]
   user@host# set tti (odu-dapi | odu-expected-receive-dapi | odu-expected-receive-sapi | odu-sapi | otu-dapi | otu-expected-receive-dapi | otu-expected-receive-sapi | otu-sapi)

3. By default, triggers are ignored. Specify defect triggers and the set the trigger hold time for the trigger. Possible values for the trigger hold time are as follows: down—Delay before marking interface down when defect occurs (1..65534 milliseconds) and up—Delay before marking interface up when defect is absent (1..65534 milliseconds).

   NOTE: The hold time value only impacts the alarm reporting time and does not mark an interface down when the defect occurs. To mark the interface up or down, you must also configure the physical interface hold time at the [**edit interfaces *interface-name***] hierarchy level.

   [edit interfaces *interface-name* otn-options]
   user@host# set trigger (oc-lof | oc-lom | oc-los | oc-tsf | odu-ais | odu-bdi | odu-bei | odu-iae | odu-lck | odu-oci | odu-sd | odu-ttim |opu-ptim | otu-ais | otu-bdi | otu-fec-deg | otu-fec-exe | otu-iae | otu-sd | otu-ttim) (hold-time (down value | up value) | ignore)

4. Enable the threshold crossing alarms for the OTN interface along with the trigger for the defect.

   [edit interfaces *interface-name* otn-options]
   user@host# set tca (odu-tca-bbe | odu-tca-es | odu-tca-ses | odu-tca-uas | otu-tca-bbe | otu-tca-es | otu-tca-ses | otu-tca-uas) (enable-tca | no-enable-tca | threshold)

5. Set the OTN header bytes as a transmit payload type from 0 bytes through 255 bytes for the packets that are transmitted on the OTN interface.

   [edit interfaces *interface-name* otn-options]
   user@host# set bytes transmit-payload-type value

6. Configure the forward error correction (FEC) mode for the OTN interface. Possible values are: Generic Forward Error Correction (GFEC), or High Gain Forward Error Correction (HGFEC) or Soft Decision Forward Error Correction (SDFEC). The default forward error correction mode is SDFEC.

   [edit interfaces *interface-name* otn-options]
   user@host# set fec (gfec | hgfec | sdfec)

7. Enable line loopback or local host loopback for the OTN interface.

   [edit interfaces *interface-name* otn-options]
   user@host# set line-loopback
   user@host# set local-loopback

8. Enable an ODU locked maintenance signal on the OTN interface to send the signal pattern 01010101.

   [edit interfaces *interface-name* otn-options]
   user@host# set insert-odu-lck

9. Enable an ODU open connection indication signal on the OTN interface to send to send the signal pattern 01100110.

   [edit interfaces *interface-name* otn-options]
   user@host# set insert-odu-oci

10. Enable a consequent action as listed in the ITU-T G.798 standard for ODU trail trace identifier mismatch (TTIM) on the OTN interface.

    [edit interfaces *interface-name* otn-options]
    user@host# set odu-ttim-action-enable

11. Enable a consequent action as listed in the ITU-T G.798 standard for OTU trail trace identifier mismatch (TTIM) on the OTN interface.

    [edit interfaces *interface-name* otn-options]
    user@host# set out-ttim-action-enable

12. Configure the OTN payload pseudorandom binary sequence (PRBS) on the OTN interface.

    [edit interfaces *interface-name* otn-options]
    user@host# set prbs

13. Configure the line rate or speed of the OTN signal to OTU4 (100Gbps) for the OTN interface.

    NOTE: **If you specify a value other than OTU4, the value is ignored. To verify the line rate, use the show interfaces *interface-name* extensive command.**

    [edit interfaces *interface-name* otn-options]
    user@host# set rate otu4

14. Configure the threshold value for signal degradation when an alarm needs to be raised. Configure the threshold value after signal degradation when the alarm needs to be cleared. When you configure the interval along with the **ber-threshold-signal-degrade *value*** statement, the bit error rate (BER) must stay above the signal degradation threshold for the configured interval after which the alarm is raised. When the interval is configured along with the **ber-threshold-clear *value*** statement, then BER must stay below the clear threshold for the configured interval after which the alarm is cleared.

    [edit interfaces *interface-name* otn-options signal-degrade]
    user@host# set ber-threshold-signal-degrade value
    user@host# set ber-threshold-clear value
    user@host# set interval value

15. Enable the following actions for the preemptive-fast-reroute statement:

    - Backward FRR—Insert the local pre-FEC status into the transmitted OTN frames and monitor the received OTN frames for the pre-FEC status.

      [edit interfaces *interface-name* otn-options preemptive-fast-reroute]
      user@host# set backward-frr-enable

    - ODU backward FRR—Insert the ODU status into the transmitted OTN frames and monitor the received OTN frames for the ODU BER status.

      [edit interfaces *interface-name* otn-options preemptive-fast-reroute]
      user@host# **set odu-backward-frr-enable**

    - Monitoring of signal degradation of pre-FEC OTN frames.

      [edit interfaces *interface-name* otn-options preemptive-fast-reroute]
      user@host# **set signal-degrade-monitor-enable**

    - Monitoring of signal degradation of ODU BER in the received OTN frames.

      [edit interfaces *interface-name* otn-options preemptive-fast-reroute] user@host# **set odu-signal-degrade-monitor-enable**

16. Configure the following options for ODU BER signal degradation on the OTN interface:

    - Configure the threshold for signal degradation for ODU BER when an alarm needs to be raised.

      [edit interfaces *interface-name* otn-options odu-signal-degrade]
      user@host# **set ber-threshold-signal-degrade *value***

    - Configure the threshold for ODU BER after signal degradation when the alarm needs to be cleared.

      [edit interfaces *interface-name* otn-options odu-signal-degrade]
      user@host# **set ber-threshold-clear *value***

    - When you configure the interval along with the **ber-threshold-signal-degrade *value*** statement, the ODU bit error rate (BER) must stay above the signal degradation threshold for the configured interval after which the alarm is raised. When the interval is configured along with the **ber-threshold-clear *value*** statement, then ODU BER must stay below the clear threshold for the configured interval after which the alarm is cleared.

      [edit interfaces *interface-name* otn-options odu-signal-degrade]
      user@host# **set interval *value***

Related Documentation

- optics-options on page 567
- *otn-options*
- *signal-degrade*
- *preemptive-fast-reroute*

CHAPTER 4

Aggregated Ethernet Interfaces

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- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
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- Verifying the Status of a LAG Interface on page 157
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- Understanding Multicast Load Balancing on Aggregated 10-Gigabit Links for Routed Multicast Traffic on EX8200 Switches on page 159
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- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- Example: Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Interfaces on EX8200 Switches on page 174
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184

Understanding Aggregated Ethernet Interfaces and LACP for Switches

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

Aggregating multiple links between physical interfaces creates a single logical point-to-point trunk link or a LAG. The LAG balances traffic across the member links within an aggregated Ethernet bundle and effectively increases the uplink bandwidth. Another advantage of link aggregation is increased availability, because the LAG is composed of multiple member links. If one member link fails, the LAG continues to carry traffic over the remaining links.

NOTE: **On QFX5100, EX4600, QFX10002 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.**

NOTE: **The QFX5200 switches do not support mixed rate aggregated Ethernet bundles.**

Link Aggregation Control 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.

NOTE: During a network Node group switchover, traffic might be dropped for a few seconds.

- Link Aggregation Group on page 93
- Link Aggregation Control Protocol (LACP) on page 95

Link Aggregation Group

You configure a LAG by specifying the link number as a physical device and then associating a set of interfaces (ports) with the link. All the interfaces must have the same speed and be in full-duplex mode. Juniper Networks Junos operating system (Junos OS) for EX Series Ethernet Switches assigns a unique ID and port priority to each interface. The ID and priority are not configurable.

The number of interfaces that can be grouped into a LAG and the total number of LAGs supported on a switch varies according to switch model. Table 16 on page 93 lists the EX Series switches and the maximum number of interfaces per LAG and the maximum number of LAGs they support. Table 16 on page 93 lists the MX Series routers and the maximum number of interfaces per LAG and the maximum number of LAG groups they support.

Table 16: Maximum Interfaces per LAG and Maximum LAGs per Switch

Switch	Maximum Interfaces per LAG	Maximum LAGs
EX2200	8	32
EX3200	8	32
EX3300 and EX3300 Virtual Chassis	8	32
EX4200 and EX4200 Virtual Chassis	8	111
EX4300 and EX4300 Virtual Chassis	16	128
EX4500, EX4500 Virtual Chassis, EX4550, and EX4550 Virtual Chassis	8	111
EX6200	8	111

Table 16: Maximum Interfaces per LAG and Maximum LAGs per Switch (continued)

Switch	Maximum Interfaces per LAG	Maximum LAGs
EX8200	12	255
EX8200 Virtual Chassis	12	239

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, EX4600, and OCX Series switches, and up to 1,000 LAGs are supported on QFX5100, QFX5200, QFX5110, QFX10002, QFX10008, and QFX10016 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.**

- Up to 64 Ethernet interfaces can be grouped to form a LAG, and In a Junos Fusion, up to 1,000 LAGs are supported on QFX10002 switches acting as aggregation devices.
- 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: **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. By default, Ethernet links do not exchange LACP protocol data units (PDUs), which contain information about the state of the link. You can configure Ethernet links to actively transmit LACP PDUs, or you can configure the links to passively transmit them, sending out LACP PDUs only when the Ethernet link receives them from the remote end. 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 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.

In a scenario where 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 might 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

PDUs are not received, 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.

When LACP is configured, it detects misconfigurations on the local end or the remote end of the link. Thus, LACP can help prevent communication failure:

- When LACP is not enabled, a local LAG might attempt to transmit packets to a remote single interface, which causes the communication to fail.
- When LACP is enabled, a local LAG cannot transmit packets unless a LAG with LACP is also configured on the remote end of the link.

Related Documentation

- Configuring Link Aggregation on page 153
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Verifying the Status of a LAG Interface on page 157

Configuring Aggregated Ethernet Links (CLI Procedure)

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

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

To configure aggregated Ethernet interfaces, using the CLI:

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

   ```
   [edit chassis]
   user@switch# set aggregated-devices ethernet (Aggregated Devices) device-count number
   ```

2. Specify the link speed for the aggregated Ethernet bundle:

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

3. Specify the members to be included within the aggregated Ethernet bundle. To avoid commit errors, you must first delete the interfaces added in LACP from the RTSP configuration before specifying the members to be included to the aggregated Ethernet bundle.


```
[edit interfaces]
user@switch# set xe-fpc/pic/port ether-options 802.3ad ae0
user@switch# set xe-fpc/pic/port ether-options 802.3ad ae0
```

4. Specify an interface family for the aggregated Ethernet bundle:

```
[edit interfaces]
user@switch# set ae0 unit 0 family inet address address
```

5. (Optional) 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 ae0 aggregated-ether-options minimum-links number
```

For information about adding LACP to a LAG, see "Configuring Aggregated Ethernet LACP (CLI Procedure)" on page 98.

Related Documentation

- *Configuring Aggregated Ethernet Interfaces (J-Web Procedure)*
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- *Verifying the Status of a LAG Interface*
- *Understanding Aggregated Ethernet Interfaces and LACP*

Configuring Aggregated Ethernet LACP (CLI Procedure)

For aggregated Ethernet interfaces on EX Series switches, 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 interfaces with or without LACP enabled.

LACP was designed to achieve the following:

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

NOTE: You can also configure LACP link protection on aggregated Ethernet interfaces. For information, see "Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches" on page 99.

The Junos OS implementation of LACP provides link monitoring but not automatic addition and deletion of links.

Before you configure LACP for EX Series, be sure you have:

- Configured the aggregated Ethernet bundles—also known as link aggregation groups (LAGs). See "Configuring Aggregated Ethernet Links (CLI Procedure)" on page 96

When LACP is enabled, the local and remote sides of the aggregated Ethernet links exchange protocol data units (PDUs), which contain 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
   ```


NOTE: LACP decides active and back up state of links. When configuring LACP, state of the backup link should not be configured manually as down. The following command is not supported if LACP is configured:**set interfaces ae0 aggregated-ether-options link-protection backup-state *down***

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
```

NOTE: The LACP process exists in the system only if you configure the system in either active or passive LACP mode.

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Configuring Aggregated Ethernet Interfaces (J-Web Procedure)*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- *Verifying the Status of a LAG Interface*
- *Understanding Aggregated Ethernet Interfaces and LACP*

Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches

You can configure LACP link protection and system priority at the global level on the switch or for a specific aggregated Ethernet interface. When using LACP link protection to protect a single link in the aggregated ethernet bundle, you configure only two member links for an aggregated Ethernet interface: one active and one standby. LACP link protection ensures that only one link—the link with the higher priority—is used for traffic. The other link is forced to stay in a *waiting* state.

When using LACP link protection to protect multiple links in an aggregated ethernet bundle, you configure links into primary and backup subgroups. A link protection subgroup is a collection of ethernet links within the aggregated ethernet bundle. When you use link protection subgroups, you configure a primary subgroup and a backup subgroup. The configuration process includes assigning member links to each subgroup. When the configuration process is complete, the primary subgroup is used to forward traffic until a switchover event, such as a link failure, occurs and causes the backup subgroup to assume control of traffic that was travelling on the links in the primary subgroup within the bundle.

By default LACP link protection reverts to a higher-priority (lower-numbered) link when the higher-priority link becomes operational or when a higher-priority link is added to the aggregated Ethernet bundle. For priority purposes, LACP link protection treats subgroups like links. You can suppress link calculation by adding the **non-revertive** statement to the link protection configuration. In nonrevertive mode, when a link is active in sending and receiving LACP packets, adding a higher-priority link to the bundle does not change the status of the currently active link. It remains active.

If LACP link configuration is specified to be nonrevertive at the global **[edit chassis]** hierarchy level, you can specify the **revertive** statement in the LACP link protection configuration at the aggregated Ethernet interface level to override the nonrevertive setting for the interface. In revertive mode, adding a higher-priority link to the aggregated Ethernet bundle results in LACP recalculating the priority and switching the status from the currently active link to the newly added, higher-priority link.

NOTE: When LACP link protection is enabled on both local and remote sides of the link, both sides must use the same mode (either revertive or nonrevertive).

Configuring LACP link configuration at the aggregated Ethernet level results in only the configured interfaces using the defined configuration. LACP interface configuration also enables you to override global (chassis) LACP settings.

Before you configure LACP link protection, be sure you have:

- Configured the aggregated Ethernet bundles—also known as link aggregation groups (LAGs). For EX Series, see "Configuring Aggregated Ethernet Links (CLI Procedure)" on page 96.

- Configured LACP for the interface. For Ex Series, see “Configuring Aggregated Ethernet LACP (CLI Procedure)” on page 98.

You can configure LACP link protection for all aggregated Ethernet interfaces on the switch by enabling it at the global level on the switch or configure it for a specific aggregated Ethernet interface by enabling it on that interface.

- Configuring LACP Link Protection for a Single Link at the Global Level on page 101
- Configuring LACP Link Protection for a Single Link at the Aggregated Interface Level on page 101
- Configuring Subgroup Bundles to Provide LACP Link Protection to Multiple Links in an Aggregated Ethernet Interface on page 102

Configuring LACP Link Protection for a Single Link at the Global Level

To configure LACP link protection for aggregated Ethernet interfaces at the global level:

1. Enable LACP link protection on the switch:

```
[edit chassis aggregated-devices ethernet lacp]
user@switch# set link-protection
```

2. (Optional) Configure the LACP link protection for the aggregated Ethernet interfaces to be in nonrevertive mode:

   NOTE: LACP link protection is in revertive mode by default.

```
[edit chassis aggregated-devices ethernet lacp link-protection]
user@switch# set non-revertive
```

3. (Optional)To configure LACP system priority for the aggregated Ethernet interfaces:

```
[edit chassis aggregated-devices ethernet lacp]
user@switch# set system-priority
```

Configuring LACP Link Protection for a Single Link at the Aggregated Interface Level

To enable LACP link protection for a specific aggregated Ethernet interface:

1. Enable LACP link protection for the interface:

```
[edit interfaces aeX aggregated-ether-options lacp]
user@switch# set link-protection
```

2. (Optional) Configure the LACP link protection for the aggregated Ethernet interface to be in revertive or nonrevertive mode:

   - To specify revertive mode:

```
[edit interfaces aeX aggregated-ether-options lacp link-protection]
user@switch# set revertive
```

- To specify nonrevertive mode:

```
[edit interfaces aeX aggregated-ether-options lacp link-protection]
user@switch# set non-revertive
```

3. (Optional)To configure LACP system priority for an aggregated Ethernet interface:

```
[edit interfaces aeX aggregated-ether-options lacp link-protection]
user@switch# set system-priority
```

4. (Optional) To configure LACP port priority for an aggregated Ethernet interface:

```
[edit interfaces ge-fpc/pic/port ether-options 802.3ad lacp]
user@switch# set port-priority
```

Configuring Subgroup Bundles to Provide LACP Link Protection to Multiple Links in an Aggregated Ethernet Interface

You can configure link protection subgroup bundles to provide link protection for multiple links in an aggregated ethernet bundle.

Link protection subgroups allow you to provide link protection to a collection of Ethernet links within a LAG bundle, instead of providing protection to a single link in the aggregated ethernet bundle only. You can, for instance, configure a primary subgroup with three member links and a backup subgroup with three different member links and use the backup subgroup to provide link protection for the primary subgroup.

To configure link protection using subgroups:

1. Configure the primary link protection subgroup in the aggregated ethernet interface:

```
[edit interfaces aeX aggregated-ether-options]
user@switch# set link-protection-sub-group group-name primary
```

   For instance, to create a primary link protection subgroup named **subgroup-primary** for interface **ae0**:

```
[edit interfaces ae0 aggregated-ether-options]
user@switch# set link-protection-sub-group subgroup-primary primary
```

2. Configure the backup link protection subgroup in the aggregated ethernet interface:

```
[edit interfaces aeX aggregated-ether-options]
user@switch# set link-protection-sub-group group-name backup
```

   For instance, to create a backup link protection subgroup named **subgroup-backup** for interface **ae0**:

```
[edit interfaces ae0 aggregated-ether-options]
user@switch# set link-protection-sub-group subgroup-backup backup
```


NOTE: You can create one primary and one backup link protection subgroup per aggregated ethernet interface.

3. Attach interfaces to the link protection subgroups:

```
[edit interfaces interface-name ether-options 802.3ad]
user@switch# set link-protection-sub-group group-name
```

NOTE: The primary and backup link protection subgroups must contain the same number of interfaces. For instance, if the primary link protection subgroup contains three interfaces, the backup link protection subgroup must also contain three interfaces.

For instance, to configure interfaces **ge-0/0/0** and **ge-0/0/1** into link protection subgroup **subgroup-primary** and interfaces **ge-0/0/2** and **ge-0/0/3** into link protection subgroup **subgroup-backup**:

```
[edit interfaces ge-0/0/0 ether-options 802.3ad]
user@switch# set link-protection-sub-group subgroup-primary
[edit interfaces ge-0/0/1 ether-options 802.3ad]
user@switch# set link-protection-sub-group subgroup-primary
[edit interfaces ge-0/0/2 ether-options 802.3ad]
user@switch# set link-protection-sub-group subgroup-backup
[edit interfaces ge-0/0/3 ether-options 802.3ad]
user@switch# set link-protection-sub-group subgroup-backup
```

4. (Optional) Configure the port priority for link protection:

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

The port priority is used to select the active link.

5. Enable link protection

To enable link protection at the LAG level:

```
[edit interfaces aeX aggregated-ether-options]
user@switch# set link-protection
```

To enable link protection at the LACP level:

```
[edit interfaces aeX aggregated-ether-options lacp]
user@switch# set link-protection
```

For instance, to enable link protection on **ae0** at the LAG level:

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


For instance, to enable link protection on **ae0** at the LACP level:

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

NOTE: The LACP decides active and back up state of links. When configuring LACP, the state of the backup link should not be configured manually as down. The following command is not supported if LACP is configured:**set interfaces ae0 aggregated-ether-options link-protection backup-state *down***

Related Documentation

- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- lacp (Aggregated Ethernet) on page 543

Configuring LACP Hold-UP Timer to Prevent Link Flapping on LAG Interfaces

On link aggregation group (LAG) interfaces, when a member (child) link goes down, its state changes from current to expired. This link might flap from the current state to the expired state and back to current state when it receives intermittent LACP protocol data units (PDUs) and keepalive timeouts. Such flapping can adversely affect the traffic on the link.

To prevent excessive flapping of a LAG child link, you can configure a hold-up timer on the LAG interface that is applicable to all member links on that particular interface. To hold up, in networking terms, means to prevent the transitioning of an interface from down to up for a specified time interval.

When configured, the hold-up timer is triggered when an LACP state machine tries to move to the current state from the expired or default state when it receives an LACP PDU. The hold-up timer is triggered only if the LACP state machine had acquired the current state at least once earlier. The timer is not triggered if LACP attempts to transition to the current state for the first time. LACP monitors the PDUs received on the child link but prevents the link from transitioning to current state. If no flapping is observed when the link receives the PDUs, the hold-up timer expiries and triggers the member link to transition back to the current state. This transition is triggered as soon as the hold-up timer expires and not necessarily when the link receives a PDU.

To configure LACP hold-up timer for LAG interface, use the **hold-time up** statement at the **[edit interfaces aex aggregated-ether-options lacp]** hierarchy level.

NOTE:

- The hold-up timer keeps running even when the interface that receives the LACP PDU moves to the port disable state. The timer is then restarted if, before the timer expires, the interface comes up again and receives an LACP PDU from its neighbor. This ensures that the timer is maintained even during a quick physical port flap.
- When the following events occur, a hold-up timer is not triggered until the member link acquires the current state after the event:
  - LACP daemon restart
  - Deactivation and reactivation of child or aggregated Ethernet interface
  - Deletion and reconfiguration of child or aggregated Ethernet interface
  - System reboot
  - Routing Engine switchover

Configuring Periodic Rebalancing of Subscribers in an Aggregated Ethernet Interface

If subscribers are frequently logging in and logging out of your network, you can configure the system to periodically rebalance the links based on a specific time and interval.

To configure periodic rebalancing:

1. Access the aggregated Ethernet interface for which you want to configure periodic rebalancing.

   edit
   user@host# **edit interfaces ae*number* aggregated-ether-options**

2. Configure the rebalancing parameters for the interface, including the time and the interval between rebalancing actions.

   [edit interfaces ae*number* aggregated-ether-options]
   user@host# **rebalance-periodic time *hour:minute* <interval *hours*>**

Related Documentation

- *Verifying the Distribution of Demux Subscribers in an Aggregated Ethernet Interface*
- *Configuring the Distribution Type for Demux Subscribers on Aggregated Ethernet Interfaces*
- *Distribution of Demux Subscribers in an Aggregated Ethernet Interface*

Configuring Aggregated Ethernet Link Protection

You can configure link protection for aggregated Ethernet interfaces to provide QoS on the links during operation.

On aggregated Ethernet interfaces, you designate a primary and backup link to support link protection. Egress traffic passes only through the designated primary link. This includes transit traffic and locally generated traffic on the router or switch. When the primary link fails, traffic is routed through the backup link. Because some traffic loss is unavoidable, egress traffic is not automatically routed back to the primary link when the primary link is reestablished. Instead, you manually control when traffic should be diverted back to the primary link from the designated backup link.

NOTE: **Link protection is not supported on MX80.**

- Configuring Link Protection for Aggregated Ethernet Interfaces on page 106
- Configuring Primary and Backup Links for Link Aggregated Ethernet Interfaces on page 106
- Reverting Traffic to a Primary Link When Traffic is Passing Through a Backup Link on page 107
- Disabling Link Protection for Aggregated Ethernet Interfaces on page 107

Configuring Link Protection for Aggregated Ethernet Interfaces

Aggregated Ethernet interfaces support link protection to ensure QoS on the interface.

To configure link protection:

1. Specify that you want to configure the options for an aggregated Ethernet interface.

   user@host# **edit interfaces ae*x* aggregated-ether-options**

2. Configure the link protection mode.

   [edit interfaces ae*x* aggregated-ether-options]
   user@host# **set link-protection**

See Also

- Configuring Primary and Backup Links for Link Aggregated Ethernet Interfaces on page 106

- *Example: Configuring Aggregated Ethernet Link Protection*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Primary and Backup Links for Link Aggregated Ethernet Interfaces

To configure link protection, you must specify a primary and a secondary, or backup, link.

To configure a primary link and a backup link:

1. Configure the primary logical interface.

   [edit interfaces *interface-name*]
   user@host# **set (fastether-options | gigether-options) 802.3ad ae*x* primary**

2. Configure the backup logical interface.

   [edit interfaces *interface-name*]
   user@host# **set (fastether-options | gigether-options) 802.3ad ae*x* backup**

See Also
- *802.3ad*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Reverting Traffic to a Primary Link When Traffic is Passing Through a Backup Link

On aggregated Ethernet interfaces, you designate a primary and backup link to support link protection. Egress traffic passes only through the designated primary link. This includes transit traffic and locally generated traffic on the router or switch. When the primary link fails, traffic is routed through the backup link. Because some traffic loss is unavoidable, egress traffic is not automatically routed back to the primary link when the primary link is reestablished. Instead, you manually control when traffic should be diverted back to the primary link from the designated backup link.

To manually control when traffic should be diverted back to the primary link from the designated backup link, enter the following operational command:

user@host> **request interface revert ae*x***

See Also
- Configuring Link Protection for Aggregated Ethernet Interfaces on page 106
- *Ethernet Interfaces Feature Guide for Routing Devices*

Disabling Link Protection for Aggregated Ethernet Interfaces

To disable link protection, issue the **delete interface revert ae*x*** configuration command.

user@host# **delete interfaces ae*x* aggregated-ether-options link-protection**

See Also
- Configuring Link Protection for Aggregated Ethernet Interfaces on page 106
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Aggregated Ethernet Link Speed

On aggregated Ethernet interfaces, you can set the required link speed for all interfaces included in the bundle. Generally, all interfaces that make up a bundle must have the same speed. If you include in the aggregated Ethernet interface an individual link that has a speed different from the speed that you specify in the **link-speed** parameter, an error message is logged. However, there are exceptions.

Starting with Junos OS Release 13.2, aggregated Ethernet supports mixed rates and mixed modes on T640, T1600, T4000, and TX Matrix Plus routers. For example, these mixes are supported:

- Member links of different modes (WAN and LAN) for 10-Gigabit Ethernet links.

- Member links of different rates: 10-Gigabit Ethernet, 40-Gigabit Ethernet, 50-Gigabit Ethernet, 100-Gigabit Ethernet, and OC192 (10-Gigabit Ethernet WAN mode)

Starting with Junos OS Release 14.1R1 and 14.2, support for mixed rates on aggregated Ethernet bundles is extended to MX240, MX480, MX960, MX2010, and MX2020 routers.

Starting with Junos OS Release 14.2, aggregated Ethernet supports mixed link speeds on PTX Series Packet Transport Routers.

NOTE:

- Member links of 50-Gigabit Ethernet can only be configured using the 50-Gigabit Ethernet interfaces of 100-Gigabit Ethernet PIC with CFP (PD-1CE-CFP-FPC4).
- Starting with Junos OS Release 13.2, 100-Gigabit Ethernet member links can be configured using the two 50-Gigabit Ethernet interfaces of 100-Gigabit Ethernet PIC with CFP. This 100-Gigabit Ethernet member link can be included in an aggregated Ethernet link that includes member links of other interfaces as well. In releases before Junos OS Release 13.2, the 100-Gigabit Ethernet member link configured using the two 50-Gigabit Ethernet interfaces of 100-Gigabit Ethernet PIC with CFP cannot be included in an aggregated Ethernet link that includes member links of other interfaces.

To configure member links of mixed rates and mixed modes on T640, T1600, T4000, TX Matrix Plus, and PTX routers, you need to configure the **mixed** option for the [**edit interfaces ae*x* aggregated-ether-options link-speed**] statement.

To set the required link speed:

1. Specify that you want to configure the aggregated Ethernet options.

   user@host# **edit interfaces *interface-name* aggregated-ether-options**

2. Configure the link speed.

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

   speed can be 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).

   Aggregated Ethernet interfaces on the M120 router can have one of the following speeds:

   - **100m**—Links are 100 Mbps.
   - **10g**—Links are 10 Gbps.
   - **1g**—Links are 1 Gbps.
   - **oc192**—Links are OC192 or STM64c.

Aggregated Ethernet links on EX Series switches can be configured to operate at one of the following speeds:

- **10m**—Links are 10 Mbps.
- **100m**—Links are 100 Mbps.
- **1g**—Links are 1 Gbps.
- **10g**—Links are 10 Gbps.
- **50g**—Links are 50 Gbps.

Aggregated Ethernet links on T Series, MX Series, PTX Series routers, and QFX5100, QFX10002, QFX10008, and QFX10016 switches can be configured to operate at one of the following speeds:

- **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.
- **mixed**—Links are of various speeds.
- **oc192**—Links are OC192.

Release History Table

Release	Description
14.2	Starting with Junos OS Release 14.2, aggregated Ethernet supports mixed link speeds on PTX Series Packet Transport Routers.
14.1	Starting with Junos OS Release 14.1R1 and 14.2, support for mixed rates on aggregated Ethernet bundles is extended to MX240, MX480, MX960, MX2010, and MX2020 routers.
13.2	Starting with Junos OS Release 13.2, aggregated Ethernet supports mixed rates and mixed modes on T640, T1600, T4000, and TX Matrix Plus routers.
13.2	Starting with Junos OS Release 13.2, 100-Gigabit Ethernet member links can be configured using the two 50-Gigabit Ethernet interfaces of 100-Gigabit Ethernet PIC with CFP.

Related Documentation

- *aggregated-ether-options*
- *Configuring Mixed Rates and Mixed Modes on Aggregated Ethernet Bundles*

- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Aggregated Ethernet Minimum Links

On aggregated Ethernet interfaces, you can configure the minimum number of links that must be up for the bundle as a whole to be labeled **up**. By default, only one link must be up for the bundle to be labeled **up**.

To configure the minimum number of links:

1. Specify that you want to configure the aggregated Ethernet options.

   user@host# **edit interfaces** ***interface-name*** **aggregated-ether-options**

2. Configure the minimum number of links.

   [edit interfaces *interface-name* aggregated-ether-options]
   user@host# **set** minimum-links ***number***

On M120, M320, MX Series, T Series, and TX Matrix routers with Ethernet interfaces, and EX 9200 switches, the valid range for **minimum-links** ***number*** is 1 through 16. When the maximum value (16) is specified, all configured links of a bundle must be up for the bundle to be labeled **up**.

On all other routers and on EX Series switches, other than EX8200 switches, the range of valid values for **minimum-links** ***number*** is 1 through 8. When the maximum value (8) is specified, all configured links of a bundle must be up for the bundle to be labeled **up**.

On EX8200 switches, the range of valid values for **minimum-links** ***number*** is 1 through 12. When the maximum value (12) is specified, all configured links of a bundle must be up for the bundle to be labeled **up**.

On MX Series routers, when Link Aggregation Control Protocol (LACP) is enabled on a link aggregation group (LAG) interface along with minimum links configuration, the bundle is considered to be up when the following two conditions are met:

- The specified minimum number of links are up.
- The links are in *collecting distributing* state—that is, collecting and distributing states are merged together to form a combined state (coupled control) for the aggregated port. 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.

If the number of links configured in an aggregated Ethernet interface is less than the minimum link value configured under the **aggregated-ether-options** statement, the configuration commit fails and an error message is displayed.

Related Documentation

- *aggregated-ether-options*
- minimum-links on page 558

- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Tagged Aggregated Ethernet Interfaces

To specify aggregated Ethernet interfaces, include the **vlan-tagging** statement at the **[edit interfaces ae*x*]** hierarchy level:

```
[edit interfaces aex]
vlan-tagging;
```

You must also include the **vlan-id** statement:

```
vlan-id number;
```

You can include this statement at the following hierarchy levels:

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

For more information about the **vlan-tagging** and **vlan-id** statements, see "802.1Q VLANs Overview" on page 265.

Related Documentation

- *vlan-id*
- vlan-tagging on page 606

Understanding Independent Micro BFD Sessions for LAG

Starting with Junos OS Release 13.3, this feature is supported on the following PIC/FPC types:

- PC-1XGE-XENPAK (Type 3 FPC)
- PD-4XGE-XFP (Type 4 FPC)
- PD-5-10XGE-SFPP (Type 4 FPC)
- 24x10GE (LAN/WAN) SFPP, 12x10GE (LAN/WAN) SFPP, 1x100GE Type 5 PICs
- All MPCs on MX Series with Ethernet MICs
- FPC-PTX-P1-A on PTX5000 with 10-Gigabit Ethernet interfaces
- FPC2-PTX-P1A on PTX5000 with 10-Gigabit Ethernet interfaces in Junos OS Release 14.1 and later
- All FPCs on PTX Series with Ethernet interfaces in Junos OS Release 14.1R3 and later 14.1 releases, and Junos 14.2 and later

TIP: See *PTX Series PIC/FPC Compatibility* for a list of PICs that are supported on each PTX Series FPC.

The Bidirectional Forwarding Detection (BFD) protocol is a simple detection protocol that quickly detects failures in the forwarding paths. A link aggregation group (LAG) combines multiple links between devices that are in point-to-point connections, thereby increasing bandwidth, providing reliability, and allowing load balancing. To run a BFD session on LAG interfaces, configure an independent, asynchronous mode BFD session on every LAG member link in a LAG bundle. Instead of a single BFD session monitoring the status of the UDP port, independent micro BFD sessions monitor the status of individual member links.

The individual BFD sessions determine the Layer 2 and Layer 3 connectivity of each member link in the LAG. Once a BFD session is established on a particular link, the member links are attached to the LAG and the load balancer either by a static configuration or by the Link Aggregation Control Protocol (LACP). If the member links are attached to the LAG by a static configuration, the device control process acts as the client to the micro BFD session. When member links are attached to the LAG by the LACP, the LACP acts as the client to the micro BFD session.

When the micro BFD session is up, a LAG link is established and data is transmitted over that LAG link. If the micro BFD session on a member link is down, that particular member link is removed from the load balancer, and the LAG managers stop directing traffic to that link. These micro BFD sessions are independent of each other despite having a single client that manages the LAG interface.

NOTE:

- Starting with Junos OS Release 13.3, IANA has allocated 01-00-5E-90-00-01 as the dedicated MAC address for micro BFD. Dedicated MAC mode is used by default for micro BFD sessions, in accordance with the latest draft for BFD over LAG.
- In Junos OS, MicroBFD control packets are always untagged by default. For L2 aggregated interfaces, the configuration must include vlan-tagging or flexible-vlan-tagging in the Aggregated Ethernet with BFD. Otherwise, the system will throw error while committing the configuration.

Micro BFD sessions run in the following modes:

- Distribution Mode—Micro BFD sessions are distributed by default at Layer 3.
- Non-Distribution Mode—You can configure the BFD session to run in this mode by including the **no-delegate-processing** statement under periodic packet management (PPM). In this mode, the packets are being sent or received by the Routing Engine at Layer 2.

A pair of routing devices in a LAG exchange BFD packets at a specified, regular interval. The routing device detects a neighbor failure when it stops receiving a reply after a specified interval. This allows the quick verification of member link connectivity with or without LACP. A UDP port distinguishes BFD over LAG packets from BFD over single-hop IP.

NOTE: IANA has allocated 6784 as the UDP destination port for micro BFD.

To enable failure detection for LAG networks for aggregated Ethernet interfaces:

- Include the bfd-liveness-detection statement in the configuration.
- Specify a hold-down interval value to set the minimum time that the BFD session must remain up before a state change notification is sent to the other members in the LAG network.
- Specify the minimum interval that indicates the time interval for transmitting and receiving data.
- Starting with Junos OS Release 14.1, specify the neighbor in a BFD session. In releases prior to Junos OS Release 16.1, you must configure the loopback address of the remote destination as the neighbor address. Beginning with Junos OS Release 16.1, you can also configure this feature with aggregated Ethernet interface address of the remote destination as the neighbor address.

  CAUTION: Deactivate bfd-liveness-detection at the **[edit interfaces aex aggregated-ether-options]** hierarchy level or deactivate the aggregated Ethernet interface before changing the neighbor address from loopback

IP address to aggregated Ethernet interface IP address. Modifying the local and neighbor address without deactivating **bfd-liveness-detection** or the aggregated Ethernet interface first might cause micro BFD sessions failure.

NOTE: Beginning with Release 16.1R2, Junos OS checks and validates the configured micro BFD **local-address** against the interface or loopback IP address before the configuration commit. Junos OS performs this check on both IPv4 and IPv6 micro BFD address configurations, and if they do not match, the commit fails.

NOTE: This feature works only when both the devices support BFD. If BFD is configured at one end of the LAG, this feature does not work.

For the IPv6 address family, disable duplicate address detection before configuring this feature with AE interface addresses. To disable duplicate address detection, include the **dad-disable** statement at the **[edit interface *aex* unit *y* family inet6]** hierarchy level.

Release History Table

Release	Description
16.1	Beginning with Junos OS Release 16.1, you can also configure this feature with aggregated Ethernet interface address of the remote destination as the neighbor address.
16.1	Beginning with Release 16.1R2, Junos OS checks and validates the configured micro BFD **local-address** against the interface or loopback IP address before the configuration commit.
14.1	Starting with Junos OS Release 14.1, specify the neighbor in a BFD session. In releases prior to Junos OS Release 16.1, you must configure the loopback address of the remote destination as the neighbor address.
13.3	Starting with Junos OS Release 13.3, IANA has allocated 01-00-5E-90-00-01 as the dedicated MAC address for micro BFD.

Related Documentation

- *authentication*
- **bfd-liveness-detection on page 521**
- *detection-time*
- *transmit-interval*
- Configuring Independent Micro BFD Sessions for LAG on page 115
- *Example: Configuring Independent Micro BFD Sessions for LAG*

Configuring Independent Micro BFD Sessions for LAG

The Bidirectional Forwarding Detection (BFD) protocol is a simple detection protocol that quickly detects failures in the forwarding paths. A link aggregation group (LAG) combines multiple links between devices that are in point-to-point connections, thereby increasing bandwidth, providing reliability, and allowing load balancing. To run a BFD session on LAG interfaces, configure an independent, asynchronous mode BFD session on every LAG member link in a LAG bundle. Instead of a single BFD session monitoring the status of the UDP port, independent micro BFD sessions monitor the status of individual member links.

To enable failure detection for aggregated Ethernet interfaces:

1. Include the following statement in the configuration at the **[edit interfaces *aex* aggregated-ether-options]** hierarchy level:

```
bfd-liveness-detection {
  authentication {
    algorithm algorithm-name;
    key-chain key-chain-name;
    loose-check;
  }
  detection-time {
    threshold milliseconds;
  }
  holddown-interval milliseconds;
  local-address bfd-local-address;
  minimum-interval milliseconds;
  minimum-receive-interval milliseconds;
  multiplier number;
  neighbor bfd-neighbor-address;
  no-adaptation;
  transmit-interval {
    minimum-interval milliseconds;
    threshold milliseconds;
  }
  version (1 | automatic);
}
```

2. Configure the authentication criteria of the BFD session for LAG.

   To specify the authentication criteria, include the **authentication** statement:

```
bfd-liveness-detection {
  authentication {
    algorithm algorithm-name;
    key-chain key-chain-name;
    loose-check;
  }
}
```

   - Specify the algorithm to be used to authenticate the BFD session. You can use one of the following algorithms for authentication:

  - keyed-md5
  - keyed-sha-1
  - meticulous-keyed-md5
  - meticulous-keyed-sha-1
  - simple-password

- To configure the key chain, specify the name that is associated with the security key for the BFD session. The name you specify must match one of the key chains configured in the **authentication-key-chains** ***key-chain*** statement at the **[edit security]** hierarchy level.
- Configure loose authentication checking on the BFD session. Use only for transitional periods when authentication might not be configured at both ends of the BFD session.

3. Configure BFD timers for aggregated Ethernet interfaces.

   To specify the BFD timers, include the **detection-time** statement:

   ```
   bfd-liveness-detection {
     detection-time {
       threshold milliseconds;
     }
   }
   ```

   Specify the threshold value. This is the maximum time interval for detecting a BFD neighbor. If the transmit interval is greater than this value, the device triggers a trap.

4. Configure a hold-down interval value to set the minimum time that the BFD session must remain up before a state change notification is sent to the other members in the LAG network.

   To specify the hold-down interval, include the **holddown-interval** statement:

   ```
   bfd-liveness-detection {
     holddown-interval milliseconds;
   }
   ```

   You can configure a number in the range from 0 through 255,000 milliseconds, and the default is 0. If the BFD session goes down and then comes back up during the hold-down interval, the timer is restarted.

   This value represents the minimum interval at which the local routing device transmits BFD packets, as well as the minimum interval in which the routing device expects to receive a reply from a neighbor with which it has established a BFD session. You can configure a number in the range from 1 through 255,000 milliseconds. You can also specify the minimum transmit and receive intervals separately.

5. Configure the source address for the BFD session.

   To specify a local address, include the **local-address** statement:

   ```
   bfd-liveness-detection {
   ```



```
    local-address bfd-local-address;
}
```

The BFD local address is the loopback address of the source of the BFD session.

NOTE: Beginning with Junos OS Release 16.1, you can also configure this feature with the AE interface address as the local address in a micro BFD session. For the IPv6 address family, disable duplicate address detection before configuring this feature with the AE interface address. To disable duplicate address detection, include the **dad-disable** statement at the **[edit interface *aex* unit *y* family inet6]** hierarchy level.

Beginning with Release 16.1R2, Junos OS checks and validates the configured micro BFD **local-address** against the interface or loopback IP address before the configuration commit. Junos OS performs this check on both IPv4 and IPv6 micro BFD address configurations, and if they do not match, the commit fails.

6. Specify the minimum interval that indicates the time interval for transmitting and receiving data.

   This value represents the minimum interval at which the local routing device transmits BFD packets, as well as the minimum interval in which the routing device expects to receive a reply from a neighbor with which it has established a BFD session. You can configure a number in the range from 1 through 255,000 milliseconds. You can also specify the minimum transmit and receive intervals separately.

   To specify the minimum transmit and receive intervals for failure detection, include the **minimum-interval** statement:

```
bfd-liveness-detection {
    minimum-interval milliseconds;
}
```

NOTE: BFD is an intensive protocol that consumes system resources. Specifying a minimum interval for BFD less than 100 ms for Routing Engine-based sessions and 10 ms for distributed BFD sessions can cause undesired BFD flapping.

Depending on your network environment, these additional recommendations might apply:

- For large-scale network deployments with a large number of BFD sessions, specify a minimum interval of 300 ms for Routing Engine-based sessions and 100 ms for distributed BFD sessions.
- For very large-scale network deployments with a large number of BFD sessions, contact Juniper Networks customer support for more information.
- For BFD sessions to remain up during a Routing Engine switchover event when nonstop active routing is configured, specify a minimum interval of 2500 ms for Routing Engine-based sessions. For distributed BFD sessions with nonstop active routing configured, the minimum interval recommendations are unchanged and depend only on your network deployment.

7. Specify only the minimum receive interval for failure detection by including the **minimum-receive-interval** statement:

   ```
   bfd-liveness-detection {
      minimum-receive-interval milliseconds;
   }
   ```

   This value represents the minimum interval in which the local routing device expects to receive a reply from a neighbor with which it has established a BFD session. You can configure a number in the range from 1 through 255,000 milliseconds.

8. Specify the number of BFD packets that were not received by the neighbor that causes the originating interface to be declared down by including the **multiplier** statement:

   ```
   bfd-liveness-detection {
      multiplier number;
   }
   ```

   The default value is 3. You can configure a number in the range from 1 through 255.

9. Configure the neighbor in a BFD session.

   The neighbor address can be either an IPv4 or an IPv6 address.

   To specify the next hop of the BFD session, include the **neighbor** statement:

   ```
   bfd-liveness-detection {
      neighbor bfd-neighbor-address;
   }
   ```

The BFD neighbor address is the loopback address of the remote destination of the BFD session.

NOTE: Beginning with Junos OS Release 16.1, you can also configure the AE interface address of the remote destination as the BFD neighbor address in a micro BFD session.

10. (Optional) Configure BFD sessions not to adapt to changing network conditions.

    To disable BFD adaptation, include the **no-adaptation** statement:

    ```
    bfd-liveness-detection {
      no-adaptation;
    }
    ```

    NOTE: We recommend that you do not disable BFD adaptation unless it is preferable not to have BFD adaptation in your network.

11. Specify a threshold for detecting the adaptation of the detection time by including the **threshold** statement:

    ```
    bfd-liveness-detection {
      detection-time {
        threshold milliseconds;
      }
    }
    ```

    When the BFD session detection time adapts to a value equal to or greater than the threshold, a single trap and a system log message are sent. The detection time is based on the multiplier of the minimum-interval or the minimum-receive-interval value. The threshold must be a higher value than the multiplier for either of these configured values. For example, if the minimum-receive-interval is 300 ms and the multiplier is 3, the total detection time is 900 ms. Therefore, the detection time threshold must have a value greater than 900.

12. Specify only the minimum transmit interval for failure detection by including the **transmit-interval minimum-interval** statement:

    ```
    bfd-liveness-detection {
      transmit-interval {
        minimum-interval milliseconds;
      }
    }
    ```

    This value represents the minimum interval at which the local routing device transmits BFD packets to the neighbor with which it has established a BFD session. You can configure a value in the range from 1 through 255,000 milliseconds.

13. Specify the transmit threshold for detecting the adaptation of the transmit interval by including the **transmit-interval threshold** statement:

```
bfd-liveness-detection {
  transmit-interval {
    threshold milliseconds;
  }
}
```

The threshold value must be greater than the transmit interval. When the BFD session detection time adapts to a value greater than the threshold, a single trap and a system log message are sent. The detection time is based on the multiplier of the minimum-interval or the minimum-receive-interval value. The threshold must be a higher value than the multiplier for either of these configured values.

14. Specify the BFD version by including the **version** statement:

```
bfd-liveness-detection {
  version (1 | automatic);
}
```

The default is to have the version detected automatically.

NOTE: **This feature works when both the devices support BFD. If BFD is configured at only one end of the LAG, this feature does not work.**

Related Documentation

- *authentication*
- bfd-liveness-detection on page 521
- *detection-time*
- *Example: Configuring Independent Micro BFD Sessions for LAG*
- Understanding Independent Micro BFD Sessions for LAG on page 112

Load Balancing and Ethernet Link Aggregation Overview

You can create a link aggregation group (LAG) for a group of Ethernet ports. Layer 2 bridging traffic is load balanced across the member links of this group, making the configuration attractive for congestion concerns as well as for redundancy. You can configure up to 128 LAG bundles on M Series, and T Series routers, and 480 LAG bundles on MX Series routers and EX9200 switches. Each LAG bundle contains up to 16 links. (Platform support depends on the Junos OS release in your installation.)

By default, the hash key mechanism to load-balance frames across LAG interfaces is based on Layer 2 fields (such as frame source and destination address) as well as the input logical interface (unit). The default LAG algorithm is optimized for Layer 2 switching. Starting with Junos OS Release 10.1, you can also configure the load balancing hash key for Layer 2 traffic to use fields in the Layer 3 and Layer 4 headers using the **payload** statement. For more information, see "Configuring Load Balancing on a LAG Link" on page 262.In a Layer 2 switch, one link is overutilized and other links are underutilized.

Release History Table

Release	Description
10.1	Starting with Junos OS Release 10.1, you can also configure the load balancing hash key for Layer 2 traffic to use fields in the Layer 3 and Layer 4 headers using the **payload** statement.

Related Documentation

- Configuring Load Balancing on a LAG Link on page 262
- Load Balancing on a LAG Link on page 262
- *payload*

Configuring Load Balancing Based on MAC Addresses

The hash key mechanism for load-balancing uses Layer 2 media access control (MAC) information such as frame source and destination address. To load-balance traffic based on Layer 2 MAC information, include the **multiservice** statement at the **[edit forwarding-options hash-key]** or **[edit chassis fpc *slot number* pic *PIC number* hash-key]** hierarchy level:

```
multiservice {
  source-mac;
  destination-mac;
  payload {
    ip {
      layer3-only;
      layer-3 (source-ip-only | destination-ip-only);
      layer-4;
      inner-vlan-id;
      outer-vlan-id;
    }
  }
}
```

To include the destination-address MAC information in the hash key, include the **destination-mac** option. To include the source-address MAC information in the hash key, include the **source-mac** option.

NOTE: Any packets that have the same source and destination address will be sent over the same path.

NOTE: You can configure per-packet load balancing to optimize EVPN traffic flows across multiple paths.

NOTE: Aggregated Ethernet member links will now use the physical MAC address as the source MAC address in 802.3ah OAM packets.

Related Documentation

- multiservice on page 562

Understanding Consistent Load Balancing Through Resilient Hashing on ECMP Groups

You can use consistent load balancing to minimize flow remapping in an equal-cost multipath (ECMP) group.

By default, when there are multiple equal-cost paths to the same destination for the active route, Junos OS uses a hash algorithm to choose one of the next-hop addresses to install in the forwarding table. Whenever the set of next hops for a destination changes in any way, Junos OS rechooses the next-hop address by using the hash algorithm.

You can configure *consistent load balancing* on the switch to prevent the reordering of *all* flows to active paths in an ECMP group when one or more next-hop paths fail. Only flows for paths that are inactive are redirected to another active next-hop path. Flows mapped to servers that remain active are maintained.

This feature applies only to external BGP peers.

Related Documentation

- Configuring Consistent Load Balancing for ECMP Groups on page 123

Configuring Consistent Load Balancing for ECMP Groups

Per-packet load balancing allows you to spread traffic across multiple equal-cost paths. By default, when a failure occurs in one or more paths, the hashing algorithm recalculates the next hop for all paths, typically resulting in the reordering of all flows. *load balancing* enables you to override this behavior so that only flows for links that are inactive are redirected. All existing active flows are maintained without disruption. In a data center environment, the reordering of all flows when a link fails potentially results in significant traffic loss or a loss of service to servers whose links remain active. load balancing maintains all active links and instead remaps only those flows affected by one or more link failures. This feature ensures that flows connected to links that remain active continue uninterrupted.

This feature applies to topologies where members of an equal-cost multipath (ECMP) group are external BGP neighbors in a single-hop BGP session. load balancing does not apply when you add a new ECMP path or modify an existing path in any way. To add a new path with minimal disruption, define a new ECMP group with both existing and new paths. In this way, clients can be moved to the new group gradually without terminating existing connections.

- (On MX Series) Only Modular Port Concentrators (MPCs) are supported.
- Both IPv4 and IPv6 paths are supported.
- ECMP groups that are part of a virtual routing and forwarding (VRF) instance or other routing instance are also supported.
- Multicast traffic is not supported.
- Aggregated interfaces are supported, but load balancing is not supported among members of the link aggregation (LAG) bundle. Traffic from active members of the LAG bundle might be moved to another active member when one or more member links fail. The hashing algorithm is restarted when one or more LAG member links fail.
- We strongly recommend that you apply load balancing to no more than a maximum of 1,000 IP prefixes per router or switch.
- Layer 3 adjacency over integrated routing and bridging (IRB) interfaces is supported.

You can configure the BGP *add-path* feature to enable replacement of a failed path with a new active path when one or more paths in the ECMP group fail. Configuring replacement of failed paths ensures that traffic flow on the failed paths only are redirected. Traffic flow on active paths will remain unaltered

NOTE:

- When you configure load balancing on generic routing encapsulation (GRE) tunnel interfaces, you must specify the inet address of the far end GRE interface so that the Layer 3 adjacencies over the GRE tunnel interfaces are installed correctly in the forwarding table. However, ECMP fast reroute (FRR) over GRE tunnel interfaces is not supported during load balancing. You can specify the destination address on the router configured with load balancing at the **[edit interfaces *interface name* unit *unit name* family inet address *address*]** hierarchy level. For example:

  ```
  [edit interfaces]
  user@host# set interfaces gr-4/0/0 unit 21 family inet address 10.10.31.2/32
    destination 10.10.31.1
  ```

- load balancing does not support BGP multihop for EBGP neighbors. Therefore, do not enable the **multihop** option on devices configured with load balancing.

To configure load balancing for ECMP groups:

1. Configure BGP and enable the BGP group of external peers to use multiple paths.

2. Create a routing policy to match incoming routes to one or more destination prefixes.

   ```
   [edit policy-options]
   user@host# set policy-statement policy-statement-name from route-filter
     destination-prefix  orlonger
   ```

3. Apply load balancing to the routing policy so that only traffic flows to one or more destination prefixes that experience a link failure are redirected to an active link.

   ```
   [edit policy-options]
   user@host# set policy-statement policy-statement-name then load-balance
     consistent-hash
   ```

4. Create a separate routing policy and enable per-packet load balancing.

   NOTE: You must configure and apply a per-packet load-balancing policy to install all routes in the forwarding table.

   ```
   [edit policy-options]
   user@host# set policy-statement policy-statement-name then load-balance per-packet
   ```

5. Apply the routing policy for consistent load balancing to the BGP group of external peers.

NOTE: Consistent load balancing can be applied only to BGP external peers. This policy cannot be applied globally.

[edit protocols bgp]
user@host# **set group *group-name* import *policy-statement-name***
#This policy-statement-name refers to the policy created in Step 2.

6. (Optional) Enable bidirectional forwarding detection (BFD) for each external BGP neighbor.

   [edit protocols bgp]
   user@host# **set group *group-name* neighbor *ip-address* bfd-liveness-detection *milliseconds***

   NOTE: This step shows the minimum BFD configuration required. You can configure additional options for BFD.

7. Apply the per-prefix load-balancing policy globally to install all next-hop routes in the forwarding table.

   [edit routing-options]
   user@host# **set forwarding table export *policy-statement-name***
   #This policy-statement-name refers to the policy created in Step 4.

8. (Optional) Enable fast reroute for ECMP routes.

   [edit routing-options]
   user@host# **set forwarding-table ecmp-fast-reroute**

9. Verify the status of one or more ECMP routes for which you enabled consistent load balancing.

   user@host> **show route *destination-prefix* extensive**

   The output of the command displays the following flag when consistent load balancing is enabled:
   State: <Active Ext LoadBalConsistentHash>

Related Documentation

- policy-statement on page 649
- Actions in Routing Policy Terms on page 125
- *Understanding Per-Packet Load Balancing*

Actions in Routing Policy Terms

Each term in a routing policy can include a **then** statement, which defines the actions to take if a route matches all the conditions in the **from** and **to** statements in the term:

```
then {
  actions;
}
```

You can include this statement at the following hierarchy levels:

- **[edit policy-options** policy-statement ***policy-name*** **term *term-name*]**
- **[edit logical-systems *logical-system-name* policy-options** policy-statement ***policy-name*** **term *term-name*]**

If a term does not have **from** and **to** statements, all routes are considered to match, and the actions apply to them all. For information about the **from** and **to** statements, see *Routing Policy Match Conditions*.

You can specify one or more actions in the **then** statement. There are three types of actions:

- Flow control actions, which affect whether to accept or reject the route and whether to evaluate the next term or routing policy.
- Actions that manipulate route characteristics.
- Trace action, which logs route matches.

NOTE: When you specify an action that manipulates the route characteristics, the changes occur in a copy of the source route. The source route itself does not change. The effect of the action is visible only after the route is imported into or exported from the routing table. To view the source route before the routing policy has been applied, use the **show route receive-protocol** command. To view a route after an export policy has been applied, use the **show route advertised-protocol** command.

During policy evaluation, the characteristics in the copy of the source route always change immediately after the action is evaluated. However, the route is not copied to the routing table or a routing protocol until the policy evaluation is complete.

The **then** statement is optional. If you omit it, one of the following occurs:

- The next term in the routing policy, if one is present, is evaluated.
- If there are no more terms in the routing policy, the next routing policy, if one is present, is evaluated.
- If there are no more terms or routing policies, the accept or reject action specified by the default policy is taken. For more information, see *Default Routing Policies*.

The following sections discuss these actions:

- Configuring Flow Control Actions on page 127
- Configuring Actions That Manipulate Route Characteristics on page 127

- Configuring the Default Action in Routing Policies on page 135
- Configuring a Final Action in Routing Policies on page 136
- Logging Matches to a Routing Policy Term on page 137
- Configuring Separate Actions for Routes in Route Lists on page 137

Configuring Flow Control Actions

Table 17 on page 127 lists the flow control actions. You can specify one of these actions along with the trace action or one or more of the actions that manipulate route characteristics (see "Configuring Actions That Manipulate Route Characteristics" on page 127).

Table 17: Flow Control Actions

Flow Control Action	Description
accept	Accept the route and propagate it. After a route is accepted, no other terms in the routing policy and no other routing policies are evaluated.
default-action accept	Accept and override any action intrinsic to the protocol. This is a nonterminating policy action.
reject	Reject the route and do not propagate it. After a route is rejected, no other terms in the routing policy and no other routing policies are evaluated.
default-action reject	Reject and override any action intrinsic to the protocol. This is a nonterminating policy action.
next term	Skip to and evaluate the next term in the same routing policy. Any accept or reject action specified in the **then** statement is skipped. Any actions in the **then** statement that manipulate route characteristics are applied to the route. **next term** is the default control action if a match occurs and you do not specify a flow control action.
next policy	Skip to and evaluate the next routing policy. Any accept or reject action specified in the **then** statement is skipped. Any actions in the **then** statement that manipulate route characteristics are applied to the route. **next policy** is the default control action if a match occurs, you do not specify a flow control action, and there are no further terms in the current routing policy.

Configuring Actions That Manipulate Route Characteristics

You can specify one or more of the actions listed in Table 18 on page 127 to manipulate route characteristics.

Table 18: Actions That Manipulate Route Characteristics

Action	Description
add-path send-count *path-count*	(BGP only) Enable sending up to 20 BGP paths to a destination for a subset of **add-path** advertised prefixes.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
as-path-prepend ***as-path***	(BGP only) Affix one or more AS numbers at the beginning of the AS path. If specifying more than one AS number, enclose the numbers in quotation marks (" "). The AS numbers are added after the local AS number has been added to the path. This action adds AS numbers to AS sequences only, not to AS sets. If the existing AS path begins with a confederation sequence or set, the affixed AS numbers are placed within a confederation sequence. Otherwise, the affixed AS numbers are placed within a nonconfederation sequence. For more information, see *Understanding Prepending AS Numbers to BGP AS Paths*. In Junos OS Release 9.1 and later, you can specify 4-byte AS numbers as defined in RFC 4893, *BGP Support for Four-octet AS Number Space*, as well as the 2-byte AS numbers that are supported in earlier releases of the Junos OS.
as-path-expand last-as count ***n***	(BGP only) Extract the last AS number in the existing AS path and affix that AS number to the beginning of the AS path ***n*** times, where ***n*** is a number from 1 through 32. The AS number is added before the local AS number has been added to the path. This action adds AS numbers to AS sequences only, not to AS sets. If the existing AS path begins with a confederation sequence or set, the affixed AS numbers are placed within a confederation sequence. Otherwise, the affixed AS numbers are placed within a nonconfederation sequence. This option is typically used in non-IBGP export policies.
bgp-output-queue-priority	(BGP only) Set the output priority queue used for this route. There are 17 prioritized output queues: an expedited queue that is the highest priority, and 16 numbered queues where 1 is the lowest priority and 16 is the highest.
class ***class-name***	(Class of service [CoS] only) Apply the specified class-of-service parameters to routes installed into the routing table. For more information, see the *Class of Service Feature Guide for Routing Devices and EX9200 Switches*.
color ***preference*** **color2** ***preference***	Set the preference value to the specified value. The **color** and **color2** preference values are even more fine-grained than those specified in the **preference** and **preference2** actions. The color value can be a number in the range from 0 through 4,294,967,295 ($2^{32} – 1$). A lower number indicates a more preferred route. If you set the preference with the **color** action, the value is internal to Junos OS and is not transitive.
color (add | subtract) ***number*** **color2 (add | subtract)** ***number***	Change the color preference value by the specified amount. If an addition operation results in a value that is greater than 4,294,967,295 ($2^{32} – 1$), the value is set to $2^{32} – 1$. If a subtraction operation results in a value less than 0, the value is set to 0. If an attribute value is not already set at the time of the addition or subtraction operation, the attribute value defaults to a value of 0 regardless of the amount specified. If you perform an addition to an attribute with a value of 0, the number you add becomes the resulting attribute value.
community (+ | add) [***names*** **]**	(BGP only) Add the specified communities to the set of communities in the route. For more information, see *Understanding BGP Communities, Extended Communities, and Large Communities as Routing Policy Match Conditions*.
community (– | delete) [***names*** **]**	(BGP only) Delete the specified communities from the set of communities in the route. For more information, see *Understanding BGP Communities, Extended Communities, and Large Communities as Routing Policy Match Conditions*.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
community (= | set) [*names*]	(BGP only) Replace any communities that were in the route in with the specified communities. For more information, see *Understanding BGP Communities, Extended Communities, and Large Communities as Routing Policy Match Conditions*.
cos-next-hop-map *map-name*	Set CoS-based next-hop map in forwarding table.
damping *name*	(BGP only) Apply the specified route-damping parameters to the route. These parameters override the default damping parameters. This action is useful only in an import policy, because the damping parameters affect the state of routes in the routing table. To apply damping parameters, you must enable BGP flap damping as described in the *Junos OS Routing Protocols Library*, and you must create a named list of parameters as described in *Using Routing Policies to Damp BGP Route Flapping*.
destination-class *destination-class-name*	Maintain packet counts for a route passing through your network, based on the destination address in the packet. You can do the following: • Configure group destination prefixes by configuring a routing policy. • Apply that routing policy to the forwarding table with the corresponding destination class. • Enable packet counting on one or more interfaces by including the **destination-class-usage** statement at the **[edit interfaces *interface-name* unit *logical-unit-number* family inet accounting]** hierarchy level (see the *Class of Service Feature Guide for Routing Devices and EX9200 Switches*). • View the output by using one of the following commands: **show interfaces destination-class (all | *destination-class-name logical-interface-name*)**, **show interfaces *interface-name* extensive**, or **show interfaces *interface-name* statistics** (see the CLI Explorer). • To configure a packet count based on the source address, use the **source-class** statement described in this table.
external type *metric*	Set the external metric type for routes exported by OSPF. You must specify the keyword **type**.
forwarding-class *forwarding-class-name*	Create the forwarding class that includes packets based on both the destination address and the source address in the packet. You can do the following: • Configure group prefixes by configuring a routing policy. • Apply that routing policy to the forwarding table with the corresponding forwarding class. • Enable packet counting on one or more interfaces by using the procedure described in either the **destination-class** or **source-class** actions defined in this table.
install-nexthop <strict> lsp *lsp-name*	Choose which next hops, among a set of equal LSP next hops, are installed in the forwarding table. Use the export policy for the forwarding table to specify the LSP next hop to be used for the desired routes. Specify the **strict** option to enable strict mode, which checks to see if any of the LSP next hops specified in the policy are up. If none of the specified LSP next hops are up, the policy installs the discard next hop.
install-to-fib	For PTX Series routers only, override the default BGP routing policy. For more information, see *Example: Overriding the Default BGP Routing Policy on PTX Series Packet Transport Routers*.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
load-balance consistent-hash	(BGP only) For MX Series routers with modular port concentrators (MPCs) and for QFX10000 switches only, specify consistent load balancing for one or more IP addresses. This feature preserves the affinity of a flow to a path in an equal-cost multipath (ECMP) group when one or more next-hop paths fail. Only flows for paths that are inactive are redirected. Flows mapped to servers that remain active are maintained.
load-balance destination-ip-only	Calculate load balancing hash based solely on destination IP address. This allows a service provider to direct traffic toward a specific content server in per-subscriber aware environments.
load-balance per-packet	(For export to the forwarding table only) Install all next-hop addresses in the forwarding table and have the forwarding table perform per-packet load balancing. This policy action allows you to optimize VPLS traffic flows across multiple paths. For more information, see *Configuring Per-Packet Load Balancing*.
load-balance per-prefix	For PTX Series routers only, override the default per-packet load balancing routing policy for BGP. For more information, see *Example: Overriding the Default BGP Routing Policy on PTX Series Packet Transport Routers*.
load-balance source-ip-only	Calculate load balancing hash based solely on source IP address. This allows a service provider to direct traffic toward a specific content server in per-subscriber aware environments.
local-preference ***value***	(BGP only) Set the BGP local preference (**LocalPref**) attribute. The preference value can be a number in the range from 0 through 4,294,967,295 ($2^{32} – 1$). In order to use common comparison routines, Junos OS stores the 1's complement of the **LocalPref** value in the **Preference2** field. For example, if the **LocalPref** value for Route 1 is 100, the **Preference2** value is -101. If the **LocalPref** value for Route 2 is 155, the **Preference2** value is -156. Route 2 is preferred because it has a higher **LocalPref** value and a lower **Preference2** value. If routing policy manipulates both **LocalPref** and **Preference2** for the same route, the **Preference2** settings specified in the routing policy are ignored, and **Preference2** value is derived from **LocalPref** value instead. If routing policy manipulates only one attribute (either **LocalPref** or **Preference2**) for the same route, the value of the second attribute is derived from the value of the first attribute.
local-preference (add | subtract) ***number***	Change the local preference value by the specified amount. If an addition operation results in a value that is greater than 4,294,967,295 ($2^{32} – 1$), the value is set to $2^{32} – 1$. If a subtraction operation results in a value less than 0, the value is set to 0. If an attribute value is not already set at the time of the addition or subtraction operation, the attribute value defaults to a value of 0 regardless of the amount specified. If you perform an addition to an attribute with a value of 0, the number you add becomes the resulting attribute value. For BGP, if the attribute value is not known, it is initialized to 100 before the routing policy is applied.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
map-to-interface (*interface-name* **| self)**	Sets the **map-to-interface** value which is similar to existing metric or tag actions. The **map-to-interface** action requires you to specify one of the following: • A logical interface (for example, ge-0/0/0.0). The logical interface can be any interface that multicast currently supports, including VLAN and aggregated Ethernet interfaces. NOTE: If you specify a physical interface as the **map-to-interface** (for example, ge-0/0/0), a value of .0 is appended to physical interface to create a logical interface. • The keyword **self**. The **self** keyword specifies that multicast data packets are sent on the same interface as the control packets and no mapping occurs. If no term matches, then no multicast data packets are sent.
metric *metric* **metric2** *metric* **metric3** *metric* **metric4** *metric*	Set the metric. You can specify up to four metric values, starting with **metric** (for the first metric value) and continuing with **metric2**, **metric3**, and **metric4**. BGP only: **metric** corresponds to the multiple exit discriminator (MED), and **metric2** corresponds to the interior gateway protocol (IGP) metric if the BGP next hop loops through another router. Although Junos may allow you to configure a value for Metric2, for example in a BGP import policy, the value of Metric2 cannot actually be changed for BGP routes. The configuration is provided for other protocols where the action is valid.
metric (add | subtract) *number* **metric2 (add | subtract)** *number* **metric3 (add | subtract)** *number* **metric4 (add | subtract)** *number*	Change the metric value by the specified amount. If an addition operation results in a value that is greater than 4,294,967,295 ($2^{32} – 1$), the value is set to $2^{32} – 1$. If a subtraction operation results in a value less than 0, the value is set to 0. If an attribute value is not already set at the time of the addition or subtraction operation, the attribute value defaults to a value of 0 regardless of the amount specified. If you perform an addition to an attribute with a value of 0, the number you add becomes the resulting attribute value.
metric expression (metric multiplier *x* **offset** *a* **| metric2 multiplier** *y* **offset** *b***)**	Calculate a metric based on the current values of **metric** and **metric2**. This policy action overrides the current value of the metric attribute with the result of the expression ((x * metric) + a) + ((y * metric2) + b) where **metric** and **metric2** are the current input values. Metric multipliers are limited in range to eight significant digits.
metric (igp | minimum-igp) *site-offset*	(BGP only) Change the metric (MED) value by the specified negative or positive offset. This action is useful only in an external BGP (EBGP) export policy.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description

next-hop (*address* | discard | next-table *table-name* | peer-address | reject | self)	Set the next-hop address. When the advertising protocol is BGP, you can set the next hop only when any third-party next hop can be advertised; that is, when you are using IBGP or EBGP confederations.
	
	If you specify **self**, the next-hop address is replaced by one of the local routing device's addresses. The advertising protocol determines which address to use. When the advertising protocol is BGP, this address is set to the local IP address used for the BGP adjacency. A routing device cannot install routes with itself as the next hop.
	
	If you specify **peer-address**, the next-hop address is replaced by the peer's IP address. This option is valid only in import policies. Primarily used by BGP to enforce using the peer's IP address for advertised routes, this option is meaningful only when the next hop is the advertising routing device or another directly connected routing device.
	
	If you specify **discard**, the next-hop address is replaced by a discard next hop.
	
	If you specify **next-table**, the routing device performs a forwarding lookup in the specified table.
	
	If you use the **next-table** action, the configuration must include a term qualifier that specifies a different table than the one specified in the **next-table** action. In other words, the term qualifier in the **from** statement must exclude the table in the **next-table** action. In the following example, the first term contains **rib vrf-customer2.inet.0** as a matching condition. The action specifies a next-hop in a different routing table, **vrf-customer1.inet.0**. The second term does the opposite by using **rib vrf-customer1.inet.0** in the match condition and **vrf-customer2.inet.0** In the **next-table** action.
	
	term 1 {
	  from {
	    protocol bgp;
	    rib vrf-customer2.inet.0;
	    community customer;
	  }
	  then {
	    next-hop next-table vrf-customer1.inet.0;
	  }
	}
	term 2 {
	  from {
	    protocol bgp;
	    rib vrf-customer1.inet.0;
	    community customer;
	  }
	  then {
	    next-hop next-table vrf-customer2.inet.0;
	  }
	}
	
	If you specify **reject**, the next-hop address is replaced by a reject next hop.

origin *value*	(BGP only) Set the BGP origin attribute to one of the following values: • **igp**—Path information originated within the local AS. • **egp**—Path information originated in another AS. • **incomplete**—Path information learned by some other means.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
p2mp-lsp-root	Set the ingress root node for a multipoint LDP (M-LDP)-based point-to-multipoint label-switched path (LSP). For more information, see *Example: Configuring Multipoint LDP In-Band Signaling for Point-to-Multipoint LSPs*.
preference ***preference*** **preference2** ***preference***	Set the preference value. You can specify a primary preference value (**preference**) and a secondary preference value (**preference2**). The preference value can be a number in the range from 0 through 4,294,967,295 ($2^{32} – 1$). A lower number indicates a more preferred route. If you set the preference with the preference action, the new preference remains associated with the route. The new preference is internal to the Junos OS and is not transitive. When you use an import policy to set the value of **preference2** to the highest allowed value of 4,294,967,295, Junos OS resets this value to -1. If you set **preference2** to a number greater than ($2^{31} – 1$), it is reset to a negative value. In order to use common comparison routines, Junos OS stores the 1's complement of the **LocalPref** value in the **Preference2** field. For example, if the **LocalPref** value for Route 1 is 100, the **Preference2** value is -101. If the **LocalPref** value for Route 2 is 155, the **Preference2** value is -156. Route 2 is preferred because it has a higher LocalPref value and a lower Preference2 value. If a routing policy manipulates both **LocalPref** and **Preference2** for the same route, the **Preference2** settings specified in the routing policy are ignored, and **Preference2** value is derived from **LocalPref** value instead. If routing policy manipulates only one attribute (either **LOCAL_PREF** or **Preference2**) for the same route, the value of the second attribute is derived from the value of the first attribute. Particularly, when you use a routing policy to set the value of **Preference2**, automatically the value of **LocalPref** is changed as well (derived from **Preference2**), and the new value of **LocalPref** is advertised subsequently on the outbound iBGP updates. To specify even finer-grained preference values, see the **color** and **color2** actions in this table.
preference (add | subtract) ***number*** **preference2 (add | subtract)** ***number***	Change the preference value by the specified amount. If an addition operation results in a value that is greater than 4,294,967,295 ($2^{32} – 1$), the value is set to $2^{32} – 1$. If a subtraction operation results in a value less than 0, the value is set to 0. If an attribute value is not already set at the time of the addition or subtraction operation, the attribute value defaults to a value of 0 regardless of the amount specified. If you perform an addition to an attribute with a value of 0, the number you add becomes the resulting attribute value.
priority (low | medium | high)	(OSPF import only) Specify a priority for prefixes included in an OSPF import policy. Prefixes learned through OSPF are installed in the routing table based on the priority assigned to the prefixes. Prefixes assigned a priority of **high** are installed first, while prefixes assigned a priority of **low** are installed last. NOTE: An OSPF import policy can only be used to set priority or to filter OSPF external routes. If an OSPF import policy is applied that results in a **reject** terminating action for a nonexternal route, then the **reject** action is ignored and the route is accepted anyway.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
source-class ***source-class-name***	Maintain packet counts for a route passing through your network, based on the source address. You can do the following: • Configure group source prefixes by configuring a routing policy. • Apply that routing policy to the forwarding table with the corresponding source class. • Enable packet counting on one or more interfaces by including the **source-class-usage** ***interface-name*** statement at the **[edit interfaces** ***logical-unit-number*** **unit family inet accounting]** hierarchy level. Also, follow the **source-class-usage** statement with the **input** or **output** statement to define the inbound and outbound interfaces on which traffic monitored for source-class usage (SCU) is arriving and departing (or define one interface for both). The complete syntax is **[edit interfaces** ***interface-name*** **unit family inet accounting source-class-usage (input | output | input output)** ***unit-number*]**. • View the output by using one of the following commands: **show interfaces** ***interface-name*** **source-class** ***source-class-name***, **show interfaces** ***interface-name*** **extensive**, or **show interfaces** ***interface-name*** **statistics** (see the CLI Explorer). • To configure a packet count based on the destination address, use the **destination-class** statement described in this table. • For a detailed source-class usage example configuration, see the *Example: Grouping Source and Destination Prefixes into a Forwarding Class*. NOTE: When configuring policy action statements, you can configure only one source class for each matching route. In other words, more than one source class cannot be applied to the same route.
ssm-source [***addresses*** **];**	Specify one or more IPv4 or IPv6 source addresses for the source-specific multicast (SSM) policy
ssm-source [***addresses*** **];**	Specify one or more IPv4 or IPv6 source addresses for the source-specific multicast (SSM) policy.
tag ***tag*** **tag2** ***tag***	Set the tag value. You can specify two tag strings: **tag** (for the first string) and **tag2** (a second string). These values are local to the router. • For OSPF routes the **tag** action sets the 32-bit tag field in OSPF external link-state advertisement (LSA) packets. • For IS-IS routes, the **tag** action sets the 32-bit flag in the IS-IS IP prefix type length values (TLV). • For RIPv2 routes, the **tag** action sets the route-tag community. The **tag2** option is not supported.
tag (add | subtract) ***number*** **tag2 (add | subtract)** ***number***	Change the tag value by the specified amount. If an addition operation results in a value that is greater than 4,294,967,295 (2^{32} – 1), the value is set to 2^{32} – 1. If a subtraction operation results in a value less than 0, the value is set to 0. If an attribute value is not already set at the time of the addition or subtraction operation, the attribute value defaults to a value of 0 regardless of the amount specified. If you perform an addition to an attribute with a value of 0, the number you add becomes the resulting attribute value.

Table 18: Actions That Manipulate Route Characteristics (continued)

Action	Description
validation-state	When BGP origin validation is configured, set the validation state of a route prefix to valid, invalid, or unknown. The route validation database contains route origin authorization (ROA) records that map route prefixes to expected originating autonomous systems (ASs). This prevents the accidental advertisement of invalid routes. See *Understanding Origin Validation for BGP*.

Configuring the Default Action in Routing Policies

The **default-action** statement overrides any action intrinsic to the protocol. This action is also nonterminating, so that various policy terms can be evaluated before the policy is terminated. You can specify a default action, either **accept** or **reject**, as follows:

```
[edit]
policy-options {
  policy-statement policy-name {
    term term-name {
      from {
        family family-name;
        match-conditions;
        policy subroutine-policy-name;
        prefix-list name;
        route-filter destination-prefix match-type <actions>;
        source-address-filter source-prefix match-type <actions>;
      }
      to {
        match-conditions;
        policy subroutine-policy-name;
      }
      then {
        actions;
        default-action (accept | reject);
      }
    }
  }
}
```

The resulting action is set either by the protocol or by the last policy term that is matched.

Example: Configuring the Default Action in a Routing Policy

Configure a routing policy that matches routes based on three policy terms. If the route matches the first term, a certain community tag is attached. If the route matches two separate terms, then both community tags are attached. If the route does not match any terms, it is rejected (protocol's default action). Note that the terms **hub** and **spoke** are mutually exclusive.

```
[edit]
policy-options {
  policy-statement test {
```

```
      term set-default {
        then default-action reject;
      }
      term hub {
        from interface ge-2/1/0.5;
        then {
          community add test-01-hub;
          default-action accept;
        }
      }
      term spoke {
        from interface [ ge-2/1/0.1 ge-2/1/0.2 ];
        then {
          community add test-01-spoke;
          default-action accept;
        }
      }
      term management {
        from protocol direct;
        then {
          community add management;
          default-action accept;
        }
      }
    }
  }
```

Configuring a Final Action in Routing Policies

In addition to specifying an action using the **then** statement in a named term, you can also specify an action using the **then** statement in an unnamed term, as follows:

```
[edit]
policy-options {
  policy-statement policy-name {
    term term-name {
      from {
        family family-name;
        match-conditions;
        policy subroutine-policy-name;
        prefix-list name;
        route-filter destination-prefix match-type <actions>;
        source-address-filter source-prefix match-type <actions>;
      }
      to {
        match-conditions;
        policy subroutine-policy-name;
      }
      then {
        actions;
      }
    }
    then action;
  }
}
```


Logging Matches to a Routing Policy Term

If you specify the trace action, the match is logged to a trace file. To set up a trace file, you must specify the following elements in the global **traceoptions** statement:

- Trace filename
- **policy** option in the **flag** statement

The following example uses the trace filename of **policy-log**:

```
[edit]
routing-options {
  traceoptions {
    file “policy-log";
    flag policy;
  }
}
```

This action does not affect the flow control during routing policy evaluation.

If a term that specifies a trace action also specifies a flow control action, the name of the term is logged in the trace file. If a term specifies a trace action only, the word <**default**> is logged.

Configuring Separate Actions for Routes in Route Lists

If you specify route lists in the **from** statement, for each route in the list, you can specify an action to take on that individual route directly, without including a **then** statement. For more information, see *Understanding Route Filters for Use in Routing Policy Match Conditions*.

Related Documentation

- *Route Filter Match Conditions*
- *Routing Policy Match Conditions*

Configuring an Aggregated Ethernet Interface

You can associate a physical interface with an aggregated Ethernet interface.

To configure an aggregated Ethernet interface:

1. Specify that you want to configure the link aggregation group interface.

   user@host# **edit interfaces** ***interface-name***

2. Configure the aggregated Ethernet interface.

   [edit interfaces *interface-name*]
   user@host# **set ether-options 802.3ad ae*x***

You specify the interface instance number ***x*** to complete the link association; ***x*** can be from 0 through 480, for a total of 480 aggregated interfaces on MX Series routers or

EX9200 switches. You must also include a statement defining **ae*x*** at the **[edit interfaces]** hierarchy level. You can optionally specify other physical properties that apply specifically to the aggregated Ethernet interfaces; for details, see *Ethernet Interfaces Overview*.

NOTE: In general, aggregated Ethernet bundles support the features available on all supported interfaces that can become a member link within the bundle. As an exception, Gigabit Ethernet IQ features and some newer Gigabit Ethernet features are not supported in aggregated Ethernet bundles.

Gigabit Ethernet IQ and SFP interfaces can be member links, but IQ- and SFP-specific features are not supported on the aggregated Ethernet bundle even if all the member links individually support those features.

You need to configure the correct link speed for the aggregated Ethernet interface to eliminate any warning message.

NOTE: Before you commit an aggregated Ethernet configuration, ensure that link mode is not configured on any member interface of the aggregated Ethernet bundle; otherwise, the configuration commit check fails.

Related Documentation

- Configuring the Number of Aggregated Ethernet Interfaces on the Device (Enhanced Layer 2 Software CLI Procedure) on page 143
- Deleting an Aggregated Ethernet Interface on page 138

- *Aggregated Ethernet Interfaces Overview*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Deleting an Aggregated Ethernet Interface

There are two approaches to deleting an aggregated Ethernet interface:

- You can delete an aggregated Ethernet interface from the interface configuration. The Junos OS removes the configuration statements related to **ae*x*** and sets this interface to down state.
- You can also permanently remove the aggregated Ethernet interface from the device configuration by deleting it from the device-count on the routing device.

To delete an aggregated Ethernet interface:

1. Delete the aggregated Ethernet configuration.

   This step changes the interface state to down and removing the configuration statements related to **ae*x***.

   ```
   [edit]
   user@host# delete interfaces aex
   ```


2. Delete the interface from the device count.

   [edit]
   user@host# **delete chassis aggregated-devices ethernet device-count**

Related Documentation

- *Configuring an Aggregated Ethernet Interface*
- *Configuring the Number of Aggregated Ethernet Interfaces on the Device*
- *Aggregated Ethernet Interfaces Overview*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Junos OS for Supporting Aggregated Devices

Junos OS supports the aggregation of physical devices into defined virtual links, such as the link aggregation of Ethernet interfaces defined by the IEEE 802.3ad standard.

Tasks for configuring aggregated devices are:

- Configuring Virtual Links for Aggregated Devices on page 139
- Configuring LACP Link Protection at the Chassis Level on page 140
- Enabling LACP Link Protection on page 141
- Configuring System Priority on page 141
- Configuring the Maximum Links Limit on page 142
- Configuring PPM on Junos Fusion on page 142

Configuring Virtual Links for Aggregated Devices

To define virtual links, you need to specify the associations between physical and logical devices within the **[edit interfaces]** hierarchy, and assign the correct number of logical devices by including the **device-count** statement at the **[edit chassis aggregated-devices ethernet]** and **[edit chassis aggregated-devices sonet]** hierarchy levels:

```
[edit chassis]
aggregated-devices {
  ethernet {
    device-count number;
  }
  sonet {
    device-count number;
  }
}
```

The aggregated interfaces are numbered from **ae0** through **ae4091**. The maximum number of aggregated interfaces supported by different routers is listed below:

- For PTX Series routers, you can configure a maximum of 128 aggregated interfaces.
- For M Series and T Series routers, you can configure a maximum of 128 aggregated interfaces (LAG bundles).

- In Junos release 14.2R2 and earlier, you can configure a maximum of 480 aggregated interfaces on MX Series routers.
- In Junos release 14.2R3 and later, you can configure a maximum of 1000 aggregated interfaces on MX240, MX480, and MX960 routers.
- In Junos release 14.2R3 and later, you can configure a maximum of 800 aggregated interfaces on MX2010 and MX2020 routers.
- In Junos OS 15.1F5 and 15.1F6 releases, you can configure a maximum of 480 aggregated interfaces on MX240, MX480, and MX960 routers.
- In Junos OS 15.1F5 and 15.1F6 releases, you can configure a maximum of 800 aggregated interfaces on MX2010 and MX2020 routers.

For SONET/SDH, starting with Junos OS Release 13.2, the maximum number of logical interfaces is 64, numbered from **as0** through **as63**. In releases before Junos OS Release 13.2, the maximum was 16.

Configuring LACP Link Protection at the Chassis Level

Link Aggregation Control Protocol (LACP) is one method of bundling several physical interfaces to form one logical interface. You can configure both VLAN-tagged and untagged aggregated Ethernet with or without LACP enabled. LACP exchanges are made between actors and partners. An actor is the local interface in an LACP exchange. A partner is the remote interface in an LACP exchange.

LACP link protection enables you to force active and standby links within an aggregated Ethernet. You configure LACP link protection by using the **link-protection** and **system-priority** statements at either the chassis or interface level and by configuring port priority at the interface level using the **system-priority** statement. Configuring LACP parameters at the chassis level results in all aggregated Ethernet interfaces using the defined values unless overridden by the LACP configuration on a specific interface.

```
[edit chassis]
aggregated-devices {
  ethernet {
    lacp {
      link-protection {
        non-revertive;
      }
      system-priority priority;
    }
  }
}
```

NOTE: LACP link protection also uses port priority. You can configure port priority at the Ethernet interface **[gigether-options]** hierarchy level using the **port-priority** statement. If you choose not to configure port priority, LACP link protection uses the default value for port priority (127).

See Also

Enabling LACP Link Protection

To enable LACP link protection for aggregated Ethernet interfaces on the chassis, use the **link-protection** statement at the **[edit chassis aggregated-devices ethernet lacp]** hierarchy level:

```
[edit chassis aggregated-devices ethernet lacp]
link-protection {
  non-revertive;
}
```

By default, LACP link protection reverts to a higher-priority (lower-numbered) link when that higher-priority link becomes operational or a link is added to the aggregator that is determined to be higher in priority. However, you can suppress link calculation by adding the **non-revertive** statement to the LACP link protection configuration. In nonrevertive mode, after a link is active and collecting and distributing packets, the subsequent addition of a higher-priority (better) link does not result in a switch, and the current link remains active.

BEST PRACTICE: (MX Series) In a highly scaled configuration over aggregated Ethernet, we recommend that you prevent the router from performing such a switch by including the **non-revertive** statement. Failure to do so may result in some traffic loss if a MIC on which a member interface is located reboots. Using the **non-revertive** statement for this purpose is not effective if both the primary and secondary interfaces are on the MIC that reboots.

CAUTION: If both ends of an aggregator have LACP link protection enabled, make sure to configure both ends of the aggregator to use the same mode. Mismatching LACP link protection modes can result in lost traffic.

Configuring System Priority

To configure LACP system priority for aggregated Ethernet interfaces on the chassis, use the **system-priority** statement at the **[edit chassis aggregated-devices ethernet lacp]** hierarchy level:

```
[edit chassis aggregated-devices ethernet lacp]
system-priority priority;
```

The system priority is a 2-octet binary value that is part of the LACP system ID. The LACP system ID consists of the system priority as the two most-significant octets and the interface MAC address as the six least-significant octets. The system with the numerically lower value for system priority has the higher priority. By default, system priority is 127, with a range of 0 through 65,535.

Configuring the Maximum Links Limit

To configure the maximum links limit, use the **maximum-links** statement at the **[edit chassis aggregated-devices]** hierarchy level:

```
[edit chassis aggregated-devices]
maximum-links maximum-links-limit;
```

Configuring PPM on Junos Fusion

If you use Junos Fusion with Junos OS Release 14.2R3, you need to ensure that link aggregation (and STP) work properly by configuring timers for the periodic packet management (PPM) daemons on the aggregation and satellite devices. We recommend using the following timer values:

```
[edit routing-options ppm]
  redistribution-timer 120;
  tcp-keepalive-interval 3000;
  tcp-keepalive-idle 3000;
```

Starting in Junos OS Release 14.2R4, the timer values that ensure proper link aggregation and STP functions are configured by default if you use Junos Fusion with Junos OS.

Release History Table

Release	Description
15.1F5	In Junos OS 15.1F5 and 15.1F6 releases, you can configure a maximum of 480 aggregated interfaces on MX240, MX480, and MX960 routers.
15.1F5	In Junos OS 15.1F5 and 15.1F6 releases, you can configure a maximum of 800 aggregated interfaces on MX2010 and MX2020 routers.
14.2R4	Starting in Junos OS Release 14.2R4, the timer values that ensure proper link aggregation and STP functions are configured by default if you use Junos Fusion with Junos OS.
14.2R3	In Junos release 14.2R3 and later, you can configure a maximum of 1000 aggregated interfaces on MX240, MX480, and MX960 routers.
14.2R3	In Junos release 14.2R3 and later, you can configure a maximum of 800 aggregated interfaces on MX2010 and MX2020 routers.
14.2R3	If you use Junos Fusion with Junos OS Release 14.2R3, you need to ensure that link aggregation (and STP) work properly by configuring timers for the periodic packet management (PPM) daemons on the aggregation and satellite devices.
14.2R2	In Junos release 14.2R2 and earlier, you can configure a maximum of 480 aggregated interfaces on MX Series routers.
13.2	For SONET/SDH, starting with Junos OS Release 13.2, the maximum number of logical interfaces is 64, numbered from **as0** through **as63**.

Related Documentation

- *Configuring an Aggregated Ethernet Interface*
- *Ethernet Interfaces Feature Guide for Routing Devices*
- *Configuring Aggregated Ethernet Interfaces on PTX Series Packet Transport Routers*
- *Configuring Aggregated SONET/SDH Interfaces*

Configuring the Number of Aggregated Ethernet Interfaces on the Device (Enhanced Layer 2 Software CLI Procedure)

By default, no aggregated Ethernet interfaces are created. You must set the number of aggregated Ethernet interfaces on the routing device before you can configure them.

On MX Series routers and EX9200 switches, you can configure a maximum of 480 aggregated interfaces. The aggregated interfaces(LAG bundles) are numbered from **ae0** through **ae479** on MX Series routers and EX9200 switches.

1. Specify that you want to access the aggregated Ethernet configuration on the device.

   user@host# **edit chassis aggregated-devices ethernet**

2. Set the number of aggregated Ethernet interfaces.

```
[edit chassis aggregated-devices ethernet]
user@host# set device-count number
```

You must also specify the constituent physical links by including the **802.3ad** statement at the **[edit interfaces *interface-name* ether-options]** or **[edit interfaces *interface-name* ether-options]** hierarchy level.

Related Documentation

- For information about physical links, see Configuring an Aggregated Ethernet Interface on page 137
- *Ethernet Interfaces Feature Guide for Routing Devices*
- For information about configuring aggregated devices, see the *Junos OS Administration Library*.

Example: Configuring Aggregated Ethernet Interfaces

Aggregated Ethernet interfaces can use interfaces from different FPCs, DPCs, or PICs. The following configuration is sufficient to get an aggregated Gigabit Ethernet interface up and running.

```
[edit chassis]
aggregated-devices {
  ethernet {
    device-count 15;
  }
}

[edit interfaces]
ge-1/3/0 {
  gigether-options {
    802.3ad ae0;
  }
}
ge-2/0/1 {
  gigether-options {
    802.3ad ae0;
  }
}
ae0 {
  aggregated-ether-options {
    link-speed 1g;
    minimum-links 1;
  }
  }
  vlan-tagging;
  unit 0 {
    vlan-id 1;
    family inet {
      address 10.0.0.1/24;
    }
  }
  unit 1 {
```



```
        vlan-id 1024;
        family inet {
            address 10.0.0.2/24;
        }
    }
    unit 2 {
        vlan-id 1025;
        family inet {
            address 10.0.0.3/24;
        }
    }
    unit 3 {
        vlan-id 4094;
        family inet {
            address 10.0.0.4/24;
        }
    }
}
```

Related Documentation

- *Ethernet Interfaces Feature Guide for Routing Devices*
- Configure 'link-speed' for Gigabit Ethernet based Aggregate Ethernet interface bundles

Configuring Untagged Aggregated Ethernet Interfaces

When you configure an untagged Aggregated Ethernet interface, the existing rules for untagged interfaces apply. These rules are as follows:

- You can configure only one logical interface (unit 0) on the port. The logical unit 0 is used to send and receive LACP or marker protocol data units (PDUs) to and from the individual links.
- You cannot include the **vlan-id** statement in the configuration of the logical interface.

Configure an untagged aggregated Ethernet interface by omitting the **vlan-tagging** and **vlan-id** statements from the configuration:

```
[edit interfaces]
ge-1/1/1 {
   ether-options {
      802.3ad ae0;
   }
}
ae0 {
   # vlan-tagging; OMIT FOR UNTAGGED AE CONFIGURATIONS
   unit 0 {
      # vlan-id 100; OMIT FOR UNTAGGED AE CONFIGURATIONS
      family inet {
         address 10.0.0.1/24 {
            vrrp-group 0 {
               virtual-address 1192.168.110.0;
               priority 200;
            }
         }
      }
   }
}
```

Related Documentation

- For more information about configuring LACP, see Configuring Aggregated Ethernet LACP on page 146.
- *Ethernet Interfaces Feature Guide for Routing Devices*

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 both VLAN-tagged and untagged aggregated Ethernet with or without LACP enabled.

For Multichassis Link Aggregation (MC-LAG), you must specify the **system-id** and **admin key**. MC-LAG peers use the same **system-id** while sending the LACP messages. The **system-id** can be configured on the MC-LAG network device and synchronized between peers for validation.

LACP exchanges are made between actors and partners. An actor is the local interface in an LACP exchange. A partner is the remote interface in an LACP exchange.

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 aggregate bundle without user intervention
- Link monitoring to check whether both ends of the bundle are connected to the correct group

The Junos OS implementation of LACP provides link monitoring but not automatic addition and deletion of links.

The LACP mode can be active or passive. 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. If either the actor or partner is active, they do exchange LACP packets. By default, LACP is turned off on aggregated Ethernet interfaces. If LACP is configured, it is in passive mode by default. To initiate transmission of LACP packets and response to LACP packets, you must configure LACP in active mode.

To enable LACP active mode, include the **lacp** statement at the **[edit interfaces *interface-name* aggregated-ether-options]** hierarchy level, and specify the **active** option:

```
[edit interfaces interface-name aggregated-ether-options]
lacp {
  active;
}
```

NOTE: The LACP process exists in the system only if you configure the system in either active or passive LACP mode.

To restore the default behavior, include the **lacp** statement at the **[edit interfaces *interface-name* aggregated-ether-options]** hierarchy level, and specify the **passive** option:

```
[edit interfaces interface-name aggregated-ether-options]
lacp {
  passive;
}
```

Starting with Junos OS release 12.2, you can also configure LACP to override the IEEE 802.3ad standard and to allow the standby link always to receive traffic. Overriding the default behavior facilitates subsecond failover.

To override the IEEE 802.3ad standard and facilitate subsecond failover, include the **fast-failover** statement at the **[edit interfaces *interface-name* aggregated-ether-options lacp]** hierarchy level.

For more information, see the following sections:

- Configuring the LACP Interval on page 148
- Configuring LACP Link Protection on page 148
- Configuring LACP System Priority on page 150
- Configuring LACP System Identifier on page 150
- Configuring LACP administrative Key on page 150
- Configuring LACP Port Priority on page 150
- Tracing LACP Operations on page 151
- LACP Limitations on page 151
- Example: Configuring Aggregated Ethernet LACP on page 152

Configuring the LACP Interval

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:

```
[edit interfaces interface-name aggregated-ether-options lacp]
periodic interval;
```

The interval can be fast (every second) or slow (every 30 seconds). You can configure different periodic rates on active and passive interfaces. When you configure the active and passive interfaces at different rates, the transmitter honors the receiver's rate.

NOTE: Source address filtering does not work when LACP is enabled.

Percentage policers are not supported on aggregated Ethernet interfaces with the CCC protocol family configured. For more information about percentage policers, see the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide*.

Generally, LACP is supported on all untagged aggregated Ethernet interfaces. For more information, see *Configuring Untagged Aggregated Ethernet Interfaces*.

Configuring LACP Link Protection

NOTE: When using LACP link protection, you can configure only two member links to an aggregated Ethernet interface: one active and one standby.

To force active and standby links within an aggregated Ethernet, you can configure LACP link protection and system priority at the aggregated Ethernet interface level using the **link-protection** and **system-priority** statements. Configuring values at this level results in only the configured interfaces using the defined configuration. LACP interface configuration also enables you to override global (chassis) LACP settings.

LACP link protection also uses port priority. You can configure port priority at the Ethernet interface **[ether-options]** hierarchy level using the **port-priority** statement. If you choose not to configure port priority, LACP link protection uses the default value for port priority (127).

NOTE: LACP link protection supports per-unit scheduling configuration on aggregated Ethernet interfaces.

To enable LACP link protection for an aggregated Ethernet interfaces, use the **link-protection** statement at the **[edit interfaces ae*X* aggregated-ether-options lacp]** hierarchy level:

```
[edit interfaces aeX aggregated-ether-options lacp]
link-protection;
  disable;
  revertive;
  non-revertive;
}
```

By default, LACP link protection reverts to a higher-priority (lower-numbered) link when that higher-priority link becomes operational or a link is added to the aggregator that is determined to be higher in priority. However, you can suppress link calculation by adding the **non-revertive** statement to the LACP link protection configuration. In nonrevertive mode, once a link is active and collecting and distributing packets, the subsequent addition of a higher-priority (better) link does not result in a switch and the current link remains active.

If LACP link protection is configured to be nonrevertive at the global (**[edit chassis]** hierarchy) level, you can add the **revertive** statement to the LACP link protection configuration to override the nonrevertive setting for the interface. In revertive mode, the addition of a higher-priority link to the aggregator results in LACP performing a priority recalculation and switching from the current active link to the new active link.

CAUTION: If both ends of an aggregator have LACP link protection enabled, make sure to configure both ends of the aggregator to use the same mode. Mismatching LACP link protection modes can result in lost traffic.

We strongly recommend you to use LACP on both ends of the aggregator, when you connect an aggregated Ethernet interface with two member interfaces to any other vendor device. Otherwise, the vendor device (say a Layer 2 switch, or a router), will not be able to manage the traffic coming from the two link aggregated Ethernet bundle. As a result, you might observe the vendor device sending back the traffic to the backup member link of the aggregated Ethernet interface.

Currently, MX-MPC2-3D, MX-MPC2-3D-Q, MX-MPC2-3D-EQ, MX-MPC1-3D, MX-MPC1-3D-Q, and MPC-3D-16XGE-SFPP do not drop traffic coming back to the backup link, whereas DPCE-R-Q-20GE-2XGE, DPCE-R-Q-20GE-SFP,

DPCE-R-Q-40GE-SFP, DPCE-R-Q-4XGE-XFP, DPCE-X-Q-40GE-SFP, and DPCE-X-Q-4XGE-XFP drop traffic coming to the backup link.

Configuring LACP System Priority

To configure LACP system priority for aggregated Ethernet interfaces on the interface, use the **system-priority** statement at the **[edit interfaces ae*X* aggregated-ether-options lacp]** hierarchy level:

```
[edit interfaces aeX aggregated-ether-options lacp]
system-priority;
```

The system priority is a 2-octet binary value that is part of the LACP system ID. The LACP system ID consists of the system priority as the two most-significant octets and the interface MAC address as the six least-significant octets. The system with the numerically lower value for system priority has the higher priority. By default, system priority is 127, with a range of 0 to 65,535.

Configuring LACP System Identifier

To configure the LACP system identifier for aggregated Ethernet interfaces, use the **system-id** statement at the **[edit interfaces ae*X* aggregated-ether-options lacp]** hierarchy level:

```
[edit interfaces aeX aggregated-ether-options lacp]
system-id system-id;
```

The user-defined system identifier in LACP enables two ports from two separate devices to act as though they were part of the same aggregate group.

The system identifier is a 48-bit (6-byte) globally unique field. It is used in combination with a 16-bit system-priority value, which results in a unique LACP system identifier.

Configuring LACP administrative Key

To configure an administrative key for LACP, include the **admin-key *number*** statement at the **edit interfaces aex aggregated-ether-options** lacp**]** hierarchy level:

```
[edit interfaces ae x aggregated-ether-options-lacp]
admin-key number;
```

NOTE: You must configure MC-LAG to configure the **admin-key** statement. For more information about MC-LAG, see *Configuring Multichassis Link Aggregation on MX Series Routers*.

Configuring LACP Port Priority

To configure LACP port priority for aggregated Ethernet interfaces, use the **port-priority** statement at the **[edit interfaces *interface-name* ether-options 802.3ad ae*X* lacp]** or **[edit interfaces *interface-name* ether-options 802.3ad ae*X* lacp]** hierarchy levels:

[edit interfaces *interface-name* ether-options 802.3ad ae*X* lacp]
port-priority *priority*;

The port priority is a 2-octet field that is part of the LACP port ID. The LACP port ID consists of the port priority as the two most-significant octets and the port number as the two least-significant octets. The system with the numerically lower value for port priority has the higher priority. By default, port priority is 127, with a range of 0 to 65,535.

Port aggregation selection is made by each system based on the highest port priority and are assigned by the system with the highest priority. Ports are selected and assigned starting with the highest priority port of the highest priority system and working down in priority from there.

NOTE: Port aggregation selection (discussed above) is performed for the active link when LACP link protection is enabled. Without LACP link protection, port priority is not used in port aggregation selection.

Tracing LACP Operations

To trace the operations of the LACP process, include the **traceoptions** statement at the **[edit protocols lacp]** hierarchy level:

```
[edit protocols lacp]
traceoptions {
  file <filename> <files number> <size size> <world-readable | no-world-readable>;
  flag flag;
  no-remote-trace;
}
```

You can specify the following flags in the **protocols lacp traceoptions** statement:

- **all**—All LACP tracing operations
- **configuration**—Configuration code
- **packet**—Packets sent and received
- **process**—LACP process events
- **protocol**—LACP protocol state machine
- **routing-socket**—Routing socket events
- **startup**—Process startup events

For general information about tracing, see the tracing and logging information in the *Junos OS Administration Library*.

LACP Limitations

LACP can link together multiple different physical interfaces, but only features that are supported across all of the linked devices will be supported in the resulting link aggregation group (LAG) bundle. For example, different PICs can support a different number of forwarding classes. If you use link aggregation to link together the ports of a PIC that supports up to 16 forwarding classes with a PIC that supports up to 8 forwarding classes, the resulting LAG bundle will only support up to 8 forwarding classes. Similarly, linking together a PIC that supports WRED with a PIC that does not support it will result in a LAG bundle that does not support WRED.

Example: Configuring Aggregated Ethernet LACP

Configure aggregated Ethernet LACP over a VLAN-tagged interface:

LACP with VLAN-Tagged Aggregated Ethernet

```
[edit interfaces]
ge--1/1/1 {
   ether-options {
      802.3ad ae0;
   }
}
ae0 {
   aggregated-ether-options {
      lacp {
         active;
      }
   }
   vlan-tagging;
   unit 0 {
      vlan-id 100;
      family inet {
         address 10.1.1.2/24 {
            vrrp-group 0 {
               virtual-address 10.1.1.4;
               priority 200;
            }
         }
      }
   }
}
```

Configure aggregated Ethernet LACP over an untagged interface:

LACP with Untagged Aggregated Ethernet

```
[edit interfaces]
ge-1/1/1 {
   ether-options-options {
      802.3ad ae0;
   }
}
ae0 {
   aggregated-ether-options {
      lacp {
         active;
      }
   }
   unit 0 {
      family inet {
         address 10.1.1.2/24 {
            vrrp-group 0 {
```



```
                virtual-address 10.1.1.4;
                priority 200;
              }
            }
          }
        }
      }
```

Related Documentation

- lacp on page 543
- link-protection on page 547
- *traceoptions*
- *Ethernet Interfaces Feature Guide for Routing Devices*

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, QFX5200, EX4600, QFX10002 , and QFX10008 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. Load balancing will not work if you configure link speeds that are not supported. (Platform support depends on the Junos OS release in your installation.)

1. Creating an Aggregated Ethernet Interface on page 154
2. Configuring the VLAN Name and VLAN ID Number on page 154
3. Configuring Aggregated Ethernet LACP (CLI Procedure) on page 155

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

NOTE: VLANs are not supported on OCX Series switches.

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


For example, 100.

NOTE: When you add or remove a vlan from a LAG interface, the interface goes down and comes back (flaps). The flapping happens when a low speed SFP is plugged into a relatively high speed port. To avoid flapping, configure the port speed to match the speed of the SFP.

Configuring Aggregated Ethernet LACP (CLI Procedure)

For aggregated Ethernet interfaces on EX Series switches, 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 interfaces with or without LACP enabled.

LACP was designed to achieve the following:

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

NOTE: You can also configure LACP link protection on aggregated Ethernet interfaces. For information, see "Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches" on page 99.

The Junos OS implementation of LACP provides link monitoring but not automatic addition and deletion of links.

Before you configure LACP for EX Series, be sure you have:

- Configured the aggregated Ethernet bundles—also known as link aggregation groups (LAGs). See "Configuring Aggregated Ethernet Links (CLI Procedure)" on page 96

When LACP is enabled, the local and remote sides of the aggregated Ethernet links exchange protocol data units (PDUs), which contain 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 ae*x* aggregated-ether-options lacp *mode***

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

   [edit interfaces]
   user@switch# **set ae*x* aggregated-ether-options lacp active**

   NOTE: LACP decides active and back up state of links. When configuring LACP, state of the backup link should not be configured manually as down. The following command is not supported if LACP is configured:**set interfaces ae0 aggregated-ether-options link-protection backup-state *down***

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

   [edit interfaces]
   user@switch# **set ae*x* aggregated-ether-options lacp periodic *interval***

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

   [edit interfaces]
   user@switch# **set ae*x* aggregated-ether-options lacp periodic fast**

NOTE: The LACP process exists in the system only if you configure the system in either active or passive LACP mode.

See Also

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Configuring Aggregated Ethernet Interfaces (J-Web Procedure)*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- *Verifying the Status of a LAG Interface*
- *Understanding Aggregated Ethernet Interfaces and LACP*

Related Documentation

- Understanding Interface Naming Conventions on page 9
- *Configuring an FCoE LAG*
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Verifying the Status of a LAG Interface on page 157
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- **show lacp statistics interfaces (View) on page 1122**

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      10.10.10.2/8
```

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 153
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179

  Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184
- **show lacp statistics interfaces (View) on page 1122**

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 158
2. Verifying That LACP Packets Are Being Exchanged on page 158

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 153
- Verifying the Status of a LAG Interface on page 157

- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184
- **show lacp statistics interfaces (View) on page 1122**

Understanding Multicast Load Balancing on Aggregated 10-Gigabit Links for Routed Multicast Traffic on EX8200 Switches

Streaming video technology was introduced in 1997. Multicast protocols were subsequently developed to reduce data replication and network overloads. With multicasting, servers can send a single stream to a group of recipients instead of sending multiple unicast streams. While the use of streaming video technology was previously limited to occasional company presentations, multicasting has provided a boost to the technology resulting in a constant stream of movies, real-time data, news clips, and amateur videos flowing nonstop to computers, TVs, tablets, and phones. However, all of these streams quickly overwhelmed the capacity of network hardware and increased bandwidth demands leading to unacceptable blips and stutters in transmission.

To satisfy the growing bandwidth demands, multiple links were virtually aggregated to form bigger logical point-to-point link channels for the flow of data. These virtual link combinations are called multicast interfaces, also known as link aggregation groups (LAGs).

Multicast load balancing involves managing the individual links in each LAG to ensure that each link is used efficiently. Hashing algorithms continually evaluate the data stream, adjusting stream distribution over the links in the LAG, so that no link is underutilized or overutilized. Multicast load balancing is enabled by default on Juniper Networks EX8200 Ethernet Switches.

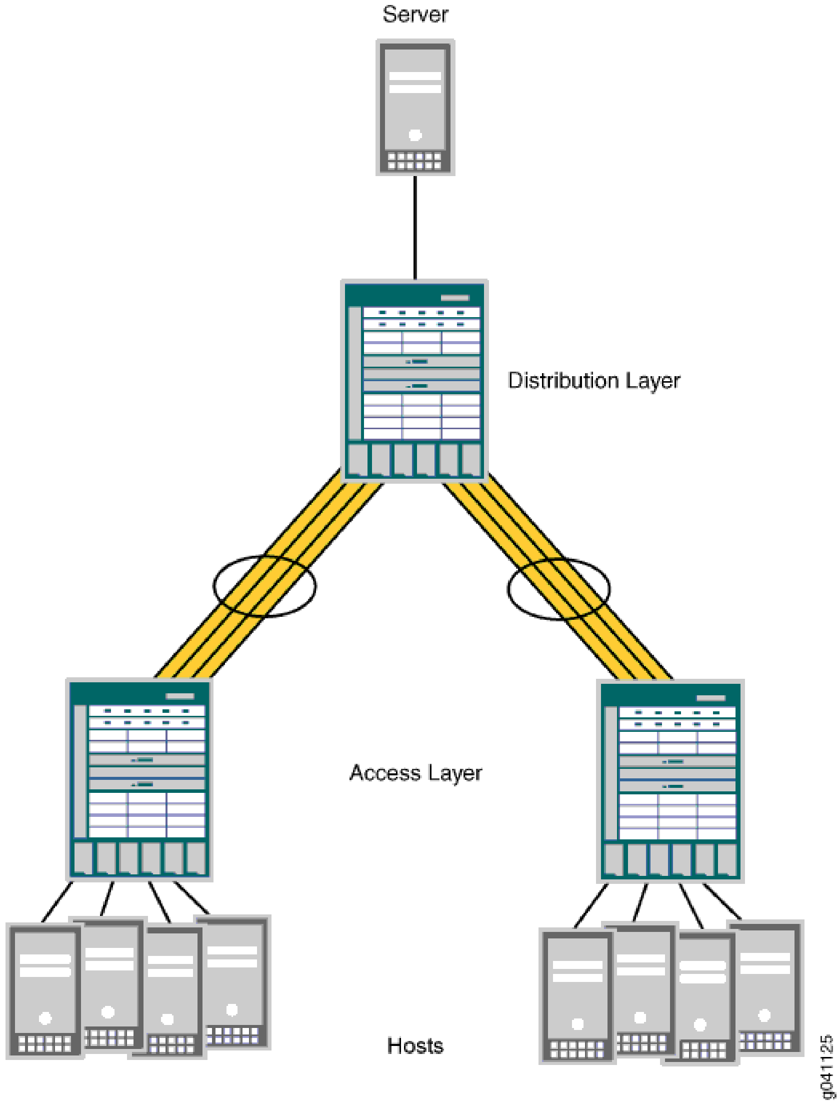
This topic includes:

- Create LAGs for Multicasting in Increments of 10 Gigabits on page 159
- When Should I Use Multicast Load Balancing? on page 160
- How Does Multicast Load Balancing Work? on page 161
- How Do I Implement Multicast Load Balancing on an EX8200 Switch? on page 162

Create LAGs for Multicasting in Increments of 10 Gigabits

The maximum link size on an EX8200 switch is 10 gigabits. If you need a larger link on an EX8200 switch, you can combine up to twelve 10-gigabit links. In the sample topology shown in Figure 1 on page 160, four 10-gigabit links have been aggregated to form each 40-gigabit link.

Figure 1: 40-Gigabit LAGs on EX8200 Switches



When Should I Use Multicast Load Balancing?

Use a LAG with multicast load balancing when you need a downstream link greater than 10 gigabits. This need frequently arises when you act as a service provider or when you multicast video to a large audience.

To use multicast load balancing, you need the following:

- An EX8200 switch—Standalone switches support multicast load balancing, while Virtual Chassis does not.
- A Layer 3 routed multicast setup—For information about configuring multicasting, see *Junos OS Routing Protocols Configuration Guide*.

- Aggregated 10-gigabit links in a LAG—For information about configuring LAGs with multicast load balancing , see *Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Links on EX8200 Switches (CLI Procedure)*.

How Does Multicast Load Balancing Work?

Juniper Networks Junos operating system (Junos OS) supports the Link Aggregation Control Protocol (LACP), which is a subcomponent of IEEE 802.3ad. LACP provides additional functionality for LAGs and is supported only on Layer 3 interfaces. When traffic can use multiple member links, traffic that is part of the same stream must always be on the same link.

Multicast load balancing uses one of seven available hashing algorithms and a technique called queue shuffling (alternating between two queues) to distribute and balance the data, directing streams over all available aggregated links. You can select one of the seven algorithms when you configure multicast load balancing, or you can use the default algorithm, crc-sgip, which uses a cyclic redundancy check (CRC) algorithm on the multicast packets' group IP address. We recommend that you start with the crc-sgip default and try other options if this algorithm does not evenly distribute the Layer 3 routed multicast traffic. Six of the algorithms are based on the hashed value of IP addresses (IPv4 or IPv6) and will produce the same result each time they are used. Only the balanced mode option produces results that vary depending on the order in which streams are added. See Table 19 on page 161 for more information.

Table 19: Hashing Algorithms Used by Multicast Load Balancing

Hashing Algorithms	Based On	Best Use
crc-sgip	Cyclic redundancy check of multicast packets' source and group IP address	Default—high-performance management of IP traffic on 10-Gigabit Ethernet network. Predictable assignment to the same link each time. This mode is complex but yields a good distributed hash.
crc-gip	Cyclic redundancy check of multicast packets' group IP address	Predictable assignment to the same link each time. Try this mode when crc-sgip does not evenly distribute the Layer 3 routed multicast traffic and the group IP addresses vary.
crc-sip	Cyclic redundancy check of multicast packets' source IP address	Predictable assignment to the same link each time. Try this mode when crc-sgip does not evenly distribute the Layer 3 routed multicast traffic and the stream sources vary.
simple-sgip	XOR calculation of multicast packets' source and group IP address	Predictable assignment to the same link each time. This is a simple hashing method that might not yield as even a distribution as crc-sgip yields. Try this mode when crc-sgip does not evenly distribute the Layer 3 routed multicast traffic.
simple-gip	XOR calculation of multicast packets' group IP address	Predictable assignment to the same link each time. This is a simple hashing method that might not yield as even a distribution as crc-gip yields. Try this when crc-gip does not evenly distribute the Layer 3 routed multicast traffic and the group IP addresses vary.

Table 19: Hashing Algorithms Used by Multicast Load Balancing (continued)

Hashing Algorithms	Based On	Best Use
simple-sip	XOR calculation of multicast packets' source IP address	Predictable assignment to the same link each time. This is a simple hashing method that might not yield as even a distribution as crc-sip yields. Try this mode when crc-sip does not evenly distribute the Layer 3 routed multicast traffic and stream sources vary.
balanced	Round-robin calculation method used to identify multicast links with the least amount of traffic	Best balance is achieved, but you cannot predict which link will be consistently used because that depends on the order in which streams come online. Use when consistent assignment is not needed after every reboot.

How Do I Implement Multicast Load Balancing on an EX8200 Switch?

To implement multicast load balancing with an optimized level of throughput on an EX8200 switch, follow these recommendations:

- Allow 25 percent unused bandwidth in the aggregated link to accommodate any dynamic imbalances due to link changes caused by sharing multicast interfaces.
- For downstream links, use multicast interfaces of the same size whenever possible. Also, for downstream aggregated links, throughput is optimized when members of the aggregated link belong to the same devices.
- For upstream aggregated links, use a Layer 3 link whenever possible. Also, for upstream aggregated links, throughput is optimized when the members of the aggregated link belong to different devices.

Related Documentation

- Example: Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Interfaces on EX8200 Switches on page 174

- *Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Links on EX8200 Switches (CLI Procedure)*

Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch

EX Series switches 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 EX Series switch model. See *Understanding Aggregated Ethernet Interfaces and LACP* for more information.

This example describes how to configure uplink LAGs to connect a Virtual Chassis access switch to a Virtual Chassis distribution switch:

- Requirements on page 163
- Overview and Topology on page 163

- Configuration on page 165
- Verification on page 168
- Troubleshooting on page 168

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- Two EX4200-48P switches
- Two EX4200-24F switches
- Four XFP uplink modules

Before you configure the LAGs, be sure you have:

- Configured the Virtual Chassis switches. See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)*.
- Configured the uplink ports on the switches as trunk ports. See *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*.

Overview and Topology

For maximum speed and resiliency, you can combine uplinks between an access switch and a distribution switch into LAGs. Using LAGs can be particularly effective when connecting a multimember Virtual Chassis access switch to a multimember Virtual Chassis distribution switch.

The Virtual Chassis access switch in this example is composed of two member switches. Each member switch has an uplink module with two 10-Gigabit Ethernet ports. These ports are configured as trunk ports, connecting the access switch with the distribution switch.

Configuring the uplinks as LAGs has the following advantages:

- Link Aggregation Control Protocol (LACP) can optionally be configured for link negotiation.
- It doubles the speed of each uplink from 10 Gbps to 20 Gbps.
- If one physical port is lost for any reason (a cable is unplugged or a switch port fails, or one member switch is unavailable), the logical port transparently continues to function over the remaining physical port.

The topology used in this example consists of one Virtual Chassis access switch and one Virtual Chassis distribution switch. The access switch is composed of two EX4200-48P switches (SWA-0 and SWA-1), interconnected to each other with their Virtual Chassis ports (VCPs) as member switches of Host-A. The distribution switch is composed of two EX4200-24F switches (SWD-0 and SWD-1), interconnected with their VCPs as member switches of Host-D.

Each member of the access switch has an uplink module installed. Each uplink module has two ports. The uplinks are configured to act as trunk ports, connecting the access switch with the distribution switch. One uplink port from SWA-0 and one uplink port from SWA-1 are combined as LAG **ae0** to SWD-0. This link is used for one VLAN. The remaining uplink ports from SWA-0 and from SWA-1 are combined as a second LAG connection (**ae1**) to SWD-1. LAG **ae1** is used for another VLAN.

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.

Figure 2: Topology for LAGs Connecting an EX4200 Virtual Chassis Access Switch to an EX4200 Virtual Chassis Distribution Switch

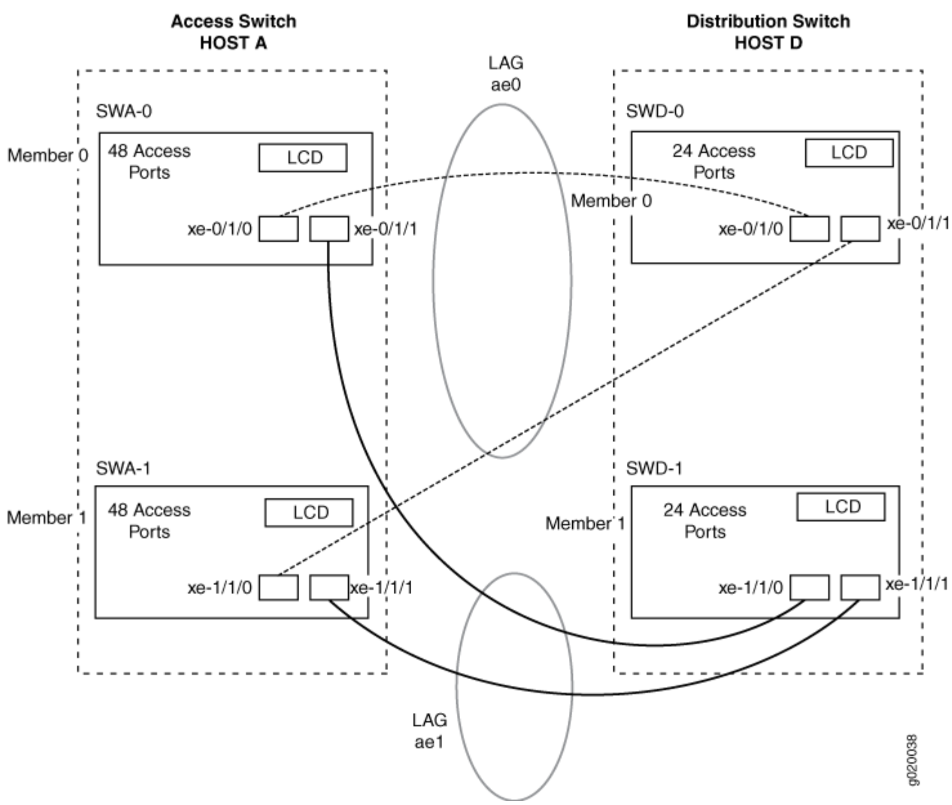


Table 20 on page 165 details the topology used in this configuration example.

Table 20: Components of the Topology for Connecting a Virtual Chassis Access Switch to a Virtual Chassis Distribution Switch

Switch	Hostname and VCID	Base Hardware	Uplink Module	Member ID	Trunk Port
SWA-0	Host-A Access switch VCID 1	EX4200-48P switch	One XFP uplink module	0	**xe-0/1/0** to SWD-0 **xe-0/1/1** to SWD-1
SWA-1	Host-A Access switch VCID 1	EX4200-48P switch	One XFP uplink module	1	**xe-1/1/0** to SWD-0 **xe-1/1/1** to SWD-1
SWD-0	Host-D Distribution switch VCID 4	EX4200 L-24F switch	One XFP uplink module	0	**xe-0/1/0** to SWA-0 **xe-0/1/1** to SWA-1
SWD-1	Host-D Distribution switch VCID 4	EX4200 L-24F switch	One XFP uplink module	1	**xe-1/1/0** to SWA-0 **xe-1/1/1** to SWA-1

Configuration

To configure two uplink LAGs from the Virtual Chassis access switch to the Virtual Chassis distribution switch:

CLI Quick Configuration

To quickly configure aggregated Ethernet high-speed uplinks between a Virtual Chassis access switch and a Virtual Chassis distribution switch, copy the following commands and paste them into the switch terminal window:

```
[edit]
set chassis aggregated-devices ethernet device-count 2
set interfaces ae0 aggregated-ether-options minimum-links 1
set interfaces ae0 aggregated-ether-options link-speed 10g
set interfaces ae1 aggregated-ether-options minimum-links 1
set interfaces ae1 aggregated-ether-options link-speed 10g
set interfaces ae0 unit 0 family inet address 192.0.2.0/25
set interfaces ae1 unit 0 family inet address 192.0.2.128/25
set interfaces xe-0/1/0 ether-options 802.3ad ae0
set interfaces xe-1/1/0 ether-options 802.3ad ae0
set interfaces xe-0/1/1 ether-options 802.3ad ae1
set interfaces xe-1/1/1 ether-options 802.3ad ae1
```

Step-by-Step Procedure

To configure aggregated Ethernet high-speed uplinks between a Virtual Chassis access switch and a Virtual Chassis distribution switch:

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

```
[edit chassis]
user@Host-A# set aggregated-devices ethernet device-count 2
```

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

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

3. Specify the number of links that need to be present for the **ae1** LAG interface to be **up**:

```
[edit interfaces]
user@Host-A# set ae1 aggregated-ether-options minimum-links 1
```

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

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

5. Specify the media speed of the **ae1** link:

```
[edit interfaces]
user@Host-A# set ae1 aggregated-ether-options link-speed 10g
```

6. Specify the interface ID of the uplinks to be included in LAG **ae0**:

```
[edit interfaces]
user@Host-A# set xe-0/1/0 ether-options 802.3ad ae0
user@Host-A# set xe-1/1/0 ether-options 802.3ad ae0
```

7. Specify the interface ID of the uplinks to be included in LAG **ae1**:

```
[edit interfaces]
user@Host-A# set xe-0/1/1 ether-options 802.3ad ae1
user@Host-A# set xe-1/1/1 ether-options 802.3ad ae1
```

8. Specify that LAG **ae0** belongs to the subnet for the employee broadcast domain:

```
[edit interfaces]
user@Host-A# set ae0 unit 0 family inet address 192.0.2.0/25
```

9. Specify that LAG **ae1** belongs to the subnet for the guest broadcast domain:

```
[edit interfaces]
user@Host-A# set ae1 unit 0 family inet address 192.0.2.128/25
```

Results

Display the results of the configuration:

```
[edit]
chassis {
  aggregated-devices {
    ethernet {
      device-count 2;
    }
  }
}
interfaces {
  ae0 {
    aggregated-ether-options {
      link-speed 10g;
      minimum-links 1;
    }
    unit 0 {
      family inet {
        address 192.0.2.0/25;
      }
    }
  }
  ae1 {
    aggregated-ether-options {
      link-speed 10g;
      minimum-links 1;
    }
    unit 0 {
      family inet {
        address 192.0.2.128/25;
      }
    }
  xe–0/1/0 {
    ether-options {
      802.3ad ae0;
    }
  }
  xe–1/1/0 {
    ether-options {
      802.3ad ae0;
    }
  }
  xe–0/1/1 {
    ether-options {
      802.3ad ae1;
    }
  }
  xe–1/1/1 {
    ether-options {
      802.3ad ae1;
    }
  }
}
```

Verification

To verify that switching is operational and two LAGs have been created, perform these tasks:

- Verifying That LAG ae0 Has Been Created on page 168
- Verifying That LAG ae1 Has Been Created on page 168

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          up
ae0.0                   up          up      inet     192.0.2.0/25
```

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

Verifying That LAG ae1 Has Been Created

Purpose Verify that LAG **ae1** has been created on the switch

Action **show interfaces ae1 terse**

```
Interface                 Admin Link  Proto     Local                    Remote
ae1                       up    down
ae1.0                     up    down  inet    192.0.2.128/25
```

Meaning The output shows that the **ae1** 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.
- Verify that the LAG members belong to the same switch (or the same Virtual Chassis).

Related Documentation

- *Example: Configuring an EX4200 Virtual Chassis with a Master and Backup in a Single Wiring Closet*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- *Example: Connecting an EX Series Access Switch to a Distribution Switch*.
- *Virtual Chassis Cabling Configuration Examples for EX4200 Switches*
- *Installing an Uplink Module in an EX4200 Switch*
- *Uplink Modules in EX4200 Switches*

Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch

EX Series switches 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. EX Series switches 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 Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch" on page 162:

- Requirements on page 169
- Overview and Topology on page 170
- Configuring LACP for the LAGs on the Virtual Chassis Access Switch on page 170
- Configuring LACP for the LAGs on the Virtual Chassis Distribution Switch on page 171
- Verification on page 172
- Troubleshooting on page 173

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.0 or later for EX Series switches
- Two EX4200-48P switches
- Two EX4200-24F switches
- Four EX Series XFP uplink modules

Before you configure LACP, be sure you have:

- Set up the Virtual Chassis switches. See *Configuring an EX4200, EX4500, or EX4550 Virtual Chassis (CLI Procedure)*.
- Configured the uplink ports on the switches as trunk ports. See *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*.
- Configured the LAGs. See "Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch" on page 162.

Overview and Topology

This example assumes that you are familiar with "Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch" on page 162. The topology in this example is exactly the same as the topology in that other 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.

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

Configuring LACP for the LAGs on the Virtual Chassis Access Switch

To configure LACP for the access switch LAGs, 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
set interfaces ae1 aggregated-ether-options lacp active periodic fast
```


Step-by-Step Procedure

To configure LACP for Host-A LAGs **ae0** and **ae1**:

1. Specify the aggregated Ethernet options for both bundles:

```
[edit interfaces]
user@Host-A#set ae0 aggregated-ether-options lacp active periodic fast
user@Host-A#set ae1 aggregated-ether-options lacp active periodic fast
```

Results

Display the results of the configuration:

```
[edit interfaces]
user@Host-A# show
ae0 {
  aggregated-ether-options {
    lacp {
      active;
      periodic fast;
    }
  }
}
ae1 {
  aggregated-ether-options {
    lacp {
      active;
      periodic fast;
    }
  }
}
```

Configuring LACP for the LAGs on the Virtual Chassis Distribution Switch

To configure LACP for the two uplink LAGs from the Virtual Chassis access switch to the Virtual Chassis distribution switch, perform these tasks:

CLI Quick Configuration

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

```
[edit interfaces]
set ae0 aggregated-ether-options lacp passive periodic fast
set ae1 aggregated-ether-options lacp passive periodic fast
```

Step-by-Step Procedure

To configure LACP for Host D LAGs **ae0** and **ae1**:

1. Specify the aggregated Ethernet options for both bundles:

```
[edit interfaces]
user@Host-D#set ae0 aggregated-ether-options lacp passive periodic fast
user@Host-D#set ae1 aggregated-ether-options lacp passive periodic fast
```

Results

Display the results of the configuration:

```
[edit interfaces]
```



```
user@Host-D# show
ae0 {
  aggregated-ether-options {
    lacp {
      passive;
      periodic fast;
    }
  }
}
ae1 {
  aggregated-ether-options {
    lacp {
      passive
      periodic fast;
    }
  }
}
```

Verification

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

- Verifying the LACP Settings on page 172
- Verifying That the LACP Packets Are Being Exchanged on page 173

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@Host-A> show lacp interfaces xe-0/1/0

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    Partner     No    Yes    No   No   No   Yes     Fast   Passive

    LACP protocol:   Receive State    Transmit State          Mux State

      xe-0/1/0          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@Host-A> 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 protocol data units (PDUs) are being exchanged.

Troubleshooting

To troubleshoot a nonworking LACP link, perform these tasks:

- Troubleshooting a Nonworking LACP Link on page 173

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

- *Example: Connecting an EX Series Access Switch to a Distribution Switch*
- *Virtual Chassis Cabling Configuration Examples for EX4200 Switches*
- *Installing an Uplink Module in an EX4200 Switch*
- *Understanding Aggregated Ethernet Interfaces and LACP*

Example: Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Interfaces on EX8200 Switches

EX8200 switches support multicast load balancing on link aggregation groups (LAGs). Multicast load balancing evenly distributes Layer 3 routed multicast traffic over the LAGs, You can aggregate up to twelve 10-gigabit Ethernet links to form a 120-gigabit virtual link or LAG. The MAC client can treat this virtual link as if it were a single link to increase bandwidth, provide graceful degradation as link failures occur, and increase availability. On EX8200 switches, multicast load balancing is enabled by default. However, if it is explicitly disabled, you can reenable it. .

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

NOTE: Only EX8200 standalone switches with 10-gigabit links support multicast load balancing. Virtual Chassis does not support multicast load balancing.

This example shows how to configure a LAG and reenable multicast load balancing:

- Requirements on page 174
- Overview and Topology on page 175
- Configuration on page 176
- Verification on page 178

Requirements

This example uses the following hardware and software components:

- Two EX8200 switches, one used as the access switch and one used as the distribution switch
- Junos OS Release 12.2 or later for EX Series switches

Before you begin:

- Configure four 10-gigabit interfaces on the EX8200 distribution switch: xe-0/1/0, xe-1/1/0, xe-2/1/0, and xe-3/1/0. See *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*.

Overview and Topology

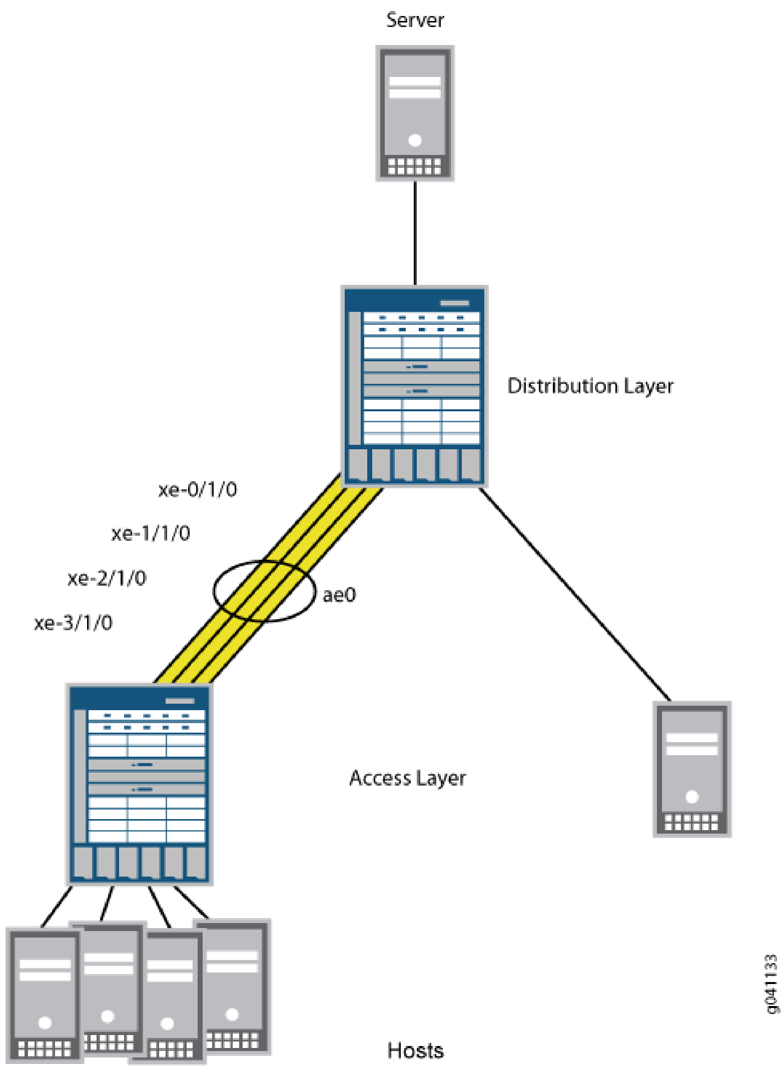
Multicast load balancing uses one of seven hashing algorithms to balance traffic between the individual 10-gigabit links in the LAG. For a description of the hashing algorithms, see **multicast-loadbalance**. The default hashing algorithm is crc-sgip. You can experiment with the different hashing algorithms until you determine the one that best balances your Layer 3 routed multicast traffic.

When a link larger than 10 gigabits is needed on an EX8200 switch, you can combine up to twelve 10-gigabit links to create more bandwidth. This example uses the link aggregation feature to combine four 10-gigabit links into a 40-gigabit link on the distribution switch. In addition, multicast load balancing is enabled to ensure even distribution of Layer 3 routed multicast traffic on the 40-gigabit link. In the sample topology illustrated in Figure 3 on page 176, an EX8200 switch in the distribution layer is connected to an EX8200 switch in the access layer.

NOTE: Link speed is automatically determined based on the size of the LAG configured. For example, if a LAG is composed of four 10-gigabit links, the link speed is 40 gigabits per second).

NOTE: The default hashing algorithm, crc-sgip, involves a cyclic redundancy check of both the multicast packet source and group IP addresses.

Figure 3: 40-Gigabit LAG Composed of Four 10-Gigabit Links



You will configure a LAG on each switch and reenable multicast load balancing. When reenabled, multicast load balancing will automatically take effect on the LAG, and the speed is set to 10 gigabits per second for each link in the LAG. Link speed for the 40-gigabit LAG is automatically set to 40 gigabits per second.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level.

```
set chassis aggregated-devices ethernet device-count 1
set interfaces ae0 aggregated-ether-options minimum-links 1
set interfaces xe-0/1/0 ether-options 802.3ad ae0
set interfaces xe-1/1/0 ether-options 802.3ad ae0
```


set interfaces xe-2/1/0 ether-options 802.3ad ae0
set interfaces xe-3/1/0 ether-options 802.3ad ae0
set chassis multicast-loadbalance hash-mode crc-gip

Step-by-Step Procedure

To configure a LAG and reenable multicast load balancing:

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

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

2. Specify the minimum number of links for the aggregated Ethernet interface (ae*x*), that is, the LAG, to be labeled **up**:

   NOTE: By default, only one link needs to be up for the LAG to be labeled up.

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

3. Specify the four members to be included within the LAG:

   ```
   [edit interfaces]
   user@switch# set xe-0/1/0 ether-options 802.3ad ae0
   user@switch# set xe-1/1/0 ether-options 802.3ad ae0
   user@switch# set xe-2/1/0 ether-options 802.3ad ae0
   user@switch# set xe-3/1/0 ether-options 802.3ad ae0
   ```

4. Reenable multicast load balancing:

   ```
   [edit chassis]
   user@switch#  set multicast-loadbalance
   ```

   NOTE: You do not need to set link speed the way you do for LAGs that do not use multicast load balancing. Link speed is automatically set to 40 gigabits per second on a 40-gigabit LAG.

5. You can optionally change the value of the **hash-mode** option in the multicast-loadbalance statement to try different algorithms until you find the one that best distributes your Layer 3 routed multicast traffic.

   If you change the hashing algorithm when multicast load balancing is disabled, the new algorithm takes effect after you reenable multicast load balancing.

Results

Check the results of the configuration:


```
user@switch>  show configuration
chassis
 aggregated-devices {
  ethernet {
       device-count 1;
  }
 }
 multicast-loadbalance {
  hash-mode crc-gip;
 }

interfaces
 xe-0/1/0 {
 ether-options {
   802.3ad ae0;
  }
 }
 xe-1/1/0 {
  ether-options {
   802.3ad ae0;
  }
 }
 xe-2/1/0 {
  ether-options {
   802.3ad ae0;
  }
 }
 xe-3/1/0 {
  ether-options {
   802.3ad ae0;
  }
 }
 ae0 {
  aggregated-ether-options {
   minimum-links 1;
  }
 }
}
```

Verification

To confirm that the configuration is working properly, perform these tasks:

- Verifying the Status of a LAG Interface on page 178
- Verifying Multicast Load Balancing on page 179

Verifying the Status of a LAG Interface

Purpose Verify that a link aggregation group (LAG) (**ae0**) has been created on the switch.

Action Verify that the **ae0** LAG has been created:

```
user@switch> 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 interface name *aex* indicates that this is a LAG. *A* stands for aggregated, and *E* stands for Ethernet. The number differentiates the various LAGs.

Verifying Multicast Load Balancing

Purpose Check that traffic is load-balanced equally across paths.

Action Verify load balancing across the four interfaces:

user@switch> **monitor interface traffic**

```
Bytes=b, Clear=c, Delta=d, Packets=p, Quit=q or ESC, Rate=r, Up=^U, Down=^D
ibmoem02-re1                       Seconds: 3                    Time: 16:06:14

Interface     Link  Input packets        (pps)     Output packets        (pps)
 xe-0/1/0      Up        2058834          (10)          7345862          (19)
 xe-1/1/0      Up        2509289           (9)          6740592          (21)
 xe-2/1/0      Up        8625688          (90)         10558315          (20)
 xe-3/1/0      Up        2374154          (23)         71494375           (9)
```

Meaning The interfaces should be carrying approximately the same amount of traffic.

Related Documentation

- *Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Links on EX8200 Switches (CLI Procedure)*
- Understanding Multicast Load Balancing on Aggregated 10-Gigabit Links for Routed Multicast Traffic on EX8200 Switches on page 159

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 or an EX4600 switch to other switches, like aggregation switches, servers, or routers. This example describes how to configure LAGs to connect a QFX3500, QFX3600, EX4600, QFX5100, and QFX10002 switch to an aggregation switch.

- Requirements on page 180
- Overview and Topology on page 180
- Configuration on page 181
- Verification on page 183
- Troubleshooting on page 184

Requirements

This example uses the following software and hardware components:

- Junos OS Release 11.1 or later for the QFX3500 and QFX3600 switches, Junos OS 13.2 or later for the QFX5100 and EX4600 switch, and Junos OS Release 15.1X53-D10 or later for QFX10002 switches.
- One QFX3500, QFX3600, EX4600, QFX5100, or QFX10002 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 (or interface-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.

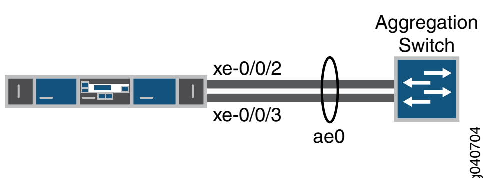


Table 21 on page 181 details the topology used in this configuration example.

Table 21: Components of the Topology for Configuring a LAG Between a Switch and an Aggregation Switch

Hostname	Base Hardware	Trunk Port
switch	QFX3500, QFX3600, EX4600, QFX5100, or QFX10002 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 using Enhanced Layer 2 Software—for example, on the EX4600, QFX5100, or QFX10002 switch—use the **interface-mode** statement instead of the **port-mode** statement. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

```
[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 802.3ad ae0
set interfaces xe-0/0/3 ether-options 802.3ad 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 802.3ad ae0
[edit interfaces]
user@switch# set interfaces xe-0/0/3 ether-options 802.3ad ae0
```

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

NOTE: If you are configuring a LAG using Enhanced Layer 2 Software—for example, on the EX4600, QFX5100, or QFX10002 switch—use the **interface-mode** statement instead of the **port-mode** statement. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

```
[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 {
          802.3ad ae0;
        }
      }
      xe-0/0/3 {
        ether-options {
          802.3ad 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 183
- Verifying That LAG ae0 Has Been Created on page 184

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 153
- Verifying the Status of a LAG Interface on page 157
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184
- **show lacp statistics interfaces (View) on page 1122**

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 179:

- Requirements on page 185
- Overview and Topology on page 185
- Configuring LACP for the LAG on the QFX Series on page 186
- Verification on page 186
- Troubleshooting on page 187

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, Junos OS Release 13.2 or later for the QFX5100 switch, and Junos OS Release 15.1X53-D10 or later for the QFX10002 switch.
- One QFX3500, QFX3600, QFX5100, QFX10002 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 186
- Verifying That the LACP Packets Are Being Exchanged on page 187

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: 10.10.10/8, 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 188

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 153
- Verifying the Status of a LAG Interface on page 157
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- *Example: Configuring an FCoE LAG on a Redundant Server Node Group*
- **show lacp statistics interfaces (View) on page 1122**

CHAPTER 5

Channelizing Interfaces

- Channelizing Interfaces Overview on page 190
- Understanding Port Ranges and System Modes on page 200
- Configuring the System Mode on page 225
- Channelizing Interfaces on Switches on page 228
- Configuring the Port Type on QFX3600 Standalone Switches on page 238
- Configuring the QSFP+ Port Type on QFX3500 Standalone Switches on page 239
- Configuring the QSFP+ Port Type on QFX5100 Devices on page 241

Channelizing Interfaces Overview

NOTE: On QFX10008 and QFX10016 switches, channelization is supported on fiber break-out cables using standard structured cabling techniques.

NOTE: On QFX10002 switches running on Junos OS Release 15.1X53-D10 or Junos OS Release 15.1X53-D15, when you delete and then reapply channelized interfaces, traffic is disrupted and might not be recovered.

The QFX3500, QFX3600, QFX5100, and EX4600, QFX10002, QFX10008, and QFX10016 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. (Platform support depends on the Junos OS release in your installation.) 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 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.

NOTE: If you are using a EX4600 or QFX5100 switch with a peer QFX10000 switch, you must disable auto-channelization on the EX4600 or QFX5100 switch to ensure that the relevant interfaces are created and the links are up.

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 225 for more information.

On QFX10002, QFX10008, and QFX10016 switches, there are 100-Gigabit Ethernet ports that work either as 100-Gigabit Ethernet or as 40-Gigabit Ethernet, but are recognized as 40-Gigabit Ethernet by default. You cannot channelize the 100-Gigabit Ethernet ports when they are operating as 100-Gigabit Ethernet interfaces. The 40-Gigabit Ethernet ports can operate independently or be channelized into four 10-Gigabit Ethernet ports as part of a port range. Ports cannot be channelized individually. Only the first and fourth port in each 6XQSFP cage is available to channelize as part of a port range. In a port range, the ports are bundled with the next two consecutive ports. For example, if you want to channelize ports 0 through 2, you would channelize port 0 only. If you try to channelize a port that is not supported, you will receive an error message when you commit the configuration. Auto-channelization is not supported on any ports.

When a 40-Gigabit Ethernet transceiver is inserted into a 100-Gigabit Ethernet port, the port recognizes the 40-Gigabit Ethernet port speed. When a 100-Gigabit Ethernet transceiver is inserted into the port and enabled in the CLI, the port recognizes the 100-Gigabit Ethernet speed and disables two adjacent 40-Gigabit Ethernet ports.

Table 22 on page 192 provides detailed information on which ports are 100-Gigabit Ethernet, which ports can be channelized, and which ports are disabled when a 100-Gigabit Ethernet is inserted in the QFX10002-36Q switch and the QFX10000-36Q line card on a QFX10008 or QFX10016 switch. Table 23 on page 194 provides detailed information on which ports are 100-Gigabit Ethernet, which ports can be channelized, and which ports are disabled when a 100-Gigabit Ethernet is inserted in the QFX10002-72Q switch. On the QFX10008 and QFX10016 switches with the QFX10000-36Q line card installed, only ports 0 through 35 are available. For more information, see *QFX10002-72Q Port Panel* and *QFX10000-36Q Line Card*.

Table 22: QFX10002-36Q Switch and QFX10000-36Q Line Card Port Mappings

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
0	✓	✓	✓	–	–
1	✓		✓	✓	0, 2
2	✓		✓	–	–
3	✓	✓	✓	–	–
4	✓		✓	–	–
5	✓		✓	✓	3, 4
6	✓	✓	✓	–	–
7	✓		✓	✓	6, 8
8	✓		✓	–	–
9	✓	✓	✓	–	–
10	✓		✓	–	–
11	✓		✓	✓	9, 10

Table 22: QFX10002-36Q Switch and QFX10000-36Q Line Card Port Mappings (continued)

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
12	✓	✓	✓	–	–
13	✓		✓	✓	12, 14
14	✓		✓	–	–
15	✓	✓	✓	–	–
16	✓		✓	–	–
17	✓		✓	✓	15, 16
18	✓	✓	✓	–	–
19	✓		✓	✓	18, 20
20	✓		✓	–	–
21	✓	✓	✓	–	–
22	✓		✓	–	–
23	✓		✓	✓	21, 22
24	✓	✓	✓	–	–
25	✓		✓	✓	24, 26
26	✓		✓	–	–
27	✓	✓	✓	–	–
28	✓		✓	–	–
29	✓		✓	✓	27, 28
30	✓	✓	✓	–	–
31	✓		✓	✓	30, 32
32	✓		✓	–	–

Table 22: QFX10002-36Q Switch and QFX10000-36Q Line Card Port Mappings (continued)

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
33	✓	✓	✓	–	–
34	✓		✓	–	–
35	✓		✓	✓	33, 34

Table 23: QFX10002-72Q Switch Port Mappings

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
0	✓	✓	✓	–	–
1	✓		✓	✓	0, 2
2	✓		✓	–	–
3	✓	✓	✓	–	–
4	✓		✓	–	–
5	✓		✓	✓	3, 4
6	✓	✓	✓	–	–
7	✓		✓	✓	6, 8
8	✓		✓	–	–
9	✓	✓	✓	–	–
10	✓		✓	–	–
11	✓		✓	✓	9, 10
12	✓	✓	✓	–	–
13	✓		✓	✓	12, 14
14	✓		✓	–	–

Table 23: QFX10002-72Q Switch Port Mappings (continued)

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
15	✓	✓	✓	–	–
16	✓		✓	–	–
17	✓		✓	✓	15, 16
18	✓	✓	✓	–	–
19	✓		✓	✓	18, 20
20	✓		✓	–	–
21	✓	✓	✓	–	–
22	✓		✓	–	–
23	✓		✓	✓	21, 22
24	✓	✓	✓	–	–
25	✓		✓	✓	24, 26
26	✓		✓	–	–
27	✓	✓	✓	–	–
28	✓		✓	–	–
29	✓		✓	✓	27, 28
30	✓	✓	✓	–	–
31	✓		✓	✓	30, 32
32	✓		✓	–	–
33	✓	✓	✓	–	–
34	✓		✓	–	–
35	✓		✓	✓	33, 34

Table 23: QFX10002-72Q Switch Port Mappings (continued)

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
36	✓	✓	✓	–	–
37	✓		✓	✓	36, 38
38	✓		✓	–	–
39	✓	✓	✓	–	–
40	✓		✓	–	–
41	✓		✓	✓	39, 40
42	✓	✓	✓	–	–
43	✓		✓	✓	42, 44
44	✓		✓	–	–
45	✓	✓	✓	–	–
46	✓		✓	–	–
47	✓		✓	✓	45, 46
48	✓	✓	✓	–	–
49	✓		✓	✓	48, 50
50	✓		✓	–	–
51	✓	✓	✓	–	–
52	✓		✓	–	–
53	✓		✓	✓	51, 52
54	✓	✓	✓	–	–
55	✓		✓	✓	54, 56
56	✓		✓	–	–

Table 23: QFX10002-72Q Switch Port Mappings (continued)

Port Number	4X10 Gigabit Ethernet Port	4X10 Gigabit Channelized Port Group	40-Gigabit Ethernet (Default)	100-Gigabit Ethernet	100-Gigabit Ethernet Disables
57	✓	✓	✓	–	–
58	✓		✓	–	–
59	✓		✓	✓	57, 58
60	✓	✓	✓	–	–
61	✓		✓	✓	60, 62
62	✓		✓	–	–
63	✓	✓	✓	–	–
64	✓		✓	–	–
65	✓		✓	✓	63, 64
66	✓	✓	✓	–	–
67	✓		✓	✓	66, 68
68	✓		✓	–	–
69	✓	✓	✓	–	–
70	✓		✓	–	–
71	✓		✓	✓	69, 70

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 on QFX3500, QFX3600, QFX5100, EX4600 switches 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 a range of ports on a QFX10002-72Q, QFX10008, or QFX10016 switch to operate as 10-Gigabit Ethernet ports:

   NOTE: The **port-range** statement is not available on QFX10002-72Q, QFX10008, and QFX10016 switches. Instead, configure the port range using the **port** statement. Starting from port 0, you channelize every third port to channelize a group of three ports. For example, channelize port 0 to channelize ports 0 through 2, port 3 to channelize ports3 through 5, and so on. See Table 22 on page 192 for port mapping information.

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

   For example, to configure ports 0 through 2 on PIC 0 to operate as 10-Gigabit Ethernet ports:

   NOTE: When you channelize port 0, ports 1 and 2 are also channelized.

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

3. To configure an individual 40-Gigabit Ethernet (*et*) port on QFX3500, QFX3600, QFX5100, and EX4600 switches 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 3 to operate as 10-Gigabit Ethernet ports:

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

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

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

5. To return a range of ports on QFX3500, QFX3600, QFX5100, and EX4600 switches 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**

6. To return a range of ports on QFX10002-72Q, QFX10008, or QFX10016 switches to the default 40-Gigabit Ethernet configuration, delete the 10g statement:

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

   For example, to return ports 0 through 2 to the default 40-Gigabit Ethernet configuration:

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

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

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

8. To return a port on QFX3500, QFX3600, QFX5100, and EX4600 switches 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**

9. 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 on QFX3500, QFX3600, QFX5100, and EX4600 switches .

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 225
- channel-speed on page 578
- fpc on page 579
- pic on page 581

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 on page 200
- Supported System Modes on page 223

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 26 on page 209 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 27 on page 212 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 29 on page 217 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 29 on page 217 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 30 on page 220 for physical port to logical port mappings.

- For QFX5100-24Q and QFX5100-96S switches running Enhanced Layer 2 Software, see Table 31 on page 224 for physical port to logical port mappings for different system modes.

Table 24: 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 24: 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 24: 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 24: 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 24: 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 25: 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 25: 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
30	ge-0/0/30	xe-0/0/30	Not supported on this port

Table 25: 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)
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 25: 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 26: 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 26: 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 26: 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 26: 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 27: 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
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

Table 27: 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)
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
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

Table 27: 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)
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
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 28: 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
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

Table 28: 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)
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
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

Table 28: 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)
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 29: 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
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

Table 29: 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)
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
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

Table 29: 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)
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
48	xe-0/0/48:0 xe-0/0/48:1 xe-0/0/48:2 xe-0/0/48:3	et-0/0/48
49	xe-0/0/49:0 xe-0/0/49:1 xe-0/0/49:2 xe-0/0/49:3	et-0/0/49

Table 29: 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)
50	xe-0/0/50:0 xe-0/0/50:1 xe-0/0/50:2 xe-0/0/50:3	et-0/0/50
51	xe-0/0/51:0 xe-0/0/51:1 xe-0/0/51:2 xe-0/0/51:3	et-0/0/51
52	xe-0/0/52:0 xe-0/0/52:1 xe-0/0/52:2 xe-0/0/52:3	et-0/0/52
53	xe-0/0/53:0 xe-0/0/53:1 xe-0/0/53:2 xe-0/0/53:3	et-0/0/53

Table 30: 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

Table 30: 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)
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
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

Table 30: 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)
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
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

Table 30: 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)
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 31 on page 224 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 31 on page 224 for more information regarding the supported system modes for your switch.

Table 31: 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
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.

Table 31: System Modes Supported on QFX5100 Switches Running Enhanced Layer 2 Software (continued)

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-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 for Switches on page 4
- Channelizing Interfaces Overview on page 190
- Configuring the System Mode on page 225
- Understanding Interface Naming Conventions on page 9
- *Rear Panel of a QFX3500 Device*
- *Front Panel of a QFX3600 Device*

Configuring the System Mode

You can configure different system modes to achieve varying levels of port density on the QFX5100-24Q, QFX5100-96S, and QFX5110-32Q 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 Overview” on page 190 for more information.

NOTE: QFX5200 switches do not support System Mode.

NOTE: When you request the system mode change, we recommend that you reboot the switch 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.

See Table 32 on page 226, Table 33 on page 227, Table 34 on page 227, and Table 35 on page 227 for more information regarding the supported system modes for your switch.

Table 32: System Modes Supported on QFX5100 Switches with QFX-EM-4Q or QFX-PFA-4Q Expansion Modules Installed

	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.

Table 33: System Modes Supported on QFX5100-24Q Switches with the EX4600-8F Expansion Module Installed

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5100-24Q	Not supported	Not supported	Supported On PIC 0, you cannot channelize ports 0 through 3.	Not supported Expansion modules cannot be installed in PICs 1 and 2.

Table 34: System Modes Supported on QFX5100-24Q Switches with EX4600-8F and QFX-EM-4Q Expansion Modules Installed

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5100-24Q	Only the QFX-EM-4Q module is supported.	Only the QFX-EM-4Q module is supported. If you have installed the EX4600-8F expansion module on PIC 1, and you have installed the QFX-EM-4Q module on PIC 2, The 40-Gbps QSFP+ ports in both PIC slots are not supported. If you have installed the EX4600-8F expansion module on PIC 2, and you have installed the QFX-EM-4Q module on PIC 1, only the QFX-EM-4Q module on PIC 1 is supported.	Supported On PIC 0, you cannot channelize ports 0 through 3.	Not supported You cannot install the QFX-EM-4Q or EX4600-8F modules on PICs 1 and 2.

Table 35: System Modes Supported on QFX5110-32Q Switches

	Default-mode	Mode-104port	Flexi-pic-mode	Non-oversubscribed-mode
QFX5110-32Q	Supported All 32 QSFP+ ports on the switch are configured for 40-Gigabit Ethernet only. All ports are supported as access or uplink ports, but cannot be channelized.	Not supported	Supported • Ports 0 through 19 of the switch are configured for 40-Gigabit Ethernet and can be channelized to 4 independent 10-Gigabit Ethernet ports. • Ports 20 though 27 are disabled. • Ports 28 through 31 are configured as 100-Gigabit Ethernet.	Not supported

CAUTION: Changing the system mode causes the FPC to reboot. Because there can be a slight loss of data while the FPC reboots, we recommend that you only configure the changes during a maintenance window for this release.

CAUTION: Take care when changing the channelization mode from Flexi-pic to default. If you have existing ports that are channelized in Flexi-pic mode, remove the channelization from the interface before changing the system mode. Changing the Flexi-pic mode to the default mode with channelized ports causes the ports to go down, log a system log error, and remain down. You must manually remove the channelization configuration on the ports to bring the ports up in default 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 9
- Understanding Port Ranges and System Modes on page 200
- Channelizing Interfaces Overview on page 190

Channelizing Interfaces on Switches

This topic discusses how to channelize 100-Gigabit Ethernet Interfaces and 40-Gigabit Ethernet Interfaces on QFX and EX switches.

- Channelizing Interfaces on QFX5110-48S Switches on page 229
- Channelizing Interfaces on QFX5200 Switches on page 231

- Channelizing Interfaces on QFX5120-48Y Switches on page 234
- Channelizing Interfaces on EX4650-48Y Switches on page 236

Channelizing Interfaces on QFX5110-48S Switches

On the QFX5110-48S switch, there are four ports labeled 48 through 51, which support QFSP28 ports. The QSFP28 ports support 100-Gigabit Ethernet interfaces and 40-Gigabit Ethernet interfaces. You can channelize the 40-Gigabit Ethernet interfaces to four independent 10-Gigabit Ethernet interfaces using breakout cables.

NOTE: You cannot configure channelized interfaces to operate as Virtual Chassis ports.

When you channelize the 40-Gigabit Ethernet interfaces as 10-Gigabit Ethernet interfaces, the interface names appear in the xe-fpc/pic/port:channel format, where channel can be a value of 0 through 3. To channelize the ports, manually configure the port speed using the **set chassis fpc *slot-number* port *port-number* channel-speed *speed*** command, where the speed can be set to 10G. The ports do not support auto-channelization.

NOTE: On QFX5110-48S standalone switches, the FPC value is always 0.

The following steps describe how to channelize blocks of ports or individual ports:

1. 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 48 to operate as 10-Gigabit Ethernet ports:

   ```
   [edit chassis fpc 0 pic 0]
   user@switch# set port 48 channel-speed 10g
   ```

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

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

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

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

   For example, to return ports 48 through 51 from the 10-Gigabit Ethernet configuration to the 40-Gigabit Ethernet configuration:

   ```
   [edit chassis fpc 0 pic 0]
   user@switch# delete port-range 48 51 channel-speed 10g
   ```


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

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

5. To return an individual 10-Gigabit Ethernet port to the 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 48 from the 10-Gigabit Ethernet configuration to the 40-Gigabit Ethernet configuration:

   [edit chassis fpc 0 pic 0]
   user@switch# **delete port 48 channel-speed 10g**

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

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

See Also

- channel-speed on page 578
- fpc on page 579
- pic on page 581

Channelizing Interfaces on QFX5200 Switches

You can channelize the 100-Gigabit Ethernet interfaces to two independent 50-Gigabit Ethernet or to four independent 25-Gigabit Ethernet interfaces. The default 100-Gigabit Ethernet interfaces can also be configured as 40-Gigabit Ethernet interfaces, and in this configuration can either operate as dedicated 40-Gigabit Ethernet interfaces or can be channelized to four independent 10-Gigabit Ethernet interfaces using breakout cables.

NOTE: **You cannot configure channelized interfaces to operate as Virtual Chassis ports.**

On the QFX5200 switch, there are a total of 32 physical ports on the QFX5200 switch. Any port can be used as either 100-Gigabit Ethernet or 40-Gigabit Ethernet interfaces. You choose the speed by plugging in the appropriate transceiver. They can also be channelized to 50G, 25G or 10G.

By default, the 100-Gigabit Ethernet and 40-Gigabit Ethernet interfaces appear in the et-fpc/pic/port format. When the 100-Gigabit Ethernet interfaces are channelized as 50-Gigabit Ethernet and 25-Gigabit Ethernet interfaces, the interface names appear in the et-fpc/pic/port:channel format. When the 40-Gigabit Ethernet interfaces are channelized as 10-Gigabit Ethernet interfaces, the interface names appear in the xe-fpc/pic/port:channel format, where channel can be a value of 0 through 3. To channelize the ports, manually configure the port speed using the **set chassis fpc** ***slot-number*** **port** ***port-number*** **channel-speed** ***speed*** command, where the speed can be set to 10G, 25G, or 50G. If a 100-Gigabit Ethernet transceiver is connected, you can only set the speed to 25G or 50G. If a 40-Gigabit Ethernet transceiver is connected, you can only set the speed to 10g. There is no commit check for this, however.

On the QFX5200 switches, the ports support auto-channelization starting in Junos OS Release 15.1X53-D230.

NOTE: **For details about supported transceivers and cable specifications, see the QFX5200 Switch Hardware Guide.**

NOTE: **On QFX5200 standalone switches, the FPC value is always 0.**

The following steps describe how to channelize blocks of ports or individual ports.

1. To configure a block of 100-Gigabit Ethernet (*et*) ports to operate as 50-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 0 to operate as 50-Gigabit Ethernet ports:

[edit chassis fpc 0 pic 0]
user@switch# **set port-range 0 3 channel-speed 50g**

2. To configure a block of 100-Gigabit Ethernet (*et*) ports to operate as 25-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 0 to operate as 25-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 0]
   user@switch# **set port-range 0 3 channel-speed 25g**

3. 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 3 to operate as 10-Gigabit Ethernet ports:

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

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

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

5. To return a range of ports from the 50-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration, delete the 50g statement:

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

   For example, to return ports 0 through 3 from the 50-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration:

   [edit chassis fpc 0 pic 0]
   user@switch# **delete port-range 0 3 channel-speed 50g**

   NOTE: To configure the ports to another channel-speed, you must delete the current port-range statement to return to the default 100-Gigabit Ethernet configuration.

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

   [edit]

```
user@switch# commit
commit complete
```

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

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

See Also

- channel-speed on page 578
- fpc on page 579
- pic on page 581

Channelizing Interfaces on QFX5120-48Y Switches

You can channelize the 100-Gigabit Ethernet interfaces to four independent 25-Gigabit Ethernet interfaces. The default 100-Gigabit Ethernet interfaces can also be configured as 40-Gigabit Ethernet interfaces, and in this configuration can either operate as dedicated 40-Gigabit Ethernet interfaces or can be channelized to four independent 10-Gigabit Ethernet interfaces using breakout cables.

NOTE: **You cannot configure channelized interfaces to operate as Virtual Chassis ports.**

On the QFX5120 switch, there are a total of 56 ports. Of these 56 ports, 8 ports (labeled 48 through 56) are QSFP28 ports that support 100-Gigabit Ethernet interfaces and 40-Gigabit Ethernet interfaces. The other 48 ports (labeled 0 through 47) are SFP+ ports that support 25-Gigabit Ethernet interfaces, 10-Gigabit Ethernet interfaces, or 1-Gigabit Ethernet interfaces. The default speed for the SFP+ ports is 10 Gbps.

By default, the 100-Gigabit Ethernet and 40-Gigabit Ethernet interfaces appear in the et-fpc/pic/port format. When the 100-Gigabit Ethernet interfaces are channelized as 25-Gigabit Ethernet interfaces, the interface names appear in the et-fpc/pic/port:channel format. When the 40-Gigabit Ethernet interfaces are channelized as 10-Gigabit Ethernet interfaces, the interface names appear in the xe-fpc/pic/port:channel format, where channel can be a value of 0 through 3. Auto-channelization is enabled by default on the QSFP28 ports. If you have disabled auto-channelization, then to channelize the ports, manually configure the port speed using the **set chassis fpc *slot-number* port *port-number* channel-speed *speed*** command, where the speed can be set to 10G or 25G. If a 100-Gigabit Ethernet transceiver is connected, you can only set the speed to 25G. For the SFP+ ports, you can set the speed to 25G, 10G, or 1G. There is no commit check for this, however.

NOTE: **On QFX5120 switches, the QSFP28 ports support auto-channelization.**

The following steps describe how to channelize blocks of ports or individual ports.

1. To configure a block of 100-Gigabit Ethernet (*et*) ports to operate as 25-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 48 through 56 on PIC 0 to operate as 25-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 0]
   user@switch# **set port-range 48 56 channel-speed 25g**

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 55 to operate as 10-Gigabit Ethernet ports:

```
[edit chassis fpc 0 pic 0]
user@switch# set port 55 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 from the 25-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration, delete the 25g statement:

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

   For example, to return ports 48 through 56 from the 25-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration:

```
[edit chassis fpc 0 pic 0]
user@switch# delete port-range 48 56 channel-speed 25g
```

NOTE: To configure the ports to another channel-speed, you must delete the current port-range statement to return to the default 100-Gigabit Ethernet configuration.

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

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

See Also

- channel-speed on page 578
- fpc on page 579
- pic on page 581

Channelizing Interfaces on EX4650-48Y Switches

You can channelize the 100-Gigabit Ethernet interfaces to four independent 25-Gigabit Ethernet interfaces. The default 100-Gigabit Ethernet interfaces can also be configured as 40-Gigabit Ethernet interfaces, and in this configuration can either operate as dedicated 40-Gigabit Ethernet interfaces or can be channelized to four independent 10-Gigabit Ethernet interfaces using breakout cables.

NOTE: **You cannot configure channelized interfaces to operate as Virtual Chassis ports.**

On the EX4650 switch, there are a total of 56 ports. Of these 56 ports, 8 ports (labeled 48 through 56) are QSFP28 ports that support 100-Gigabit Ethernet interfaces and 40-Gigabit Ethernet interfaces. The other 48 ports (labeled 0 through 47) are SFP+ ports that support 25-Gigabit Ethernet interfaces, 10-Gigabit Ethernet interfaces, or 1-Gigabit Ethernet interfaces. The default speed for the SFP+ ports is 10 Gbps.

By default, the 100-Gigabit Ethernet and 40-Gigabit Ethernet interfaces appear in the et-fpc/pic/port format. When the 100-Gigabit Ethernet interfaces are channelized as 25-Gigabit Ethernet interfaces, the interface names appear in the et-fpc/pic/port:channel format. When the 40-Gigabit Ethernet interfaces are channelized as 10-Gigabit Ethernet interfaces, the interface names appear in the xe-fpc/pic/port:channel format, where channel can be a value of 0 through 3. Auto-channelization is enabled by default on the QSFP28 ports. If you have disabled auto-channelization, then to channelize the ports, manually configure the port speed using the **set chassis fpc *slot-number* port *port-number* channel-speed *speed*** command, where the speed can be set to 10G or 25G. If a 100-Gigabit Ethernet transceiver is connected, you can only set the speed to 25G. For the SFP+ ports, you can set the speed to 25G, 10G, or 1G. There is no commit check for this, however.

NOTE: **On EX4650 switches, the QSFP28 ports support auto-channelization.**

The following steps describe how to channelize blocks of ports or individual ports.

1. To configure a block of 100-Gigabit Ethernet (*et*) ports to operate as 25-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 48 through 56 on PIC 0 to operate as 25-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 0]
   user@switch# **set port-range 48 56 channel-speed 25g**

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 50 to operate as 10-Gigabit Ethernet ports:

[edit chassis fpc 0 pic 0]
user@switch# **set port 50 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 from the 25-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration, delete the 25g statement:

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

   For example, to return ports 48 through 56 from the 25-Gigabit Ethernet configuration to the default 100-Gigabit Ethernet configuration:

   [edit chassis fpc 0 pic 0]
   user@switch# **delete port-range 48 56 channel-speed 25g**

   NOTE: To configure the ports to another channel-speed, you must delete the current port-range statement to return to the default 100-Gigabit Ethernet configuration.

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

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

See Also

- channel-speed on page 578
- fpc on page 579
- pic on page 581

Related Documentation

- channel-speed on page 578
- fpc on page 579
- pic on page 581

Configuring the Port Type on QFX3600 Standalone Switches

The QFX3600 standalone switch provides 16 40-Gbps QSFP+ ports. By default, all 16 ports operate as 40-Gigabit Ethernet (*xle*) ports. Optionally, you can choose to configure the 40-Gbps ports to operate as four 10-Gigabit Ethernet (*xe*) ports. 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. You can configure up to 64 10-Gigabit Ethernet ports on ports **Q0** through **Q15**.

This topic explains how to configure the port type on QFX3600 standalone switches.

CAUTION: The Packet Forwarding Engine on the QFX3600 standalone switch is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the switch.

The following message may be displayed in the system log file when the Packet Forwarding Engine is restarted. You can ignore this message.

Pipe write error: Broken pipe

flush operation failed

The following steps describe how to configure either a block of ports or an individual port to operate as 10-Gigabit Ethernet (xe) ports, as well as how to delete a 10-Gigabit Ethernet (xe) port configuration.

NOTE: When you delete the xe port type configuration for an individual port or a block of ports, the ports return to operating as 40-Gigabit Ethernet (xle) ports.

1. To configure a block of ports to operate as 10-Gigabit Ethernet (xe) ports, specify a port range:

   [edit chassis (QFX Series) fpc 0 pic 0]
   user@switch# **set xe port-range *port-range-low port-range-high***

   For example, to configure ports Q4 through Q7 to operate as 10-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 0]
   user@switch# **set xe port-range 4 7**

2. To configure an individual port to operate as a 10-Gigabit Ethernet (xe) port, specify a port number:

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

   For example, to configure port Q4 to operate as a 10-Gigabit Ethernet port:

   [edit chassis fpc 0 pic 0]


```
user@switch# set xe port 4
```

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

```
[edit chassis fpc 0 pic 0]
user@switch# commit
commit complete
```

4. To delete the 10-Gigabit Ethernet (xe) port configuration for a block of ports (and return to the default 40-Gigabit Ethernet configuration), specify a port range:

```
[edit chassis fpc 0 pic 0]
user@switch# delete xe port-range port-range-low port-range-high
```

   For example, to delete the 10-Gigabit Ethernet port configuration for ports Q4 through Q7:

```
[edit chassis fpc 0 pic 0]
user@switch# delete xe port-range 4 7
```

5. To delete the 10-Gigabit Ethernet (xe) port configuration for an individual port (and return to the default 40-Gigabit Ethernet configuration), specify a port number:

```
[edit chassis fpc 0 pic 0]
user@switch# delete xe port port-number
```

   For example, to delete the 10-Gigabit Ethernet port configuration for port Q4:

```
[edit chassis fpc 0 pic 0]
user@switch# delete xe port 4
```

Related Documentation

- Understanding Interface Naming Conventions on page 9
- pic on page 581

Configuring the QSFP+ Port Type on QFX3500 Standalone Switches

By default, the four 40-Gbps QSFP+ ports are configured to operate as 10-Gigabit Ethernet (*xe*) ports. 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. You can, however, configure the four 40-Gbps QSFP+ ports to operate as 40-Gigabit Ethernet (*xle*) ports.

NOTE: Port Q0 supports only three (not the typical four) 10-Gigabit Ethernet ports, because one port is reserved.

CAUTION: The Packet Forwarding Engine on the QFX3500 standalone switch is restarted when you commit port type configuration changes (for example, configuring or deleting an xle port). As a result, you might experience packet loss on the device.

The following steps describe how to configure either a block of ports or an individual port to operate as 40-Gigabit Ethernet (xle) ports, as well as how to delete a 40-Gigabit Ethernet (xle) configuration.

NOTE: When you delete an xle block of ports or individual port, the ports return to operating as 10-Gigabit Ethernet ports.

1. To configure a block of ports to operate as 40-Gigabit Ethernet (xle) ports, specify a port range:

   [edit chassis (QFX Series) fpc 0 pic 2]
   user@switch# **set xle port-range** ***port–range-low port-range-high***

   For example, to configure ports Q0 through Q3 to operate as 40-Gigabit Ethernet ports:

   [edit chassis fpc 0 pic 2]
   user@switch# **set xle port-range 0 3**

2. To configure an individual port to operate as a 40-Gigabit Ethernet (xle) port, specify a port number:

   [edit chassis fpc 0 pic 2]
   user@switch# **set xle port** ***port-number***

   For example, to configure port Q2 to operate as a 40-Gigabit Ethernet port:

   [edit chassis fpc 0 pic 2]
   user@switch# **set xle port 2**

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

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

4. To delete a block of ports configured as 40-Gigabit Ethernet (xle) ports (and return to the default 10-Gigabit Ethernet configuration), specify a port range:

   [edit chassis fpc 0 pic 2]
   user@switch# **delete xle port-range** ***port-range-low port-range-high***

   For example, to delete the 40-Gigabit Ethernet (xle) port configuration for ports Q0 through Q3 (and return to the default 10-Gigabit Ethernet configuration):

   [edit chassis fpc 0 pic 2]
   user@switch# **delete xle port-range 0 3**

5. To delete an individual port configured as a 40-Gigabit Ethernet (xle) port (and return to the default 10-Gigabit Ethernet configuration), specify an individual port:

   [edit chassis fpc 0 pic 2]
   user@switch# **delete xle port** ***port-number***

   For example, to delete the 40-Gigabit Ethernet (xle) port configuration for port Q2 (and return to the default 10-Gigabit Ethernet configuration):

   [edit chassis fpc 0 pic 2]
   user@switch# **delete xle port 2**

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

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

Related Documentation

- Understanding Interface Naming Conventions on page 9
- pic on page 581

Configuring the QSFP+ Port Type on QFX5100 Devices

You can convert default 40-Gigabit Ethernet data plane uplink interfaces (fte) to 40-Gigabit Ethernet access interfaces (xle) ports, and default 40-Gigabit Ethernet interfaces (xle) to 40-Gigabit Ethernet data plane uplink interfaces (fte). Ports Q0 and Q1 are fixed fte ports and cannot be changed. Ports Q2 and Q3 are fte ports by default but can be changed to xle ports. Ports Q4 and Q5 are xle ports by default but can be changed to fte ports.

NOTE: On QFX5100-24Q switches, ports Q1 through Q7 are fixed FTE ports and cannot be changed.

NOTE: You must configure xle ports in pairs, not individually, otherwise functionality is not guaranteed.

CAUTION: The Packet Forwarding Engine on a QFX5100 switch is restarted when you commit port type configuration changes (for example, configuring or deleting an fte or xle port). As a result, you might experience packet loss on the device.

The following steps describe how to configure either a block of ports or an individual port, as well as how to delete these configurations.

1. To configure a block of ports to operate as 40-Gigabit Ethernet interfaces (xle) , specify a port range:

   [edit chassis (QFX Series) node-group *name* node-device *name* pic 1]
   user@switch# **set xle port-range *port–range-low port-range-high***

   For example, to configure ports Q4 through Q5 to operate as 40-Gigabit Ethernet interfaces (xle):

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **set xle port-range 4 5**

2. To configure a block of ports to operate as 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port range:

   [edit chassis (QFX Series) node-group *name* node-device *name* pic 1]
   user@switch# **set fte port-range *port–range-low port-range-high***

   For example, to configure ports Q4 through Q5 to operate as 40-Gigabit Ethernet data plane uplink interfaces (fte):

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **set fte port-range 4 5**

3. To configure an individual port to operate as a 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port number:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **set fte port *port-number***

   For example, to configure port Q4 to operate as a 40-Gigabit Ethernet data plane uplink interfaces (fte):

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **set fte port 4**

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

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

5. To delete a block of ports configured as 40-Gigabit Ethernet (xle) ports, specify a port range:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete xle port-range *port-range-low port-range-high***

   For example, to delete the 40-Gigabit Ethernet access interface (xle) port configuration for ports Q2 through Q3:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete xle port-range 2 3**

6. To delete an individual port configured as a 40-Gigabit Ethernet (xle) interface:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete xle port** ***port-number***

   For example, to delete the 40-Gigabit Ethernet interface (xle) for port Q2:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete xle port 2**

7. To delete a block of ports configured as 40-Gigabit Ethernet data plane uplink interfaces (fte), specify a port range:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete fte port-range** ***port-range-low port-range-high***

   For example, to delete the block of ports configured as 40-Gigabit Ethernet data plane uplink interfaces (fte) for ports Q4 through Q5:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete fte port-range 4 5**

8. To delete an individual port configured as a 40-Gigabit Ethernet data plane uplink interfaces (fte):

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete fte port** ***port-number***

   For example, to delete the 40-Gigabit Ethernet data plane uplink interfaces (fte) for port Q4:

   [edit chassis node-group *name* node-device *name* pic 1]
   user@switch# **delete fte port 4**

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

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

Related Documentation

- Understanding Interface Naming Conventions on page 9
- Understanding Port Ranges and System Modes on page 200
- pic on page 581

CHAPTER 6

Energy Efficient Interfaces

- Understanding How Energy Efficient Ethernet Reduces Power Consumption on Interfaces on page 245
- Configuring Energy Efficient Ethernet on Interfaces (CLI Procedure) on page 245
- Verifying That EEE Is Saving Energy on Configured Ports on page 246

Understanding How Energy Efficient Ethernet Reduces Power Consumption on Interfaces

Energy Efficient Ethernet (EEE), an Institute of Electrical and Electronics Engineers (IEEE) 802.3az standard, reduces the power consumption of physical layer devices (PHYs) during periods of low link utilization. EEE saves energy by putting part of the transmission circuit into low power mode when the link is idle.

An Ethernet link consumes power even when a ink is idle. EEE provides a method to utilize power in such a way that Ethernet links use power only during data transmission. EEE specifies a signaling protocol, Low Power Idle (LPI) for achieving the power saving during the idle time of Ethernet links. EEE allows PHYs to exchange LPI indications to signal the transition to low power mode when there is no traffic. LPI indicates when a link can go idle and when the link needs to resume after a predefined delay without impacting data transmission.

The following copper PHYs are standardized by IEEE 802.3az:

- 100BASE-T
- 1000BASE-T
- 10GBASE-T

Related Documentation

- Configuring Energy Efficient Ethernet on Interfaces (CLI Procedure) on page 245

Configuring Energy Efficient Ethernet on Interfaces (CLI Procedure)

Energy Efficient Ethernet (EEE), an Institute of Electrical and Electronics Engineers (IEEE) 802.3az standard, reduces the power consumption of physical layer devices (PHYs) during periods of low link utilization. EEE saves energy by putting part of the transmission circuit into low power mode when a link is idle.

NOTE: Configure EEE only on EEE-capable Base-T copper Ethernet ports. If you configure EEE on unsupported ports, the console displays the message: **“EEE not supported”.**

This topic describes:

- Enabling EEE on an EEE-Capable Base-T Copper Ethernet Port on page 246
- Disabling EEE on a Base-T Copper Ethernet Port on page 246

Enabling EEE on an EEE-Capable Base-T Copper Ethernet Port

To enable EEE on an EEE-capable Base-T copper Ethernet interface:

```
[edit]
user@switch# set interfaces interface-name ether-options ieee-802-3az-eee
```

You can view the EEE status by using the **show interfaces** ***interface-name*** **detail** command.

Disabling EEE on a Base-T Copper Ethernet Port

To disable EEE on a Base-T copper Ethernet interface:

```
[edit]
user@switch# delete interfaces interface-name ether-options ieee-802-3az-eee
```

By default, EEE is disabled on EEE-capable ports.

Related Documentation

- Verifying That EEE Is Saving Energy on Configured Ports on page 246
- Understanding How Energy Efficient Ethernet Reduces Power Consumption on Interfaces on page 245

Verifying That EEE Is Saving Energy on Configured Ports

Purpose Verify that enabling EEE saves energy on Base-T Copper Ethernet ports.

Action You can see the amount of energy saved by EEE on an EX Series switch using the **show chassis power-budget-statistics** command.

1. View the power budget of an EX Series switch before enabling EEE.
   - On an EX6210 switch:

```
user@switch>show chassis power-budget-statistics
     PSU  2     (EX6200-PWR-AC2500)              :    2500 W   Online
            PSU  3                  )              :       0 W  Offline
            Total Power supplied by all Online PSUs  :    2500 W
            Power Redundancy Configuration           :     N+1
```



```
        Power Reserved for the Chassis           :     500 W
Fan Tray Statistics                       Base power   Power Used
FTC  0                                   :     300 W        nan W
FPC Statistics                            Base power   Power Used   PoE
power   Priority
FPC  3   (EX6200-48T)                    :     150 W      61.54 W
0 W       9
FPC  4   (EX6200-SRE64-4XS)              :     100 W      48.25 W
0 W       0
FPC  5   (EX6200-SRE64-4XS)              :     100 W      48.00 W
0 W       0
FPC  7   (EX6200-48T)                    :     150 W      63.11 W
0 W       9
FPC  8   (EX6200-48T)                    :     150 W      12.17 W
0 W       9

Total (non-PoE) Power allocated          :     950 W
        Total Power allocated for PoE            :       0 W
        Power Available (Redundant case)         :       0 W
        Total Power Available                    :    1550 W
```

- On an EX4300 switch:

```
user@switch>show chassis power-budget-statistics fpc 1
 PSU  1    (JPSU-1100-AC-AFO-A)          :    1100 W   Online
        Power redundancy configuration           :    N+0
        Total power supplied by all online PSUs  :    1100 W
        Base power reserved                      :    175 W
        Non-PoE power being consumed             :    95 W
        Total Power allocated for PoE            :    925 W
        Total PoE power consumed                 :    0 W
        Total PoE power remaining                :    925 W
```

2. Enable EEE on Base-T Copper Ethernet ports and save the configuration.

3. View the power budget of the switch after enabling EEE.

   - On an EX6210 switch:

```
user@switch> show chassis power-budget-statistics
 PSU  2     (EX6200-PWR-AC2500)                 :    2500 W   Online
        PSU  3                 )                 :       0 W  Offline
        Total Power supplied by all Online PSUs  :    2500 W
        Power Redundancy Configuration           :     N+1
        Power Reserved for the Chassis           :     500 W
Fan Tray Statistics                       Base power   Power Used
FTC  0                                   :     300 W        nan W
FPC Statistics                            Base power   Power Used   PoE
power   Priority
FPC  3   (EX6200-48T)                    :     150 W      50.36 W
0 W       9
FPC  4   (EX6200-SRE64-4XS)              :     100 W      48.60 W
0 W       0
FPC  5   (EX6200-SRE64-4XS)              :     100 W      48.09 W
0 W       0
FPC  7   (EX6200-48T)                    :     150 W      51.38 W
0 W       9
```

```
FPC  8   (EX6200-48T)                     :     150 W      12.17 W
0 W       9

Total (non-PoE) Power allocated           :     950 W
        Total Power allocated for PoE             :       0 W
        Power Available (Redundant case)          :       0 W
        Total Power Available                     :    1550 W
```

- On an EX4300 switch:

```
user@switch> show chassis power-budget-statistics fpc 1
     PSU  1    (JPSU-1100-AC-AFO-A)           :    1100 W   Online
            Power redundancy configuration            :    N+0
            Total power supplied by all online PSUs   :    1100 W
            Base power reserved                       :    175 W
            Non-PoE power being consumed              :    86 W
            Total Power allocated for PoE             :    925 W
            Total PoE power consumed                  :    0 W
            Total PoE power remaining                 :    925 W
```

Meaning

On an EX6210 switch, the **Power Used** field in the output shows the actual power being consumed by the line card or SRE module, including PoE power. If you compare the values in the **Power Used** field before and after enabling EEE for FPC 3 and FPC 7, you will notice that power is saved when EEE is enabled.

NOTE: The **Power Used** field is displayed in the output only for EX6210 switches.

On an EX4300 switch, if you compare the values in the **Non-PoE power being consumed** field before and after enabling EEE, you will notice that power is saved when EEE is enabled.

Related Documentation

- Configuring Energy Efficient Ethernet on Interfaces (CLI Procedure) on page 245
- Understanding How Energy Efficient Ethernet Reduces Power Consumption on Interfaces on page 245

PART 2

VLANs

- Layer 2 Virtual Switch on page 251
- Layer 3 SubInterfaces on page 265
- Layer 3 Logical Interfaces on page 269
- Flexible Ethernet Services Encapsulation on page 273

CHAPTER 7

Layer 2 Virtual Switch

- Understanding Layer 2 Virtual Switches Instances on page 251
- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252
- Configuring a Layer 2 Virtual Switch with a Layer 2 Trunk Port on page 253
- Configuring a Logical Interface for Access Mode on page 254
- Configuring VLAN Encapsulation on page 254
- Rewriting the Inner and Outer VLAN Tags on page 256
- Rewriting the VLAN Tag on Tagged Frames on page 256
- Binding VLAN IDs to Logical Interfaces on page 258
- Configuring Load Balancing on a LAG Link on page 262
- Example: Configuring Load Balancing on a LAG Link on page 262

Understanding Layer 2 Virtual Switches Instances

At Layer 2, you can group one or more VLANs into a single routing instance to form a virtual switch instance. A virtual switch instance is composed of VLANs. The virtual switch instance isolates a LAN segment and contains most Layer 2 functions, such as spanning-tree protocol instances and VLAN ID spaces, into it's own smaller, logical network. Splitting Layer 2 traffic using virtual switch instances allows you to more logically organize your Layer 2 traffic into multiple "virtual" Layer 2 networks.

A default virtual switch, called default-switch, is automatically created when a virtual switch is configured. All Layer 2 traffic not assigned to a VLAN in a virtual switch automatically becomes part of the default virtual switch.

You can configure a virtual switch to participate only in Layer 2 bridging and optionally to perform Layer 3 routing. In addition, you can configure spanning-tree protocols (STPs) within the virtual switch to prevent forwarding loops. For more information about how to configure Layer 2 logical ports on an interface, see the *Junos OS Network Interfaces Library for Routing Devices*.

You can associate one or more logical interfaces configured as trunk interfaces with a virtual switch. A trunk interface, or Layer 2 trunk port, enables you to configure a logical interface to represent multiple VLANs on the physical interface. For more information about how to configure trunk interfaces, see the *Junos OS Network Interfaces Library for Routing Devices*.

You can also configure Layer 2 forwarding and learning properties for the virtual switch.

Related Documentation

- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252
- Configuring a Layer 2 Virtual Switch with a Layer 2 Trunk Port on page 253
- *Configuring a Layer 2 Control Protocol Routing Instance*

Configuring a Layer 2 Virtual Switch on an EX Series Switch

A Layer 2 virtual switch, which isolates a LAN segment with its spanning-tree protocol instance and separates its VLAN ID space, filters and forwards traffic only at the data link layer. Each VLAN consists of a set of logical ports that participate in Layer 2 learning and forwarding. A virtual switch represents a Layer 2 network.

Two main types of interfaces are used in virtual switch hierarchies:

- Layer 2 logical interface—This type of interface uses the VLAN-ID as a virtual circuit identifier and the scope of the VLAN-ID is local to the interface port. This type of interface is often used in service-provider-centric applications.
- Access or trunk interface—This type of interface uses a VLAN-ID with global significance. The access or trunk interface is implicitly associated with VLANs based on VLAN membership. Access or trunk interfaces are typically used in enterprise-centric applications.

NOTE: The difference between access interfaces and trunk interfaces is that access interfaces can be part of one VLAN only and the interface is normally attached to an end-user device (packets are implicitly associated with the configured VLAN). In contrast, trunk interfaces multiplex traffic from multiple VLANs and usually interconnect switches.

To configure a Layer 2 virtual switch, include the following statements:

```
[edit]
routing-instances {
  routing-instance-name (
    instance-type virtual-switch;
    vlans vlan-name{
      vlan-id (all | none | number);
        [...configure optional VLAN parameters]
    }
  }
}
```

To enable a virtual switch, you must specify **virtual-switch** as the **instance-type**.

The VLANs that are specified with the **vlan-id** statement are included in the virtual switch.

You can configure other optional VLAN parameters in the virtual switch.

Related Documentation

- Configuring a Layer 2 Virtual Switch with a Layer 2 Trunk Port on page 253
- *Configuring a Layer 2 Virtual Switch*

Configuring a Layer 2 Virtual Switch with a Layer 2 Trunk Port

You can associate one or more Layer 2 trunk interfaces with a virtual switch.

A virtual switch configured with a Layer 2 trunk port also supports IRB within a VLAN. IRB provides simultaneous support for Layer 2 bridging and Layer 3 IP routing on the same interface. Only an interface configured with the **interface-mode (access | trunk)** statement can be associated with a virtual switch. An access interface enables you to accept packets with no VLAN identifier.

In addition, you can configure Layer 2 learning and forwarding properties for the virtual switch.

To configure a virtual switch with a Layer 2 trunk interface, include the following statements:

```
[edit]
routing-instances {
  routing-instance-name {
    instance-type virtual-switch;
    interface interface-name;
    vlans name{
      vlan-id (all | none | number);
        [...configure optional VLAN parameters]
    }
  }
}
```

Related Documentation

- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252

Configuring a Logical Interface for Access Mode

Enterprise network administrators can configure a single logical interface to accept untagged packets and forward the packets within a specified VLAN. A logical interface configured to accept untagged packets is called an *access interface* or *access port*.

interface-mode access;

You can include this statement at the following hierarchy levels:

- **[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 ethernet-switching]**

When an untagged or tagged packet is received on an access interface, the packet is accepted, the VLAN ID is added to the packet, and the packet is forwarded within the VLAN that is configured with the matching VLAN ID.

The following example configures a logical interface as an access port with a VLAN ID of 20 on routers and switches that support the enhanced Layer 2 software:

```
[edit interfaces ge-1/2/0]
unit 1 {
   family ethernet-switching {
      interface-mode access;
      vlan members 20;
   }
}
```

Related Documentation

- 802.1Q VLANs Overview on page 265
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring VLAN Encapsulation

To configure encapsulation on an interface, enter the **encapsulation** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
encapsulation type;
```

The following list contains important notes regarding encapsulation:

- Ethernet interfaces in VLAN mode can have multiple logical interfaces. In CCC and VPLS modes, VLAN IDs from 1 through 511 are reserved for normal VLANs, and VLAN IDs 512 through 4094 are reserved for CCC or VPLS VLANs. For 4-port Fast Ethernet interfaces, you can use VLAN IDs 512 through 1024 for CCC or VPLS VLANs.
- For encapsulation type **flexible-ethernet-services**, all VLAN IDs are valid.

- For some encapsulation types, including flexible Ethernet services, Ethernet VLAN CCC, and VLAN VPLS, you can also configure the encapsulation type that is used inside the VLAN circuit itself. To do this, include the **encapsulation** statement:

  ```
  encapsulation (vlan-ccc | vlan-tcc | vlan-vpls);
  ```

  You can include this statement at the following hierarchy levels:

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

- You cannot configure a logical interface with VLAN CCC or VLAN VPLS encapsulation unless you also configure the physical device with the same encapsulation or with flexible Ethernet services encapsulation. In general, the logical interface must have a VLAN ID of 512 or higher; if the VLAN ID is 511 or lower, it will be subject to the normal destination filter lookups in addition to source address filtering. However if you configure flexible Ethernet services encapsulation, this VLAN ID restriction is removed.

In general, you configure an interface's encapsulation at the **[edit interfaces *interface-name*]** hierarchy level.

Example: Configuring VLAN Encapsulation on a Gigabit Ethernet Interface

Configure VLAN CCC encapsulation on a Gigabit Ethernet interface:

```
interfaces ge-2/1/0 {
  vlan-tagging;
  encapsulation vlan-ccc;
  unit 0 {
    encapsulation vlan-ccc;
    vlan-id 600;
  }
}
```

Example: Configuring VLAN Encapsulation on an Aggregated Ethernet Interface

Configure VLAN CCC encapsulation on an aggregated Gigabit Ethernet interface:

```
interfaces ae0 {
  vlan-tagging;
  encapsulation vlan-vpls;
  unit 0 {
    vlan-id 100;
  }
}
```

Related Documentation

- 802.1Q VLANs Overview on page 265
- *Ethernet Interfaces Feature Guide for Routing Devices*

Rewriting the Inner and Outer VLAN Tags

On Ethernet IQ, IQ2 and IQ2-E interfaces, on MX Series router Gigabit Ethernet, Tri-Rate Ethernet copper, and 10-Gigabit Ethernet interfaces, and on aggregated Ethernet interfaces using Gigabit Ethernet IQ2 and IQ2-E or 10-Gigabit Ethernet PICs on MX Series routers, to replace both the inner and the outer VLAN tags of the incoming frame with a user-specified VLAN tag value, include the **swap-swap** statement in the input VLAN map or output VLAN map:

```
swap-swap;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]**
- **[edit interfaces *interface-name* unit *logical-unit-number* output-vlan-map]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* output-vlan-map]**

See *Rewrite Operations and Statement Usage for Input VLAN Maps* and *Rewrite Operations and Statement Usage for Output VLAN Maps* for information about configuring inner and outer VLAN ID values and inner and outer TPID values required for VLAN maps.

Related Documentation

- *input-vlan-map*
- *output-vlan-map*
- *swap-swap*
- *unit*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Rewriting the VLAN Tag on Tagged Frames

To rewrite the VLAN tag on all tagged frames entering the interface to a specified VLAN ID and TPID, include the **swap**, **tag-protocol-id**, and **vlan-id** statements in the input VLAN map:

```
input-vlan-map {
  swap;
  vlan-id number;
  tag-protocol-id tpid;
}
```

To rewrite the VLAN tag on all tagged frames exiting the interface to a specified VLAN ID and TPID, include the **swap** and **tag-protocol-id** statements in the output VLAN map:

```
output-vlan-map {
  swap;
```



```
    vlan-id number;
    tag-protocol-id tpid;
  }
```

You can include these statements at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number* input-vlan-map]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* input-vlan-map]**

You cannot include both the **swap** statement and the **vlan-id** statement in the output VLAN map configuration. If you include the **swap** statement in the configuration, the VLAN ID in outgoing frames is rewritten to the VLAN ID bound to the logical interface. For more information about binding a VLAN ID to the logical interface, see "802.1Q VLANs Overview" on page 265.

The swap operation works on the outer tag only, whether or not you include the **stacked-vlan-tagging** statement in the configuration. For more information, see *Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags*.

Related Documentation

- *input-vlan-map*
- *output-vlan-map*
- *swap*
- *vlan-id*
- *tag-protocol-id*
- *unit*
- For more information about binding a VLAN ID to the logical interface, see 802.1Q VLANs Overview on page 265.
- For more information about the swap operation, see *Examples: Stacking and Rewriting Gigabit Ethernet IQ VLAN Tags*.
- *Ethernet Interfaces Feature Guide for Routing Devices*

Binding VLAN IDs to Logical Interfaces

This topic describes how to configure logical interfaces to receive and forward VLAN-tagged frames:

To configure a logical interface to receive and forward VLAN-tagged frames, you must bind a VLAN ID, a range of VLAN IDs, or a list of VLAN IDs to the logical interface. Table 36 on page 258 lists the configuration statements you use to bind VLAN IDs to logical interfaces, organized by scope of the VLAN IDs used to match incoming packets. You can configure these statements at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

Table 36: Configuration Statements Used to Bind VLAN IDs to Logical Interfaces

Scope of VLAN ID Matching	Type of VLAN Framing Supported on the Logical Interface	
	Single-Tag Framing	Dual-Tag Framing
VLAN ID	**vlan-id** *vlan-id*;	**vlan-tags outer** *tpid*.<*vlan-id*> **inner** *tpidvlan-id*;
VLAN ID Range	**vlan-id-range** *vlan-id–vlan-id*;	**vlan-tags outer** *tpid.vlan-id* **inner-range** *tpid.vlan-id–vlan-id*;
VLAN ID List	**vlan-id-list** [*vlan-id vlan-id–vlan-id*];	**vlan-tags outer** <*tpid.*>*vlan-id* **inner-list** [*vlan-id vlan-id–vlan-id*];

NOTE: The **inner-list** option of the **vlan-tags** statement does not support Tag Protocol ID (TPID) values.

1. A logical interface that you have associated (bound) to a particular VLAN ID will receive and forward incoming frames that contain a matching VLAN ID. To bind a VLAN ID to a single-tag logical interface, include the **vlan-id** statement at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

   [edit interfaces *interface-name* unit *logical-unit-number*]
   user@host# vlan-id *vlan-id*;

   To configure an Ethernet interface to support single-tag logical interfaces, include the **vlan-tagging** statement at the **[edit interfaces *ethernet-interface-name*]** hierarchy level. To support mixed tagging, include the **flexible-vlan-tagging** statement instead.

2. To bind a VLAN ID to a dual-tag logical interface, include the **vlan-tags** statement at the **[edit interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level:

   [edit interfaces *ethernet-interface-name* unit *logical-unit-number*]
   vlan-tags inner <*tpid.*>*vlan-id* outer <*tpid.*>*vlan-id*;

To configure an Ethernet interface to support dual-tag logical interfaces, include the **stacked-vlan-tagging** statement at the **[edit interfaces *ethernet-interface-name*]** hierarchy level. To support mixed tagging, include the **flexible-vlan-tagging** statement instead.

3. A VLAN range can be used by service providers to interconnect multiple VLANs belonging to a particular customer over multiple sites. Using a VLAN ID range conserves switch resources and simplifies configuration. To bind a range of VLAN IDs to a single-tag logical interface, include the **vlan-id-range** statement at the **[edit interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level.

   [edit interfaces *ethernet-interface-name* unit *logical-unit-number*]
   vlan-id-range *vlan-id-vlan-id*;

4. To bind a range of VLAN IDs to a dual-tag logical interface, include the **vlan-tags** statement. Use the **inner–list** option to specify the VLAN IDs as an inclusive range by separating the starting VLAN ID and ending VLAN ID with a hyphen. You can include the statement at the **[edit interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level.

   [edit interfaces *ethernet-interface-name* unit *logical-unit-number*]
   vlan-tags inner–list [*vlan-id vlan-id–vlan-id*] outer <*tpid*.>*vlan-id*;

   To configure an Ethernet interface to support dual-tag logical interfaces, include the **stacked-vlan-tagging** statement at the **[edit interfaces *ethernet-interface-name*]** hierarchy level. To support mixed tagging, include the **flexible-vlan-tagging** statement instead.

In Junos OS Release 9.5 and later, on MX Series routers and in Junos OS Release 12.2R2 and later on EX Series switches, you can bind a list of VLAN IDs to a single logical interface, eliminating the need to configure a separate logical interface for every VLAN or VLAN range. A logical interface that accepts packets tagged with any VLAN ID specified in a VLAN ID list is called a *VLAN-bundled* logical interface.

You can use VLAN-bundled logical interfaces to configure circuit cross-connects between Layer 2 VPN routing instances or Layer 2 circuits. Using VLAN-bundled logical interfaces simplifies configuration and reduces use of system resources such as logical interfaces, next hops, and circuits.

As an alternative to configuring multiple logical interfaces (one for each VLAN ID and one for each range of VLAN IDs), you can configure a single VLAN-bundled logical interface based on a list of VLAN IDs.

NOTE: The **vlan-id** option is not supported to achieve VLAN normalization on VPLS instances that are configured with **vlan-id-list**. However, you can use the **vlan-maps** option to achieve VLAN normalization.

1. To bind a list of VLAN IDs to a single-tag logical interface, include the **vlan-id-list** statement at the **[edit interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level. Specify the VLAN IDs in the list individually by using a space to separate each ID, as an inclusive list by separating the starting VLAN ID and ending VLAN ID with a hyphen, or as a combination of both.

   [edit interfaces *ethernet-interface-name* unit *logical-unit-number*]
   user@host# vlan-id-list [*vlan-id vlan-id–vlan-id*];

   To configure an Ethernet interface to support single-tag logical interfaces, include the **vlan-tagging** statement at the **[edit interfaces *ethernet-interface-name*]** hierarchy level. To support mixed tagging, include the **flexible-vlan-tagging** statement instead.

2. To bind a list of VLAN IDs to a dual-tag logical interface, include the **vlan-tags** statement at the **[edit interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level or at the **[edit logical-systems *logical-system-name* interfaces *ethernet-interface-name* unit *logical-unit-number*]** hierarchy level. Use the **inner-list** option to specify the VLAN IDs individually by using a space to separate each ID, as an inclusive list by separating the starting VLAN ID and ending VLAN ID with a hyphen, or as a combination of both.

   [edit interfaces *ethernet-interface-name* unit *logical-unit-number*]
   user@host# vlan-tags inner-list [*vlan-id vlan-id–vlan-id*] outer <*tpid*>*vlan-id*;

   NOTE: The **inner-list** option of the **vlan-tags** statement does not support Tag Protocol ID (TPID) values.

To configure an Ethernet interface to support dual-tag logical interfaces, include the **stacked-vlan-tagging** statement at the **[edit interfaces *ethernet-interface-name*]** hierarchy level. To support mixed tagging, include the **flexible-vlan-tagging** statement instead.

The following sample configuration configures two different lists of VLAN IDs on two different logical ports.

```
[edit interfaces]
ge-1/1/0 {
  vlan-tagging; # Only for single-tagging
  encapsulation flexible-ethernet-services;
  unit 10 {
    encapsulation vlan-ccc;
    vlan-id-list [20 30–40 45];
  }
}
ge-1/1/1 {
  flexible-vlan-tagging; # Only for mixed tagging
  encapsulation flexible-ethernet-services;
  unit 10 {
    encapsulation vlan-ccc;
    vlan-id-list [1 10 20 30–40];
  }
  unit 20 {
    encapsulation vlan-ccc;
    vlan-tags outer 200 inner-list [50–60 80 90–100];
  }
}
```

In the example configuration above, **ge-1/1/0** supports single-tag logical interfaces, and **ge-1/1/1** supports mixed tagging. The single-tag logical interfaces **ge-1/1/0.10** and **ge-1/1/1.20** each bundle lists of VLAN IDs. The dual-tag logical interface **ge-1/1/1.20** bundles lists of inner VLAN IDs.

TIP: You can group a range of identical interfaces into an interface range and then apply a common configuration to that interface range. For example, in the above example configuration, both interfaces ge-1/1/0 and ge-1/1/1 have the same physical encapsulation type of **flexible-ethernet-services**. Thus you can define an interface range with the interfaces ge-1/1/0 and ge-1/1/1 as its members and apply the encapsulation type flexible-ethernet-services to that defined interface range.

Related Documentation

- 802.1Q VLANs Overview on page 265
- Configuring Interface Ranges on page 32
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Load Balancing on a LAG Link

You can configure the load balancing hash key for Layer 2 traffic to use fields in the Layer 3 and Layer 4 headers inside the frame payload for load-balancing purposes using the **payload** statement. You can configure the statement to look at **layer-3** (and **source-ip-only** or **destination-ip-only** packet header fields) or **layer-4** fields. You configure this statement at the **[edit forwarding-options hash-key family multiservice]** hierarchy level.

You can configure Layer 3 or Layer 4 options, or both. The **source-ip-only** or **destination-ip-only** options are mutually exclusive. The **layer-3-only** statement is not available on MX Series routers.

By default, Junos implementation of 802.3ad balances traffic across the member links within an aggregated Ethernet bundle based on the Layer 3 information carried in the packet.

For more information about link aggregation group (LAG) configuration, see the *Junos OS Network Interfaces Library for Routing Devices*.

Related Documentation

- Load Balancing and Ethernet Link Aggregation on page 120
- Load Balancing on a LAG Link on page 262

Example: Configuring Load Balancing on a LAG Link

This example configures the load-balancing hash key to use the source Layer 3 IP address option and Layer 4 header fields as well as the source and destination MAC addresses for load balancing on a link aggregation group (LAG) link:

```
[edit]
forwarding-options {
  hash-key {
    family multiservice {
      source-mac;
      destination-mac;
      payload {
        ip {
          layer-3 {
            source-ip-only;
          }
          layer-4;
        }
      }
    }
  }
}
```

NOTE: Any change in the hash key configuration requires a reboot of the FPC for the changes to take effect.

Related Documentation

- Load Balancing and Ethernet Link Aggregation on page 120
- Configuring Load Balancing on a LAG Link on page 262

CHAPTER 8

Layer 3 SubInterfaces

- 802.1Q VLANs Overview on page 265
- Understanding Layer 3 Subinterfaces on page 266
- Configuring a Layer 3 Subinterface (CLI Procedure) on page 266
- Verifying That Layer 3 Subinterfaces Are Working on page 267

802.1Q VLANs Overview

For Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet interfaces supporting VPLS, the Junos OS supports a subset of the IEEE 802.1Q standard for channelizing an Ethernet interface into multiple logical interfaces, allowing many hosts to be connected to the same Gigabit Ethernet switch, but preventing them from being in the same routing or bridging domain.

Related Documentation

- *Configuring Dynamic 802.1Q VLANs*
- *802.1Q VLAN IDs and Ethernet Interface Types*
- *Enabling VLAN Tagging*
- Binding VLAN IDs to Logical Interfaces on page 258
- *Guidelines for Configuring VLAN ID List-Bundled Logical Interfaces That Connect CCCs*
- *Configuring a Layer 2 VPN Routing Instance on a VLAN-Bundled Logical Interface*
- *Configuring a VLAN-Bundled Logical Interface to Support a Layer 2 VPN Routing Instance*
- *Specifying the Interface Over Which VPN Traffic Travels to the CE Router*
- *Specifying the Interface to Handle Traffic for a CCC*
- *Configuring a Layer 2 Circuit on a VLAN-Bundled Logical Interface*
- *Configuring a VLAN-Bundled Logical Interface to Support a Layer 2 VPN Routing Instance*
- *Specifying the Interface to Handle Traffic for a CCC Connected to the Layer 2 Circuit*
- *Example: Configuring a Layer 2 VPN Routing Instance on a VLAN-Bundled Logical Interface*
- *Example: Configuring a Layer 2 Circuit on a VLAN-Bundled Logical Interface*
- *Configuring Access Mode on a Logical Interface*

- *Configuring a Logical Interface for Trunk Mode*
- *Configuring the VLAN ID List for a Trunk Interface*
- *Configuring a Trunk Interface on a Bridge Network*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Understanding Layer 3 Subinterfaces

A Layer 3 subinterface 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 subinterfaces to route traffic among multiple VLANs along a single trunk line that connects a Juniper Networks EX Series Ethernet Switch to a Layer 2 switch. Only one physical connection is required between the switches. This topology is often called a *router on a stick* or a *one-armed router* when the Layer 3 device is a router.

To create Layer 3 subinterfaces on an EX Series switch, you enable VLAN tagging, partition the physical interface into logical partitions, and bind the VLAN ID to the logical interface.

You can partition one physical interface into up to 4094 different subinterfaces, one for each VLAN. We recommend that you use the VLAN ID as the subinterface number when you configure the subinterface. Juniper Networks Junos operating system (Junos OS) reserves VLAN IDs 0 and 4095.

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 EX Series 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. Double-tagging is not supported.

Related Documentation

- Interfaces Overview for Switches on page 4
- *Junos OS Ethernet Interfaces Configuration Guide*

Configuring a Layer 3 Subinterface (CLI Procedure)

EX Series switches use Layer 3 subinterfaces to divide a physical interface into multiple logical interfaces, each corresponding to a VLAN. The switch uses the Layer 3 subinterfaces to route traffic between subnets.

To configure Layer 3 subinterfaces, you 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.

To configure Layer 3 subinterfaces:

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

- *Example: Configuring Layer 3 Subinterfaces for a Distribution Switch and an Access Switch*
- Verifying That Layer 3 Subinterfaces Are Working on page 267
- Understanding Layer 3 Subinterfaces on page 266

Verifying That Layer 3 Subinterfaces Are Working

Purpose After configuring Layer 3 subinterfaces, verify they are set up properly and transmitting data.

Action

1. Use the **show interfaces** command to determine whether you successfully created the subinterfaces and the links are up:

```
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     10.1.1.1/24
ge-0/0/0.1              up    up   inet     10.1.1.2/24
ge-0/0/0.2              up    up   inet     10.1.1.3/24
ge-0/0/0.3              up    up   inet     10.1.1.4/24
ge-0/0/0.4              up    up   inet     10.1.1.5/24
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 whether packets were transmitted correctly on the subinterface VLANs:

```
user@switch> ping ip-address
PING 10.1.1.1 (10.1.1.1): 56 data bytes
64 bytes from 10.1.1.1: icmp_seq=0 ttl=64 time=0.157 ms
64 bytes from 10.1.1.1: icmp_seq=1 ttl=64 time=0.238 ms
64 bytes from 10.1.1.1: icmp_seq=2 ttl=64 time=0.255 ms
64 bytes from 10.1.1.1: icmp_seq=3 ttl=64 time=0.128 ms
--- 10.1.1.1 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
```

Meaning The output confirms that the subinterfaces are created and the links are up.

Related Documentation

- Configuring a Layer 3 Subinterface (CLI Procedure) on page 266
- *Example: Configuring Layer 3 Subinterfaces for a Distribution Switch and an Access Switch*

CHAPTER 9

Layer 3 Logical Interfaces

- Understanding Layer 3 Logical Interfaces on page 269
- Configuring a Layer 3 Logical Interface on page 270
- Verifying That Layer 3 Logical Interfaces Are Working on page 270

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. .

NOTE: **You can also use Layer 3 logical interfaces to provide alternative gateway addresses for smart DHCP relay. The logical tunnel (lt) and virtual loopback tunnel (vt) interfaces are not supported in logical interfaces.**

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 for Switches on page 4
- Configuring a Layer 3 Logical Interface on page 270

- *Configuring DHCP and BOOTP Relay*

- *Junos OS Network Interfaces Library for Routing Devices*

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 on Switches*.

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 269
- Verifying That Layer 3 Logical Interfaces Are Working on page 270

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     10.0.0.1/8
ge-0/0/0.1             up    up   inet     10.0.0.2/8
ge-0/0/0.2             up    up   inet     10.0.0.3/8
ge-0/0/0.3             up    up   inet     10.0.0.4/8
ge-0/0/0.4             up    up   inet     10.0.0.5/8
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 10.1.1.1 (1.1.1.1): 56 data bytes
64 bytes from 10.1.1.1: icmp_seq=0 ttl=64 time=0.157 ms
64 bytes from 10.1.1.1: icmp_seq=1 ttl=64 time=0.238 ms
64 bytes from 10.1.1.1: icmp_seq=2 ttl=64 time=0.255 ms
64 bytes from 10.1.1.1: icmp_seq=3 ttl=64 time=0.128 ms
--- 10.1.1.1 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 270

CHAPTER 10

Flexible Ethernet Services Encapsulation

- Understanding Flexible Ethernet Services Encapsulation on Switches on page 273
- Configuring Flexible Ethernet Services Encapsulation to Support the Service Provider and Enterprise Styles of Configuration on page 275

Understanding Flexible Ethernet Services Encapsulation on Switches

Junos OS supports two different styles of configuration for switch interfaces: the service provider style and the enterprise style. The service provider style requires more configuration but provides greater flexibility. The enterprise style is easier to configure but offers less functionality. Each configuration style requires a different Ethernet encapsulation type. You can configure a physical interface to support both styles of configuration using flexible Ethernet services.

NOTE: On EX4300, QFX5100 (running Junos OS 16.1R5 or earlier), and QFX5200, the service provider style and enterprise style interface configurations are handled differently within Junos OS. If the service provider style and enterprise style interface configurations are mixed, the egress VLAN translation within the hardware can be incorrectly programmed leading to forwarding issues across the configured ports. Use the service provider style configuration in a Q-in-Q scenario. For all other scenarios, use the enterprise style configuration.

Flexible Ethernet services is a type of encapsulation that enables a physical interface to support different types of Ethernet encapsulations at the logical interface level. Defining multiple per-unit Ethernet encapsulations makes it easier to customize Ethernet-based services to multiple hosts connected to the same physical interface.

- Service Provider Style on page 273
- Enterprise Style on page 274
- Flexible Ethernet Services on page 274

Service Provider Style

The service provider style of configuration allows for customization of Ethernet-based services at the logical interface level. Service providers typically have multiple customers connected to the same physical interface. Using the service provider style, you can configure multiple logical interfaces on the physical interface, and associate each unit with a different VLAN. This provides the flexibility to configure different services for each customer, but also requires more configuration, because each feature must be explicitly configured on the logical interface.

When configuring a physical interface to support only the service provider style, the physical interface must be encapsulated with the **extended-vlan-bridge** option to support bridging features. VLAN tagging must also be configured on the physical interface so that it can operate in trunk mode and transmit Ethernet frames with VLAN tags for multiple VLANs. Each logical interface is bound to a unique VLAN ID.

Enterprise Style

The enterprise style of configuration is designed to provide basic bridging functionality for consumers of Ethernet-based services. The isolation of services for different customers on a single port is not required, because each port is typically connected to a host or is providing a trunk to another switch.

With the enterprise style of configuration, logical interfaces are placed into Layer 2 mode by specifying **ethernet-switching** as the interface family. Without using flexible Ethernet services, **ethernet-switching** can only be configured on a single logical unit, unit 0. You cannot bind a VLAN ID to unit 0, because these interfaces operate either in trunk mode, which supports traffic with various VLAN tags, or in access mode, which supports untagged traffic.

Flexible Ethernet Services

The flexible Ethernet services encapsulation type enables a physical interface to support both styles of configuration. To support the service provider style, flexible Ethernet services allows for encapsulations to be configured at the logical interface level instead of the physical interface. To support the enterprise style, flexible Ethernet services allows the **ethernet-switching** family to be configured on any logical interface unit number instead of only unit 0.

For example, the configuration below shows three logical interfaces configured on a physical interface, xe-0/0/51, that is encapsulated for flexible Ethernet services. Unit 100 and unit 200 are configured in the service provider style and unit 300 is configured in the enterprise style. The encapsulation type of **vlan-bridge** is used to enable bridging on unit 100 and unit 200, and **family ethernet-switching** enables bridging on unit 300.

```
interfaces {
  xe-0/0/51 {
    flexible-vlan-tagging;
    encapsulation flexible-ethernet-services;
    unit 100 {
      encapsulation vlan-bridge;
      vlan-id 100;
    }
    unit 200 {
      encapsulation vlan-bridge;
      vlan-id 200;
    }
```



```
        unit 300 {
            family ethernet-switching {
                interface-mode trunk;
                vlan members 300;
            }
        }
    }
}
```

NOTE: It is not required that the unit number and VLAN ID match, but it is considered a best practice.

NOTE: On QFX5100 switches, you can combine encapsulations on the same physical interface for **vlan-bridge** and **family ethernet switching**. Starting with Junos OS Release 16.1R6, you can also combine encapsulations on the same physical interface for **family inet** and **family ethernet-switching**.

Release History Table

Release	Description
16.1R3	Starting with Junos OS Release 16.1R6, you can also combine encapsulations on the same physical interface for **family inet** and **family ethernet-switching**.

Related Documentation

- Configuring Flexible Ethernet Services Encapsulation to Support the Service Provider and Enterprise Styles of Configuration on page 275

Configuring Flexible Ethernet Services Encapsulation to Support the Service Provider and Enterprise Styles of Configuration

Flexible Ethernet services is a type of encapsulation that enables a physical interface to specify Ethernet encapsulations at the logical interface level. Each logical interface can have a different Ethernet encapsulation. Defining multiple per-unit Ethernet encapsulations makes it easier to customize Ethernet-based services to multiple hosts connected to the same physical interface.

An Ethernet interface that is not encapsulated with flexible Ethernet services and is operating in Layer 2 mode is limited to a single logical interface unit (0). Bridging is enabled on the interface by configuring **ethernet-switching** as the interface family on unit 0. The **ethernet-switching** family can be configured only on logical interface unit 0, and no other logical units can be defined on that interface.

Some switching features, however, cannot be configured on logical interface unit 0. Features such as Q-in-Q tunneling require the logical interface to transmit VLAN-tagged frames. To enable a logical interface to receive and forward Ethernet frames tagged with a matching VLAN ID, you must bind the logical interface to that VLAN. These features must be configured on a logical interface unit other than 0, because you cannot bind a VLAN ID to unit 0.

When you encapsulate an interface by using flexible Ethernet services, you can configure a logical interface unit other than 0 with **family ethernet-switching**. You can also configure other logical interfaces on that same interface with different types of Ethernet encapsulations. This enables logical interfaces that are bound to a VLAN ID to coexist with logical interfaces configured with **family ethernet-switching**.

For example, if you configure PVLAN on the same physical interface on which you are configuring Q-in-Q tunneling, you can use flexible ethernet services to support the enterprise style of configuration for PVLAN, using **family ethernet-switching**, along with **vlan-bridge** encapsulation for Q-in-Q tunneling.

To configure the interface to support both the service provider and enterprise styles of configuration:

1. Enable flexible Ethernet services encapsulation on the interface. The **flexible-ethernet-services** statement allows configuration of both service-provider-style logical interfaces and enterprise-style logical interfaces:

   [edit interfaces *interface-name*]
   `user@switch#` **set encapsulation flexible-ethernet-services**

2. Enable the interface to transmit packets with 802.1Q VLAN single-tagged and dual-tagged frames:

   [edit interfaces *interface-name*]
   `user@switch#` **set flexible-vlan-tagging**

3. Configure a logical interface (unit) on the interface:

   [edit interfaces *interface-name*]
   `user@switch#` **set unit *unit-number***

   NOTE: Do not use logical interface unit 0. You must later bind a VLAN tag ID to the unit you specify in this step, and you cannot bind a VLAN tag ID to unit 0. It is a best practice to match the unit number to the VLAN ID to which the interface is bound.

4. Encapsulate the logical interface for service provider style bridging configuration—for example, use **vlan-bridge** encapsulation on an interface to be used for Q-in-Q tunneling. (If you were configuring the interface only for Q-in-Q tunneling, you would use **encapsulation extended-vlan-bridge** on the *physical* interface.)

   [edit interfaces *interface-name*]
   `user@switch#` **set unit *unit-number* encapsulation vlan-bridge**

5. Bind the logical interface from the preceding step to a VLAN ID:

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

6. Configure another logical interface. (If you were configuring just PVLAN, we would recommend that you configure a single logical interface for all PVLAN domains on an interface.)

   [edit interfaces *interface-name*]
   `user@switch#` **set unit *unit-number***

7. Enable the logical interface in the preceding step for enterprise style bridging configuration:

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

8. Assign VLAN membership to the logical interface:

   [edit interfaces *interface-name*]
   `user@switch#` **set unit *unit-number* family ethernet-switching vlan members *vlan-id***

9. Configure the interface as a trunk interface to transmit frames with 802.1Q VLAN tags:

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

NOTE: For EX4300 device, the service provider style configuration (encapsulation extended-vlan-bridge) is recommended only for QinQ scenarios. For other scenarios, use the enterprise style configuration.

Related Documentation

- Understanding Flexible Ethernet Services Encapsulation on Switches on page 273
- *Configuring Q-in-Q Tunneling*
- *Creating a Private VLAN on a Single Switch with ELS Support (CLI Procedure)*

PART 3

Link Fault Management and Uplink Failure Detection for Interfaces

- OAM Link Fault Management on page 281
- Uplink Failure Detection on page 289

CHAPTER 11

OAM Link Fault Management

- Understanding Ethernet OAM Link Fault Management on page 281
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282
- Example: Configuring Ethernet OAM Link Fault Management on page 285

Understanding Ethernet OAM Link Fault Management

Juniper Networks Junos operating system (Junos OS) for Juniper Networks allows the Ethernet interfaces on these switches to support the IEEE 802.3ah standard for the Operation, Administration, and Maintenance (OAM) of Ethernet in access networks. The standard defines OAM link fault management (LFM). You can configure IEEE 802.3ah OAM LFM on point-to-point Ethernet links that are connected either directly or through Ethernet repeaters. The IEEE 802.3ah standard meets the requirement for OAM capabilities even as Ethernet moves from being solely an enterprise technology to a WAN and access technology, and the standard remains backward-compatible with existing Ethernet technology.

Ethernet OAM provides the tools that network management software and network managers can use to determine how a network of Ethernet links is functioning. Ethernet OAM should:

- Rely only on the media access control (MAC) address or virtual LAN identifier for troubleshooting.
- Work independently of the actual Ethernet transport and function over physical Ethernet ports or a virtual service such as pseudowire.
- Isolate faults over a flat (or single operator) network architecture or nested or hierarchical (or multiprovider) networks.

The following OAM LFM features are supported:

- Discovery and Link Monitoring

  The discovery process is triggered automatically when OAM is enabled on the interface. The discovery process permits Ethernet interfaces to discover and monitor the peer on the link if it also supports the IEEE 802.3ah standard. You can specify the discovery mode used for IEEE 802.3ah OAM support. In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality. In passive mode, the peer initiates the discovery process. After the discovery process has been initiated, both sides participate in discovery. The switch performs link monitoring by sending periodic OAM protocol data units (PDUs) to advertise OAM mode, configuration, and capabilities.

You can specify the number of OAM PDUs that an interface can miss before the link between peers is considered down.

- Remote Fault Detection

  Remote fault detection uses flags and events. Flags are used to convey the following: Link Fault means a loss of signal, Dying Gasp means an unrecoverable condition such as a power failure, and Critical Event means an unspecified vendor-specific critical event. You can specify the periodic OAM PDU sending interval for fault detection. The switch uses the Event Notification OAM PDU to notify the remote OAM device when a problem is detected. You can specify the action to be taken by the system when the configured link-fault event occurs.

- Remote Loopback Mode

  Remote loopback mode ensures link quality between the switch and a remote peer during installation or troubleshooting. In this mode, when the interface receives a frame that is not an OAM PDU or a pause frame, it sends it back on the same interface on which it was received. The link appears to be in the active state. You can use the returned loopback acknowledgement to test delay, jitter, and throughput.

  Junos OS can place a remote DTE into loopback mode (if remote loopback mode is supported by the remote DTE). When you place a remote DTE into loopback mode, the interface receives the remote loopback request and puts the interface into remote loopback mode. When the interface is in remote loopback mode, all frames except OAM PDUs are looped back without any changes made to the frames. OAM PDUs continue to be sent and processed.

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282
- Example: Configuring Ethernet OAM Link Fault Management on page 285

Configuring Ethernet OAM Link Fault Management (CLI Procedure)

Ethernet OAM link fault management (LFM) can be used for physical link-level fault detection and management. The IEEE 802.3ah LFM works across point-to-point Ethernet links either directly or through repeaters.

To configure Ethernet OAM LFM using the CLI:

1. Enable IEEE 802.3ah OAM support on an interface:

   [edit protocols oam ethernet link-fault-management]
   user@switch# **set interface** ***interface-name***

   NOTE: You can configure Ethernet OAM LFM on aggregated interfaces.

   NOTE: The remaining steps are optional. You can choose which of these features to configure for Ethernet OAM LFM on your switch.

2. Specify whether the interface or the peer initiates the discovery process by configuring the link discovery mode to **active** or **passive** (**active** = interface initiates; **passive** = peer initiates):

   [edit protocols oam ethernet link-fault-management]
   user@switch# **set interface** ***interface-name*****link-discovery active**

3. Configure a periodic OAM PDU-sending interval (in milliseconds) for fault detection:

   [edit protocols oam ethernet link-fault-management]
   user@switch# **set interface pdu-interval*****interval***

4. Specify the number of OAM PDUs that an interface can miss before the link between peers is considered down:

   [edit protocols oam ethernet link-fault-management]
   user@switch# **set interface** ***interface-name*** **pdu-threshold** ***threshold-value***

5. Configure event threshold values on an interface for the local errors that trigger the sending of link event TLVs:

   - Set the threshold value (in seconds) for sending frame-error events or taking the action specified in the action profile:

     [edit protocols oam ethernet link-fault-management]
     user@switch# **set interface** ***interface-name*** **event-thresholds frame-error** ***count***

   - Set the threshold value (in seconds) for sending frame-period events or taking the action specified in the action profile:

     [edit protocols oam ethernet link-fault-management]
     user@switch# **set interface** ***interface-name*** **event-thresholds frame-period** ***count***

   - Set the threshold value (in seconds) for sending frame-period-summary events or taking the action specified in the action profile:

     [edit protocols oam ethernet link-fault-management]
     user@switch# **set interface** ***interface-name*** **event-thresholds frame-period-summary** ***count***

- Set the threshold value (in seconds) for sending symbol-period events or taking the action specified in the action profile:

  ```
  [edit protocols oam ethernet link-fault-management]
  user@switch# set interface interface-name event-thresholds symbol-period count
  ```

NOTE: You can disable the sending of link event TLVs.

To disable the sending of link event TLVs:

```
[edit protocols oam ethernet link-fault-management]
user@switch# set interface interface-name negotiation-options no-allow-link-events
```

6. Create an action profile to define event fault flags and thresholds to be taken when the link fault event occurs. Then apply the action profile to one or more interfaces. (You can also apply multiple action profiles to a single interface.)

   a. Name the action profile:

   ```
   [edit protocols oam ethernet link-fault-management]
   user@switch# set action-profile profile-name
   ```

   b. Specify actions to be taken by the system when the link fault event occurs:

   ```
   [edit protocols oam ethernet link-fault-management]
   user@switch# set action-profile profile-name  action syslog

   user@switch# set action-profile profile-name action link-down
   ```

   c. Specify events for the action profile:

   ```
   [edit protocols oam ethernet link-fault-management]
   user@switch# set action-profile profile-name event link-adjacency-loss
   ```

   NOTE: For each action profile, you must specify at least one link event and one action. The actions are taken only when all of the events in the action profile are true. If more than one action is specified, all actions are executed. You can set a low threshold for a specific action such as logging the error and set a high threshold for another action such as system logging.

7. Set a remote interface into loopback mode so that all frames except OAM PDUs are looped back without any changes made to the frames. Set the remote DTE in loopback mode (the remote DTE must support remote-loopback mode) and then enable remote loopback support for the local interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@switch# set interface interface-name remote-loopback

   user@switch# set interface interface-name negotiation-options allow-remote-loopback
   ```


Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Understanding Ethernet OAM Link Fault Management on page 281

Example: Configuring Ethernet OAM Link Fault Management

Junos OS allows the Ethernet interfaces on these switches to support the IEEE 802.3ah standard for the Operation, Administration, and Maintenance (OAM) of Ethernet in access networks. The standard defines OAM link fault management (LFM). You can configure IEEE 802.3ah OAM LFM on point-to-point Ethernet links that are connected either directly or through Ethernet repeaters.

This example describes how to enable and configure OAM LFM on a Gigabit Ethernet interface:

- Requirements on page 285
- Overview and Topology on page 285
- Configuring Ethernet OAM Link Fault Management on Switch 1 on page 285
- Configuring Ethernet OAM Link Fault Management on Switch 2 on page 286
- Verification on page 287

Requirements

This example uses the following hardware and software components:

- Junos OS Release 9.4 or later for EX Series switches
- Two EX3200 or EX4200 switches connected directly

Overview and Topology

Junos OS switches allows the Ethernet interfaces on these switches to support the IEEE 802.3ah standard for the Operation, Administration, and Maintenance (OAM) of Ethernet in access networks. The standard defines OAM link fault management (LFM). You can configure IEEE 802.3ah OAM LFM on point-to-point Ethernet links that are connected either directly or through Ethernet repeaters.

This example uses two EX4200 switches connected directly. Before you begin configuring Ethernet OAM LFM on two switches, connect the two switches directly through a trunk interface.

Configuring Ethernet OAM Link Fault Management on Switch 1

CLI Quick Configuration

To quickly configure Ethernet OAM LFM, copy the following commands and paste them into the switch terminal window:

```
[edit protocols oam ethernet link-fault-management]
set interface ge-0/0/0
set interface ge-0/0/0 link-discovery active
set interface ge-0/0/0 pdu-interval 800
set interface ge-0/0/0 remote-loopback
```

Step-by-Step Procedure

To configure Ethernet OAM LFM on switch 1:

1. Enable IEEE 802.3ah OAM support on an interface:

```
[edit protocols oam ethernet link-fault-management]
user@switch1# set interface ge-0/0/0
```

2. Specify that the interface initiates the discovery process by configuring the link discovery mode to **active**:

```
[edit protocols oam ethernet link-fault-management]
user@switch1# set interface ge-0/0/0 link-discovery active
```

3. Set the periodic OAM PDU-sending interval (in milliseconds) to 800 on switch 1:

```
[edit protocols oam ethernet link-fault-management]
user@switch1# set interface pdu-interval 800
```

4. Set a remote interface into loopback mode so that all frames except OAM PDUs are looped back without any changes made to the frames. Ensure that the remote DTE supports remote loopback mode. To set the remote DTE in loopback mode

```
[edit protocols oam ethernet link-fault-management]
user@switch1# set interface ge-0/0/0.0 remote-loopback
```

Results

Check the results of the configuration:

```
[edit]
user@switch1# show

  protocols {
    oam {
      ethernet {
        link-fault-management {
          interface ge-0/0/0 {
            pdu-interval 800;
            link-discovery active;
            remote-loopback;
          }
        }
      }
    }
```

Configuring Ethernet OAM Link Fault Management on Switch 2

CLI Quick Configuration

To quickly configure Ethernet OAM LFM on switch 2, copy the following commands and paste them into the switch terminal window:

```
[edit protocols oam ethernet link-fault-management ]
```

set interface ge-0/0/1
set interface ge-0/0/1 negotiation-options allow-remote-loopback

Step-by-Step Procedure

To configure Ethernet OAM LFM on switch 2:

1. Enable OAM on the peer interface on switch 2:

```
[edit protocols oam ethernet link-fault-management]
user@switch2# set interface ge-0/0/1
```

2. Enable remote loopback support for the local interface:

```
[edit protocols oam ethernet link-fault-management]
user@switch2# set interface ge-0/0/1 negotiation-options allow-remote-loopback
```

Results

Check the results of the configuration:

```
[edit]
user@switch2# show
```

```
protocols {
  oam {
    ethernet {
      link-fault-management {
        interface ge-0/0/1 {
          negotiation-options {
            allow-remote-loopback;
          }
        }
      }
    }
  }
```

Verification

Verifying That OAM LFM Has Been Configured Properly

Purpose

Verify that OAM LFM has been configured properly.

Action

Use the **show oam ethernet link-fault-management** command:

```
user@switch1#show oam ethernet link-fault-management
```

Sample Output

```
Interface: ge-0/0/0.0
Status: Running, Discovery state: Send Any
Peer address: 00:19:e2:50:3b:e1
Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
Remote entity information:
Remote MUX action: forwarding, Remote parser action: forwarding
```



```
Discovery mode: active, Unidirectional mode: unsupported
Remote loopback mode: supported, Link events: supported
Variable requests: unsupported
```

Meaning When the output displays the MAC address and the discover state is **Send Any**, it means that OAM LFM has been configured properly.

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282
- Understanding Ethernet OAM Link Fault Management on page 281

CHAPTER 12

Uplink Failure Detection

- Overview of Uplink Failure Detection on page 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292
- Verifying That Uplink Failure Detection Is Working Correctly on page 296

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:

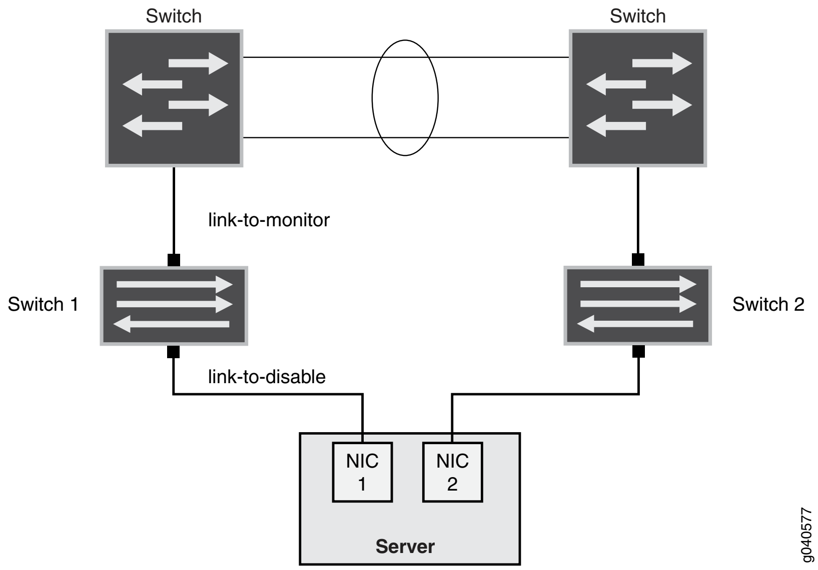
- Uplink Failure Detection Configuration on page 289
- Failure Detection Pair on page 290

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 4 on page 290 illustrates a typical setup for uplink failure detection.

Figure 4: 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 48 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 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

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 48groups for each switch.
- Configure a maximum of 48 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 289

- Example: Configuring Interfaces for Uplink Failure Detection on page 292
- Verifying That Uplink Failure Detection Is Working Correctly on page 296

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 on page 292
- Overview and Topology on page 292
- Configuring Uplink Failure Detection on Both Switches on page 293
- Verification on page 295

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 4 on page 290 illustrates a typical setup for uplink failure detection.

Figure 5: Uplink Failure Detection Configuration on Switches

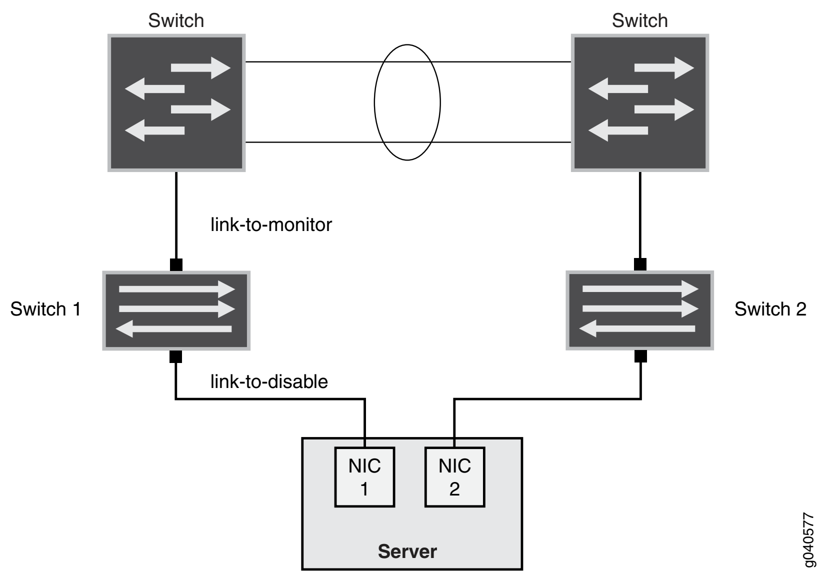


Table 37 on page 293 lists uplink failure settings for each QFX3500 switch.

Table 37: 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 295

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 289
- Configuring Interfaces for Uplink Failure Detection on page 291

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 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

PART 4

Other Interface Features

- Unicast Reverse Path Forwarding (uRPF) on page 299
- IP Directed and Targeted Broadcast on page 327
- ARP on page 343
- Resilient Hashing on page 349
- Local Link Bias on page 365
- Generic Routing Encapsulation (GRE) on page 371

CHAPTER 13

Unicast Reverse Path Forwarding (uRPF)

- Understanding How Unicast Reverse Path Forwarding Prevents Spoofed IP Packet Forwarding on page 299
- Understanding Unicast RPF on page 300
- Configuring Unicast RPF on page 304
- Configuring Unicast RPF (CLI Procedure) on page 313
- Disabling Unicast RPF (CLI Procedure) on page 315
- Understanding Multicast Reverse Path Forwarding on page 316
- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- Verifying Unicast RPF Status on page 323

Understanding How Unicast Reverse Path Forwarding Prevents Spoofed IP Packet Forwarding

IP spoofing can occur during a denial-of-service (DoS) attack. IP spoofing allows an intruder to pass IP packets to a destination as genuine traffic, when in fact the packets are not actually meant for the destination. This type of spoofing is harmful because it consumes the destination's resources.

A unicast reverse-path-forwarding (RPF) check is a tool to reduce forwarding of IP packets that might be spoofing an address. A unicast RPF check performs a route table lookup on an IP packet's source address, and checks the incoming interface. The router or switch determines whether the packet is arriving from a path that the sender would use to reach the destination. If the packet is from a valid path, the router or switch forwards the packet to the destination address. If it is not from a valid path, the router or switch discards the packet. Unicast RPF is supported for the IPv4 and IPv6 protocol families, as well as for the virtual private network (VPN) address family.

NOTE: Reverse path forwarding is not supported on the interfaces you configure as tunnel sources. This affects only the transit packets exiting the tunnel.

Related Documentation

- *Example: Configuring Unicast Reverse-Path-Forwarding Checking to Prevent DoS and DDoS Attacks*

Understanding Unicast RPF

Unicast reverse-path forwarding (RPF) helps protect the switch against denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks by verifying the unicast source address of each packet that arrives on an ingress interface where unicast RPF is enabled. It also helps ensure that traffic arriving on ingress interfaces comes from a network source that the receiving interface can reach.

When you enable unicast RPF, by default the switch forwards a packet only if the receiving interface is the best return path to the packet's unicast source address. This is known as strict mode unicast RPF. You can also enable loose mode, which means that the system checks to see if the packet has a source address with a corresponding prefix in the routing table but does not check whether the receiving interface is the best return path to the packet's unicast source address.

NOTE: On Juniper Networks EX3200, EX4200, and EX4300 Ethernet Switches, the switch applies unicast RPF *globally* to all interfaces when unicast RPF is configured on any interface. For additional information, see "Limitations of the Unicast RPF Implementation on EX3200, EX4200, and EX4300 Switches" on page 303.

NOTE: Platform support depends on the Junos OS release in your installation.

- Unicast RPF for Switches Overview on page 300
- Unicast RPF Implementation on page 301
- When to Enable Unicast RPF on page 301
- When Not to Enable Unicast RPF on page 303
- Limitations of the Unicast RPF Implementation on EX3200, EX4200, and EX4300 Switches on page 303

Unicast RPF for Switches Overview

Unicast RPF functions as an ingress filter that reduces the forwarding of IP packets that might be spoofing an address. By default, unicast RPF is disabled on the switch interfaces.

The type of unicast RPF provided on the switches—that is, strict mode unicast RPF is especially useful on untrusted interfaces. An untrusted interface is an interface where untrusted users or processes can place packets on the network segment.

The switch supports only the active paths method of determining the best return path back to a unicast source address. The active paths method looks up the best reverse path entry in the forwarding table. It does not consider alternate routes specified using routing-protocol-specific methods when determining the best return path.

If the forwarding table lists the receiving interface as the interface to use to forward the packet back to its unicast source, it is the best return path interface.

Use strict mode unicast RPF only on symmetrically routed interfaces. (For information about symmetrically routed interfaces, see "When to Enable Unicast RPF" on page 301.)

For more information about strict unicast RPF, see RFC 3704, *Ingress Filtering for Multihomed Networks* at http://www.ietf.org/rfc/rfc3704.txt.

Unicast RPF Implementation

This section includes:

- Unicast RPF Packet Filtering on page 301
- Bootstrap Protocol (BOOTP) and DHCP Requests on page 301
- Default Route Handling on page 301

Unicast RPF Packet Filtering

When you enable unicast RPF on the switch, the switch handles traffic in the following manner:

- If the switch receives a packet on the interface that is the best return path to the unicast source address of that packet, the switch forwards the packet.
- If the best return path from the switch to the packet's unicast source address is not the receiving interface, the switch discards the packet.
- If the switch receives a packet that has a source IP address that does not have a routing entry in the forwarding table, the switch discards the packet.

Bootstrap Protocol (BOOTP) and DHCP Requests

Bootstrap protocol (BOOTP) and DHCP request packets are sent with a broadcast MAC address and therefore the switch does not perform unicast RPF checks on them. The switch forwards all BOOTP packets and DHCP request packets without performing unicast RPF checks.

Default Route Handling

If the best return path to the source is the default route (**0.0.0.0**) and the default route points to **reject**, the switch discards the packets. If the default route points to a valid network interface, the switch performs a normal unicast RPF check on the packets.

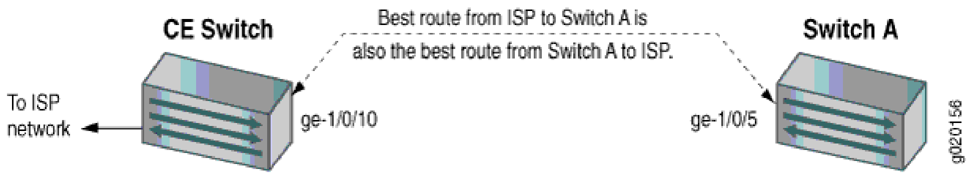
NOTE: On the EX4300, the default route is not used when the switch is configured in unicast RPF strict mode.

When to Enable Unicast RPF

Enable unicast RPF when you want to ensure that traffic arriving on a network interface comes from a source that resides on a network that that interface can reach. You can enable unicast RPF on untrusted interfaces to filter spoofed packets. For example, a common application for unicast RPF is to help defend an enterprise network from DoS/DDoS attacks coming from the Internet.

Enable unicast RPF only on symmetrically routed interfaces. A symmetrically routed interface uses the same route in both directions between the source and the destination, as shown in Figure 6 on page 302. Symmetrical routing means that if an interface receives a packet, the switch uses the same interface to send a reply to the packet source (the receiving interface matches the forwarding-table entry for the best return path to the source).

Figure 6: Symmetrically Routed Interfaces



Enabling unicast RPF on asymmetrically routed interfaces (where different interfaces receive a packet and reply to its source) results in packets from legitimate sources being filtered (discarded) because the best return path is not the same interface that received the packet.

The following switch interfaces are most likely to be symmetrically routed and thus are candidates for unicast RPF enabling:

- The service provider edge to a customer
- The customer edge to a service provider
- A single access point out of the network (usually on the network perimeter)
- A terminal network that has only one link

NOTE: Because unicast RPF is enabled globally on EX3200, EX4200, and EX4300 switches, ensure that *all* interfaces are symmetrically routed before you enable unicast RPF on these switches. Enabling unicast RPF on asymmetrically routed interfaces results in packets from legitimate sources being filtered.

TIP: Enabling unicast RPF as close as possible to the traffic source stops spoofed traffic before it can proliferate or reach interfaces that do not have unicast RPF enabled.

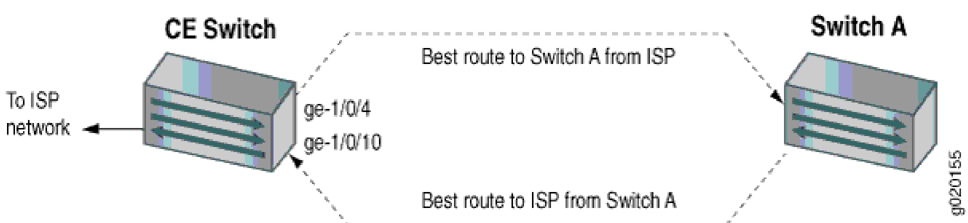
When Not to Enable Unicast RPF

Typically, you will not enable unicast RPF if:

- Switch interfaces are multihomed.
- Switch interfaces are trusted interfaces.
- BGP is carrying prefixes and some of those prefixes are not advertised or are not accepted by the ISP under its policy. (The effect in this case is the same as filtering an interface by using an incomplete access list.)
- Switch interfaces face the network core. Core-facing interfaces are usually asymmetrically routed.

An asymmetrically routed interface uses different paths to send and receive packets between the source and the destination, as shown in Figure 7 on page 303. This means that if an interface receives a packet, that interface does not match the forwarding table entry as the best return path back to the source. If the receiving interface is not the best return path to the source of a packet, unicast RPF causes the switch to discard the packet even though it comes from a valid source.

Figure 7: Asymmetrically Routed Interfaces



NOTE: Do not enable unicast RPF on EX3200, EX4200, and EX4300 switches if any switch interfaces are asymmetrically routed, because unicast RPF is enabled globally on all interfaces of these switches. All switch interfaces must be symmetrically routed for you to enable unicast RPF without the risk of the switch discarding traffic that you want to forward.

Limitations of the Unicast RPF Implementation on EX3200, EX4200, and EX4300 Switches

On EX3200, EX4200, and EX4300 switches, the switch implements unicast RPF on a global basis. You cannot enable unicast RPF on a per-interface basis. Unicast RPF is globally disabled by default.

- When you enable unicast RPF on any interface, it is automatically enabled on all switch interfaces, including link aggregation groups (LAGs), integrated routing and bridging (IRB) interfaces, and routed VLAN interfaces (RVIs).
- When you disable unicast RPF on the interface (or interfaces) on which you enabled unicast RPF, it is automatically disabled on all switch interfaces.

NOTE: You must explicitly disable unicast RPF on every interface on which it was explicitly enabled or unicast RPF remains enabled on all switch interfaces.

QFX switches, OCX switches, and EX3200 and EX4200 switches do not perform unicast RPF filtering on equal-cost multipath (ECMP) traffic. The unicast RPF check examines only one best return path to the packet source, but ECMP traffic employs an address block consisting of multiple paths. Using unicast RPF to filter ECMP traffic on these switches can result in the switch discarding packets that you want to forward because the unicast RPF filter does not examine the entire ECMP address block.

Related Documentation

- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- Configuring Unicast RPF (CLI Procedure) on page 313
- Disabling Unicast RPF (CLI Procedure) on page 315

Configuring Unicast RPF

- Configuring Unicast RPF on page 304
- Unicast RPF and Default Route on page 305
- Configuring Unicast RPF Strict Mode on page 307
- Configuring Unicast RPF Loose Mode on page 309
- Configuring Unicast RPF Loose Mode with Ability to Discard Packets on page 310
- Configuring Unicast RPF on a VPN on page 312
- Configuring Unicast RPF on page 312

Configuring Unicast RPF

For interfaces that carry IPv4 or IPv6 traffic, you can reduce the impact of denial of service (DoS) attacks by configuring unicast reverse path forwarding (RPF). Unicast RPF helps determine the source of attacks and rejects packets from unexpected source addresses on interfaces where unicast RPF is enabled.

NOTE:

- You can protect a network by applying unicast RPF check feature at the edge (on customer facing interfaces) of the network. In an ISP environment, this can impact the network which can impose on a scaled setup. In case if you have already protected the edge of your network, a packet with a spoofed IP source address would not even appear in a core facing interface. In this case, unicast RPF check is not necessary. Enabling unicast RPF feature can impact the control plane performance, so use it where it is required. So it is strongly recommended not to enable this feature on the network core (internal) interfaces.

The following sections describe unicast RPF in detail:

Unicast RPF and Default Route

When the active route cannot be chosen from the routes in a routing table, the router chooses a default route. A default route is equivalent to an IP address of 0.0.0.0/0. If you configure a default route, and you configure unicast RPF on an interface that the default route uses, unicast RPF behaves differently than it does otherwise. For information about configuring default routes, see the *Junos OS Routing Protocols Library*.

To determine whether the default route uses an interface, enter the **show route** command:

user@host> **show route *address***

address is the next-hop address of the configured default route. The default route uses the interfaces shown in the output of the **show route** command.

The following sections describe how unicast RPF behaves when a default route uses an interface and when a default route does not use an interface:

- Unicast RPF Behavior with a Default Route on page 305
- Unicast RPF Behavior Without a Default Route on page 306
- Unicast RPF with Routing Asymmetry on page 306

Unicast RPF Behavior with a Default Route

On all routers except those with MPCs and the MX80 router, unicast RPF behaves as follows if you configure a default route that uses an interface configured with unicast RPF:

- Loose mode—All packets are automatically accepted. For this reason, we recommend that you not configure unicast RPF loose mode on interfaces that the default route uses.
- Strict mode—The packet is accepted when the source address of the packet matches any of the routes (either default or learned) that can be reachable through the interface. Note that routes can have multiple destinations associated with them; therefore, if one of the destinations matches the incoming interface of the packet, the packet is accepted.

On all routers with MPCs and the MX80 router, unicast RPF behaves as follows if you configure a default route that uses an interface configured with unicast RPF:

- Loose mode—All packets except the packets whose source is learned from the default route are accepted. All packets whose source is learned from the default route are dropped at the Packet Forwarding Engine. The default route is treated as if the route does not exist.
- Strict mode—The packet is accepted when the source address of the packet matches any of the routes (either default or learned) that can be reachable through the interface. Note that routes can have multiple destinations associated with them; therefore, if one of the destinations matches the incoming interface of the packet, the packet is accepted.

On all routers, the packet is not accepted when either of the following is true:

- The source address of the packet does not match a prefix in the routing table.
- The interface does not expect to receive a packet with this source address prefix.

Unicast RPF Behavior Without a Default Route

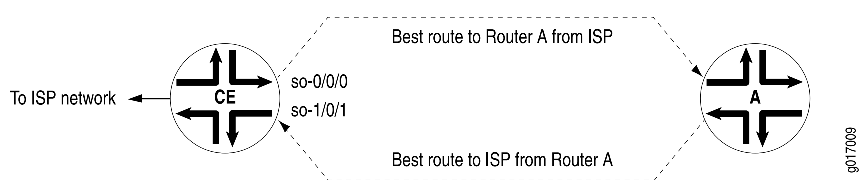
If you do not configure a default route, or if the default route does not use an interface configured with unicast RPF, unicast RPF behaves as described in “Configuring Unicast RPF Strict Mode” on page 307 and “Configuring Unicast RPF Loose Mode” on page 309. To summarize, unicast RPF without a default route behaves as follows:

- Strict mode—The packet is not accepted when either of the following is true:
  - The packet has a source address that does not match a prefix in the routing table.
  - The interface does not expect to receive a packet with this source address prefix.
- Loose mode—The packet is not accepted when the packet has a source address that does not match a prefix in the routing table.

Unicast RPF with Routing Asymmetry

In general, we recommend that you not enable unicast RPF on interfaces that are internal to the network because internal interfaces are likely to have *routing asymmetry*. Routing asymmetry means that a packet’s outgoing and return paths are different. Routers in the core of the network are more likely to have asymmetric reverse paths than routers at the customer or provider edge. Figure 8 on page 306 shows unicast RPF in an environment with routing asymmetry.

Figure 8: Unicast RPF with Routing Asymmetry



In Figure 8 on page 306, if you enable unicast RPF on interface **so-0/0/0**, traffic destined for Router A is not rejected. If you enable unicast RPF on interface **so-1/0/1**, traffic from Router A is rejected.

If you need to enable unicast RPF in an asymmetric routing environment, you can use fail filters to allow the router to accept incoming packets that are known to be arriving by specific paths. For an example of a fail filter that accepts packets with a specific source and destination address, see "Configuring Unicast RPF" on page 312.

Configuring Unicast RPF Strict Mode

In strict mode, unicast RPF checks whether the incoming packet has a source address that matches a prefix in the routing table, and whether the interface expects to receive a packet with this source address prefix.

If the incoming packet fails the unicast RPF check, the packet is not accepted on the interface. When a packet is not accepted on an interface, unicast RPF counts the packet and sends it to an optional fail filter. If the fail filter is not configured, the default action is to silently discard the packet.

The optional fail filter allows you to apply a filter to packets that fail the unicast RPF check. You can define the fail filter to perform any filter operation, including accepting, rejecting, logging, sampling, or policing.

When unicast RPF is enabled on an interface, Bootstrap Protocol (BOOTP) packets and Dynamic Host Configuration Protocol (DHCP) packets are not accepted on the interface. To allow the interface to accept BOOTP packets and DHCP packets, you must apply a fail filter that accepts all packets with a source address of **0.0.0.0** and a destination address of **255.255.255.255.** For a configuration example, see "Configuring Unicast RPF" on page 312.

For more information about unicast RPF, see the *Junos OS Routing Protocols Library*. For more information about defining fail filters, see the *Routing Policies, Firewall Filters, and Traffic Policers Feature Guide*.

To configure unicast RPF, include the **rpf-check** statement:

```
rpf-check <fail-filter filter-name>;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6)]**
- **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6)]**

Using unicast RPF can have several consequences when implemented with traffic filters:

- RPF fail filters are evaluated after input filters and before output filters.
- If you configure a filter counter for packets dropped by an input filter, and you want to know the total number of packets dropped, you must also configure a filter counter for packets dropped by the RPF check.

- To count packets that fail the RPF check and are accepted by the RPF fail filter, you must configure a filter counter.
- If an input filter forwards packets anywhere other than the inet.0 or inet6.0 routing tables, the unicast RPF check is not performed.
- If an input filter forwards packets anywhere other than the routing instance the input interface is configured for, the unicast RPF check is not performed.

Configure unicast RPF strict mode, and apply a fail filter that allows the interface to accept BOOTP packets and DHCP packets. The filter accepts all packets with a source address of **0.0.0.0** and a destination address of **255.255.255.255**.

To configure unicast RPF in strict mode:

1. Configure the fail filter:

```
[edit firewall]
filter rpf-special-case-dhcp-bootp {
  term allow-dhcp-bootp {
    from {
      source-address {
        0.0.0.0/32;
      }
      address {
        255.255.255.255/32;
      }
    }
    then {
      count rpf-dhcp-bootp-traffic;
      accept;
    }
  }
  term default {
    then {
      log;
      reject;
    }
  }
}
```

2. Configure unicast RPF on interfaces:

```
[edit]
interfaces {
  so-0/0/0 {
    unit 0 {
      family inet {
        rpf-check fail-filter rpf-special-case-dhcp-bootp;
      }
    }
  }
}
```

3. Commit the configuration.

```
[edit]
commit;
```

Configuring Unicast RPF Loose Mode

By default, unicast RPF uses strict mode. Unicast RPF loose mode is similar to unicast RPF strict mode and has the same configuration restrictions. The only check in loose mode is whether the packet has a source address with a corresponding prefix in the routing table; loose mode does not check whether the interface expects to receive a packet with a specific source address prefix. If a corresponding prefix is not found, unicast RPF loose mode does not accept the packet. As in strict mode, loose mode counts the failed packet and optionally forwards it to a fail filter, which either accepts, rejects, logs, samples, or polices the packet.

To configure unicast RPF loose mode, include the **mode**:

1. mode loose;

   You can include this statement at the following hierarchy levels:

   - **[edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check <fail-filter *filter-name*>]**
   - **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check <fail-filter *filter-name*>]**

2. For example:

   In this example, no special configuration beyond device initialization is required.

   Configure unicast RPF loose mode, and apply a fail filter that allows the interface to accept BOOTP packets and DHCP packets. The filter accepts all packets with a source address of **0.0.0.0** and a destination address of **255.255.255.255**.

   To configure unicast RPF in loose mode:

   a. Configure the fail filter:

```
[edit firewall]
filter rpf-special-case-dhcp-bootp {
  term allow-dhcp-bootp {
    from {
      source-address {
        0.0.0.0/32;
      }
      address {
        255.255.255.255/32;
      }
    }
    then {
      count rpf-dhcp-bootp-traffic;
      accept;
    }
  }
  term default {
    then {
```

```
            log;
            reject;
          }
        }
      }
```

b. Configure unicast RPF on interfaces:

```
[edit]
interfaces {
  so-0/0/0 {
    unit 0 {
      family inet {
        rpf-check fail-filter rpf-special-case-dhcp-bootp;
        mode loose;
      }
    }
  }
}
```

c. Commit the configuration.

```
[edit]
commit;
```

Configuring Unicast RPF Loose Mode with Ability to Discard Packets

Starting with Junos OS Release 12.1, unicast RPF loose mode has the ability to discard packets with the source address pointing to the discard interface. This feature is supported on MX Series routers and on T Series routers with Type 1 FPCs, Type 2 FPCs, and Type 3 FPCs. Using unicast RPF loose mode, along with Remote Triggered Black Hole (RTBH) filtering, provides an efficient way to discard packets coming from known attack sources. BGP policies in edge routers ensure that packets with untrusted source addresses have their next hop set to a discard route. When a packet arrives at the router with an untrusted source address, unicast RPF performs a route lookup of the source address. Because the source address route points to a discard next hop, the packet is dropped and a counter is incremented. This feature is supported on both IPv4 (inet) and IPv6 (inet6) address families.

To configure unicast RPF loose mode with the ability to discard packets, include the **rpf-loose-mode-discard family inet** statement at the **[edit forwarding-options]** hierarchy level:

```
rpf-loose-mode-discard {
  family {
    inet;
  }
}
```


In this example, no special configuration beyond device initialization is required.

Configure unicast RPF loose mode, and apply a fail filter that allows the interface to accept BOOTP packets and DHCP packets. The filter accepts all packets with a source address of **0.0.0.0** and a destination address of **255.255.255.255**.

To configure unicast RPF loose mode with the ability to discard packets:

1. Configure the fail filter:

```
[edit firewall]
filter rpf-special-case-dhcp-bootp {
   term allow-dhcp-bootp {
      from {
         source-address {
            0.0.0.0/32;
         }
         address {
            255.255.255.255/32;
         }
      }
      then {
         count rpf-dhcp-bootp-traffic;
         accept;
      }
   }
   term default {
      then {
         log;
         reject;
      }
   }
}
```

2. Configure unicast RPF on interfaces:

```
[edit]
interfaces {
   so-0/0/0 {
      unit 0 {
         family inet {
            rpf-check fail-filter rpf-special-case-dhcp-bootp;
            mode loose;
         }
      }
   }
}
```

3. Configure the ability to discard packets.

```
[edit]
forwarding-options{
   rpf-loose-mode-discard {
      family {
         inet;
```

```
            }
          }
        }
```

4. Commit the configuration.

```
[edit]
commit;
```

Configuring Unicast RPF on a VPN

You can configure unicast RPF on a VPN interface by enabling unicast RPF on the interface and including the **interface** statement at the **[edit routing-instances *routing-instance-name*]** hierarchy level.

You can configure unicast RPF only on the interfaces you specify in the routing instance. This means the following:

- For Layer 3 VPNs, unicast RPF is supported on the CE router interface.
- Unicast RPF is not supported on core-facing interfaces.
- For virtual-router routing instances, unicast RPF is supported on all interfaces you specify in the routing instance.
- If an input filter forwards packets anywhere other than the routing instance the input interface is configured for, the unicast RPF check is not performed.

For more information about VPNs and virtual-router routing instances, see the *Junos OS VPNs Library for Routing Devices*. For more information about FBF, see the *Junos OS Routing Protocols Library*.

Configure unicast RPF on a Layer 3 VPN interface:

```
[edit interfaces]
so-0/0/0 {
  unit 0 {
    family inet {
      rpf-check;
    }
  }
}
[edit routing-instance]
VPN-A {
  interface so-0/0/0.0;
}
```

Configuring Unicast RPF

Configure unicast RPF strict mode, and apply a fail filter that allows the interface to accept BOOTP packets and DHCP packets. The filter accepts all packets with a source address of **0.0.0.0** and a destination address of **255.255.255.255**.

```
[edit firewall]
filter rpf-special-case-dhcp-bootp {
```



```
    term allow-dhcp-bootp {
      from {
        source-address {
          0.0.0.0/32;
        }
        address {
          255.255.255.255/32;
        }
      }
      then {
        count rpf-dhcp-bootp-traffic;
        accept;
      }
    }
    term default {
      then {
        log;
        reject;
      }
    }
  }
  [edit]
  interfaces {
    so-0/0/0 {
      unit 0 {
        family inet {
          rpf-check fail-filter rpf-special-case-dhcp-bootp;
        }
      }
    }
  }
```

See Also

- unicast-reverse-path on page 644
- *Example: Configuring Unicast Reverse-Path-Forwarding Check*

Configuring Unicast RPF (CLI Procedure)

Unicast reverse-path forwarding (RPF) can help protect your LAN from denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks on untrusted interfaces. When you enable unicast RPF, by default the switch forwards a packet only if the receiving interface is the best return path to the packet's unicast source address. This is known as strict mode unicast RPF. You can also enable loose mode, which means that the system checks to see if the packet has a source address with a corresponding prefix in the routing table but does not check whether the receiving interface is the best return path to the packet's unicast source address.

NOTE: On EX3200, EX4200, and EX4300 switches, you can enable unicast RPF only globally—that is, on all switch interfaces. You cannot enable unicast RPF on a per-interface basis.

Before you begin:

- On an EX8200, EX6200, QFX Series switch, or OCX Series switch, ensure that the selected switch interface is symmetrically routed before you enable unicast RPF. A symmetrically routed interface is an interface that uses the same route in both directions between the source and the destination. Do not enable unicast RPF on asymmetrically routed interfaces. An asymmetrically routed interface uses different paths to send and receive packets between the source and the destination.
- On an EX3200, EX4200, or EX4300 switch, ensure that *all* switch interfaces are symmetrically routed before you enable unicast RPF on an interface. When you enable unicast RPF on any interface, it is enabled globally on all switch interfaces. Do not enable unicast RPF on asymmetrically routed interfaces. An asymmetrically routed interface uses different paths to send and receive packets between the source and the destination.

To enable unicast RPF, configure it explicitly on a selected customer-edge interface:

[edit interfaces]
user@switch# **set *interface-name* unit 0 family inet** rpf-check

To enable unicast RPF loose mode, enter:

[edit interfaces]
user@switch# **set *interface-name* unit 0 family inet rpf-check mode loose**

BEST PRACTICE: On EX3200, EX4200, and EX4300 switches, unicast RPF is enabled globally on *all* switch interfaces, regardless of whether you configure it explicitly on only one interface or only on some interfaces.

On EX3200, EX4200, and EX4300 switches, we recommend that you enable unicast RPF explicitly on either all interfaces or only one interface. To avoid possible confusion, do not enable it on only some interfaces:

- Enabling unicast RPF explicitly on only one interface makes it easier if you choose to disable it in the future because you must explicitly disable unicast RPF on every interface on which you explicitly enabled it. If you explicitly enable unicast RPF on two interfaces and you disable it on only one interface, unicast RPF is still implicitly enabled globally on the switch. The drawback of this approach is that the switch displays the flag that indicates that unicast RPF is enabled only on interfaces on which unicast RPF is explicitly enabled, so even though unicast RPF is enabled on all interfaces, this status is not displayed.
- Enabling unicast RPF explicitly on all interfaces makes it easier to know whether unicast RPF is enabled on the switch because every interface shows the correct status. (Only interfaces on which you explicitly enable unicast RPF display the flag that indicates that unicast RPF is enabled.) The drawback of this approach is that if you want to disable unicast RPF,

you must explicitly disable it on every interface. If unicast RPF is enabled on any interface, it is implicitly enabled on all interfaces.

Related Documentation

- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- Verifying Unicast RPF Status on page 323
- Disabling Unicast RPF (CLI Procedure) on page 315
- Troubleshooting Unicast RPF on page 397
- Understanding Unicast RPF on page 300

Disabling Unicast RPF (CLI Procedure)

Unicast reverse-path forwarding (RPF) can help protect your LAN from denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks on untrusted interfaces. Unicast RPF filters traffic with source addresses that do not use the incoming interface as the best return path back to the source. If the network configuration changes so that an interface that has unicast RPF enabled becomes a trusted interface or becomes asymmetrically routed (the interface that receives a packet is not the best return path to the packet's source), disable unicast RPF.

To disable unicast RPF on an EX3200, EX4200, or EX4300 switch, you must delete it from every interface on which you explicitly configured it. If you do not disable unicast RPF on every interface on which you explicitly enabled it, it remains implicitly enabled on all interfaces. If you attempt to delete unicast RPF from an interface on which it was not explicitly enabled, the **warning: statement not found** message appears. If you do not disable unicast RPF on every interface on which you explicitly enabled it, unicast RPF remains implicitly enabled on all interfaces of the EX3200, EX4200, or EX4300 switch.

On EX8200, EX6200, QFX Series switches, and OCX Series switches, the switch does not apply unicast RPF to an interface unless you explicitly enable that interface for unicast RPF.

To disable unicast RPF, delete its configuration from the interface:

[edit interfaces]
user@switch# **delete ge-1/0/10 unit 0 family inet rpf-check**

NOTE: On EX3200, EX4200, and EX4300 switches, if you do not disable unicast RPF on every interface on which you explicitly enabled it, unicast RPF remains implicitly enabled on all interfaces.

Related Documentation

- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- Verifying Unicast RPF Status on page 323

- Configuring Unicast RPF (CLI Procedure) on page 313
- Understanding Unicast RPF on page 300

Understanding Multicast Reverse Path Forwarding

Unicast forwarding decisions are typically based on the destination address of the packet arriving at a router. The unicast routing table is organized by destination subnet and mainly set up to forward the packet toward the destination.

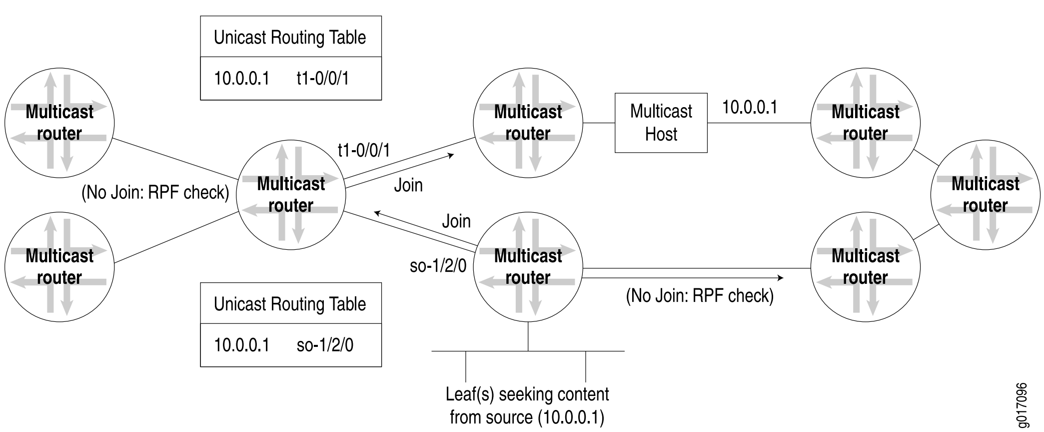
In multicast, the router forwards the packet away from the source to make progress along the distribution tree and prevent routing loops. The router's multicast forwarding state runs more logically by organizing tables based on the reverse path, from the receiver back to the root of the distribution tree. This process is known as *reverse-path forwarding* (*RPF*).

The router adds a branch to a distribution tree depending on whether the request for traffic from a multicast group passes the reverse-path-forwarding check (RPF check). Every multicast packet received must pass an RPF check before it is eligible to be replicated or forwarded on any interface.

The RPF check is essential for every router's multicast implementation. When a multicast packet is received on an interface, the router interprets the source address in the multicast IP packet as the destination address for a unicast IP packet. The source multicast address is found in the unicast routing table, and the outgoing interface is determined. If the outgoing interface found in the unicast routing table is the same as the interface that the multicast packet was received on, the packet passes the RPF check. Multicast packets that fail the RPF check are dropped because the incoming interface is not on the *shortest path* back to the source.

Figure 9 on page 316 shows how multicast routers can use the unicast routing table to perform an RPF check and how the results obtained at each router determine where join messages are sent.

Figure 9: Multicast Routers and the RPF Check



Routers can build and maintain separate tables for RPF purposes. The router must have some way to determine its RPF interface for the group, which is the interface topologically closest to the root. For greatest efficiency, the distribution tree follows the shortest-path tree topology. The RPF check helps to construct this tree.

RPF Table

The RPF table plays the key role in the multicast router. The RPF table is consulted for every RPF check, which is performed at intervals on multicast packets entering the multicast router. Distribution trees of all types rely on the RPF table to form properly, and the multicast forwarding state also depends on the RPF table.

RPF checks are performed only on unicast addresses to find the upstream interface for the multicast source or RP.

The routing table used for RPF checks can be the same routing table used to forward unicast IP packets, or it can be a separate routing table used only for multicast RPF checks. In either case, the RPF table contains only unicast routes, because the RPF check is performed on the source address of the multicast packet, not the multicast group destination address, and a multicast address is forbidden from appearing in the source address field of an IP packet header. The unicast address can be used for RPF checks because there is only one source host for a particular stream of IP multicast content for a multicast group address, although the same content could be available from multiple sources.

If the same routing table used to forward unicast packets is also used for the RPF checks, the routing table is populated and maintained by the traditional unicast routing protocols such as BGP, IS-IS, OSPF, and the Routing Information Protocol (RIP). If a dedicated multicast RPF table is used, this table must be populated by some other method. Some multicast routing protocols (such as the Distance Vector Multicast Routing Protocol [DVMRP]) essentially duplicate the operation of a unicast routing protocol and populate a dedicated RPF table. Others, such as PIM, do not duplicate routing protocol functions and must rely on some other routing protocol to set up this table, which is why PIM is protocol independent. .

Some traditional routing protocols such as BGP and IS-IS now have extensions to differentiate between different sets of routing information sent between routers for unicast and multicast. For example, there is multiprotocol BGP (MBGP) and multitopology routing in IS-IS (M-IS-IS). IS-IS routes can be added to the RPF table even when special features such as traffic engineering and “shortcuts” are turned on. Multicast Open Shortest Path First (MOSPF) also extends OSPF for multicast use, but goes further than MBGP or M-IS-IS and makes MOSPF into a complete multicast routing protocol on its own. When these routing protocols are used, routes can be tagged as multicast RPF routers and used by the receiving router differently than the unicast routing information.

Using the main unicast routing table for RPF checks provides simplicity. A dedicated routing table for RPF checks allows a network administrator to set up separate paths and routing policies for unicast and multicast traffic, allowing the multicast network to function more independently of the unicast network.

Example: Configuring Unicast RPF on an EX Series Switch

Unicast reverse-path forwarding (RPF) helps protect the switch against denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks by verifying the unicast source address of each packet that arrives on an ingress interface where unicast RPF is enabled.

This example shows how to help defend the switch ingress interfaces against denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks by configuring unicast reverse-path forwarding (RPF) on a customer-edge interface to filter incoming traffic:

- Requirements on page 318
- Overview and Topology on page 318
- Configuration on page 319
- Verification on page 319

Requirements

This example uses the following software and hardware components:

- Junos OS Release 10.1 or later for EX Series switches
- Two EX8200 switches

Before you begin, be sure you have:

- Connected the two switches by symmetrically routed interfaces.
- Ensured that the interface on which you will configure unicast RPF is symmetrically routed.

Overview and Topology

Large amounts of unauthorized traffic such as attempts to flood a network with fake (bogus) service requests in a denial-of-service (DoS) attack can consume network resources and deny service to legitimate users. One way to help prevent DoS and distributed denial-of-service (DDoS) attacks is to verify that incoming traffic originates from legitimate network sources.

Unicast RPF helps ensure that a traffic source is legitimate (authorized) by comparing the source address of each packet that arrives on an interface to the forwarding-table entry for its source address. If the switch uses the same interface that the packet arrived on to reply to the packet's source, this verifies that the packet originated from an authorized source, and the switch forwards the packet. If the switch does not use the same interface that the packet arrived on to reply to the packet's source, the packet might have originated from an unauthorized source, and the switch discards the packet.

This example uses two EX8200 switches. On EX3200 and EX4200 switches, you cannot configure individual interfaces for unicast RPF. On EX3200 and EX4200 switches, the switch applies unicast RPF globally to all interfaces on the switch. See "Understanding

Unicast RPF" on page 300 for more information on limitations regarding the configuration of unicast RPF on EX3200 and EX4200 switches.

In this example, an enterprise network's system administrator wants to protect Switch A against potential DoS and DDoS attacks from the Internet. The administrator configures unicast RPF on interface **ge-1/0/10** on Switch A. Packets arriving on interface **ge-1/0/10** on Switch A from the Switch B source also use incoming interface **ge-1/0/10** as the best return path to send packets back to the source.

The topology of this configuration example uses two EX8200 switches, Switch A and Switch B, connected by symmetrically routed interfaces:

- Switch A is on the edge of an enterprise network. The interface **ge-1/0/10** on Switch A connects to the interface **ge-1/0/5** on Switch B.
- Switch B is on the edge of the service provider network that connects the enterprise network to the Internet.

Configuration

To enable unicast RPF, perform these tasks:

CLI Quick Configuration

To quickly configure unicast RPF on Switch A, copy the following command and paste it into the switch terminal window:

```
[edit interfaces]
set ge-1/0/10 unit 0 family inet rpf-check
```

Step-by-Step Procedure

To configure unicast RPF on Switch A:

1. Enable unicast RPF on interface **ge-1/0/10**:

   ```
   [edit interfaces]
   user@switch# set ge-1/0/10 unit 0 family inet rpf-check
   ```

Results

Check the results:

```
[edit interfaces]
user@switch# show
ge-1/0/10 {
   unit 0 {
      family inet {
         rpf-check;
      }
   }
}
```

Verification

To confirm that the configuration is correct, perform these tasks:

- Verifying That Unicast RPF Is Enabled on the Switch on page 320

Verifying That Unicast RPF Is Enabled on the Switch

Purpose Verify that unicast RPF is enabled.

Action Verify that unicast RPF is enabled on interface **ge-1/0/10** by using the **show interfaces ge-1/0/10 extensive** or **show interfaces ge-1/0/10 detail** command.

```
user@switch> show interfaces ge-1/0/10 extensive
Physical interface: ge-1/0/10, Enabled, Physical link is Down
  Interface index: 139, SNMP ifIndex: 58, Generation: 140
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, MAC-REWRITE Error: None,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online
  Device flags   : Present Running
  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: 00:19:e2:50:95:ab, Hardware address: 00:19:e2:50:95:ab
  Last flapped   : Never
  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, 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  : 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
  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: 0, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Incomplete
  Packet Forwarding Engine configuration:
    Destination slot: 1

  Logical interface ge-1/0/10.0 (Index 69) (SNMP ifIndex 59) (Generation 135)
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    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, Generation: 144, Route table: 0
      Flags: uRPF
      Addresses, Flags: Is-Preferred Is-Primary
```

Meaning The second-to-last line of the display shows the unicast RPF flag enabled, confirming that unicast RPF is enabled on interface **ge-1/0/10**.

Related Documentation

- Configuring Unicast RPF (CLI Procedure) on page 313
- Disabling Unicast RPF (CLI Procedure) on page 315

Verifying Unicast RPF Status

Purpose Verify that unicast reverse-path forwarding (RPF) is enabled and is working on the interface.

Action Use one of the **show interfaces *interface-name*** commands with either the **extensive** or **detail** options to verify that unicast RPF is enabled and working on the switch. The example below displays output from the **show interfaces ge- extensive** command.

```
user@switch> show interfaces ge1/0/10 extensive
Physical interface: ge-1/0/10, Enabled, Physical link is Down
  Interface index: 139, SNMP ifIndex: 58, Generation: 140
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, MAC-REWRITE Error: None,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online
  Device flags   : Present Running
  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: 00:19:e2:50:95:ab, Hardware address: 00:19:e2:50:95:ab
  Last flapped   : Never
  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, 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  : 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
  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: 0, CAM source filters: 0
  Autonegotiation information:
    Negotiation status: Incomplete
  Packet Forwarding Engine configuration:
    Destination slot: 1

  Logical interface ge-1/0/10.0 (Index 69) (SNMP ifIndex 59) (Generation 135)
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    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, Generation: 144, Route table: 0
      Flags: uRPF
      Addresses, Flags: Is-Preferred Is-Primary
```

Meaning The **show interfaces ge-1/0/10 extensive** command (and the **show interfaces ge-1/0/10 detail** command) displays in-depth information about the interface. The **Flags:** output field near the bottom of the display reports the unicast RPF status. If unicast RPF has not been enabled, the **uRPF** flag is not displayed.

On EX3200 and EX4200 switches, unicast RPF is implicitly enabled on *all* switch interfaces, including aggregated Ethernet interfaces (also referred to as link aggregation groups or LAGs) and routed VLAN interfaces (RVIs) when you enable unicast RPF on a single interface. However, the unicast RPF status is shown as enabled only on interfaces for which you have explicitly configured unicast RPF. Thus, the **uRPF** flag is not displayed on interfaces for which you have not explicitly configured unicast RPF even though unicast RPF is implicitly enabled on all interfaces on EX3200 and EX4200 switches.

Related Documentation

- **show interfaces xe on page 1048**
- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- *Configuring Unicast RPF on ACX Series Routers*
- Configuring Unicast RPF (CLI Procedure) on page 313
- Disabling Unicast RPF (CLI Procedure) on page 315
- Troubleshooting Unicast RPF on page 397

CHAPTER 14

IP Directed and Targeted Broadcast

- Understanding Targeted Broadcast on page 327
- Configuring Targeted Broadcast on page 328
- Understanding IP Directed Broadcast on page 331
- Configuring IP Directed Broadcast for Switches on page 332
- Example: Configuring IP Directed Broadcast on a Switch on page 334
- Example: Configuring IP Directed Broadcast on QFX Series Switch on page 337
- Verifying IP Directed Broadcast Status on page 341

Understanding Targeted Broadcast

Targeted broadcast is a process of flooding a target subnet with Layer 3 broadcast IP packets originating from a different subnet. The intent of targeted broadcast is to flood the target subnet with the broadcast packets on a LAN interface without broadcasting to the entire network. Targeted broadcast is configured with various options on the egress interface of the router or switch and the IP packets are broadcast only on the LAN (egress) interface. Targeted broadcast helps you implement remote administration tasks such as backups and wake-on LAN (WOL) on a LAN interface, and supports virtual routing and forwarding (VRF) instances.

Regular Layer 3 broadcast IP packets originating from a subnet are broadcast within the same subnet. When these IP packets reach a different subnet, they are forwarded to the Routing Engine (to be forwarded to other applications). Because of this, remote administration tasks such as backups cannot be performed on a particular subnet through another subnet. As a workaround you can enable targeted broadcast, to forward broadcast packets that originate from a different subnet.

Layer 3 broadcast IP packets have a destination IP address that is a valid broadcast address for the target subnet. These IP packets traverse the network in the same way as unicast IP packets until they reach the destination subnet. In the destination subnet, if the receiving router has targeted broadcast enabled on the egress interface, the IP packets are forwarded to an egress interface and the Routing Engine or to an egress interface only. The IP packets are then translated into broadcast IP packets which flood the target subnet only through the LAN interface (if there is no LAN interface, the packets are discarded), and all hosts on the target subnet receive the IP packets. If targeted broadcast is not enabled on the receiving router, the IP packets are treated as regular

Layer 3 broadcast IP packets and are forwarded to the Routing Engine. If targeted broadcast is enabled without any options, the IP packets are forwarded to the Routing Engine.

Targeted broadcast can be configured to forward the IP packets only to an egress interface, which is helpful when the router is flooded with packets to process, or to both an egress interface and the Routing Engine.

NOTE: Targeted broadcast does not work when the targeted broadcast option **forward-and-send-to-re** and the traffic sampling option **sampling** are configured on the same egress interface of an M320 router, a T640 router, or an MX960 router. To overcome this scenario, you must either disable one of the these options or enable the **sampling** option with the targeted broadcast option **forward-only** on the egress interface. For information about traffic sampling, see *Configuring Traffic Sampling*.

NOTE: Any firewall filter that is configured on the Routing Engine loopback interface (lo0) cannot be applied to IP packets that are forwarded to the Routing Engine as a result of a targeted broadcast. This is because broadcast packets are forwarded as flood next hop and not as local next hop traffic, and you can only apply a firewall filter to local next hop routes for traffic directed towards the Routing Engine.

Related Documentation

- Configuring Targeted Broadcast on page 328
- **targeted-broadcast on page 648**

Configuring Targeted Broadcast

The following sections explain how to configure targeted broadcast on an egress interface and its options:

- Configuring Targeted Broadcast and Its Options on page 328
- Display Targeted Broadcast Configuration Options on page 329

Configuring Targeted Broadcast and Its Options

You can configure targeted broadcast on an egress interface with different options. You can either allow the IP packets destined for a Layer 3 broadcast address to be forwarded on the egress interface and to send a copy of the IP packets to the Routing Engine or you can allow the IP packets to be forwarded on the egress interface only. Note that the packets are broadcast only if the egress interface is a LAN interface.

To configure targeted broadcast and its options:

1. Configure the physical interface.

[edit]
user@host# **set interfaces** *interface-name*

2. Configure the logical unit number at the **[edit interfaces** ***interface-name*** hierarchy level.

   [edit interfaces *interface-name*]
   user@host# **set unit** *logical-unit-number*

3. Configure the protocol family as inet at the **[edit interfaces** ***interface-name*** **unit** ***interface-unit-number*** hierarchy level.

   [edit interfaces *interface-name* unit *interface--unit-number*]
   user@host# **set family inet**

4. Configure targeted broadcast at the **[edit interfaces** ***interface-name*** **unit** ***interface-unit-number*** **family inet** hierarchy level

   [edit interfaces *interface-name* unit *interface--unit-number* family inet]
   user@host# **set targeted-broadcast**

5. Specify one of the following options as per requirement:

   - To allow IP packets destined for a Layer 3 broadcast address to be forwarded on the egress interface and to send a copy of the IP packets to the Routing Engine.

     [edit interfaces *interface-name* unit *interface-unit-number* family inet
       targeted-broadcast]
     user@host# **set forward-and-send-to-re**

   - To allow IP packets to be forwarded on the egress interface only.

     [edit interfaces *interface-name* unit *interface-unit-number* family inet
       targeted-broadcast]
     user@host# **set forward-only**

NOTE: Targeted broadcast does not work when the targeted broadcast option **forward-and-send-to-re** and the traffic sampling option **sampling** are configured on the same egress interface of an M320 router, a T640 router, or an MX960 router. To overcome this scenario, you must either disable one of the these options or enable the **sampling** option with the targeted broadcast option **forward-only** on the egress interface. For information about traffic sampling, see *Configuring Traffic Sampling*.

Display Targeted Broadcast Configuration Options

The following topics display targeted broadcast configuration with its various options:

- Forward IP Packets On the Egress Interface and To the Routing Engine on page 330
- Forward IP Packets On the Egress Interface Only on page 330

Forward IP Packets On the Egress Interface and To the Routing Engine

Purpose Display the configuration when targeted broadcast is configured on the egress interface to forward the IP packets on the egress interface and to send a copy of the IP packets to the Routing Engine.

Action To display the configuration run the **show** command at the **[edit interfaces *interface-name* unit *interface-unit-number* family inet]** where the interface name is ge-2/0/0, the unit value is set to 0, the protocol family is set to inet.

```
[edit interfaces interface-name unit interface-unit-number family inet]
user@host#show
targeted-broadcast {
  forward-and-send-to-re;
}
```

Forward IP Packets On the Egress Interface Only

Purpose Display the configuration when targeted broadcast is configured on the egress interface to forward the IP packets on the egress interface only.

Action To display the configuration run the **show** command at the **[edit interfaces *interface-name* unit *interface-unit-number* family inet]** where the interface name is ge-2/0/0, the unit value is set to 0, the protocol family is set to inet.

```
[edit interfaces interface-name unit interface-unit-number family inet]
user@host#show
targeted-broadcast {
  forward-only;
}
```

Related Documentation

- **targeted-broadcast on page 648**
- Understanding Targeted Broadcast on page 327

Understanding IP Directed Broadcast

IP directed broadcast helps you implement remote administration tasks such as backups and wake-on-LAN (WOL) application tasks by sending broadcast packets targeted at the hosts in a specified destination subnet. IP directed broadcast packets traverse the network in the same way as unicast IP packets until they reach the destination subnet. When they reach the destination subnet and IP directed broadcast is enabled on the receiving switch, the switch translates (*explodes*) the IP directed broadcast packet into a broadcast that floods the packet on the target subnet. All hosts on the target subnet receive the IP directed broadcast packet.

This topic covers:

- IP Directed Broadcast Overview on page 331
- IP Directed Broadcast Implementation on page 331
- When to Enable IP Directed Broadcast on page 332
- When Not to Enable IP Directed Broadcast on page 332

IP Directed Broadcast Overview

IP directed broadcast packets have a destination IP address that is a valid broadcast address for the subnet that is the target of the directed broadcast (the target subnet). The intent of an IP directed broadcast is to flood the target subnet with the broadcast packets without broadcasting to the entire network. IP directed broadcast packets cannot originate from the target subnet.

When you send an IP directed broadcast packet, as it travels to the target subnet, the network forwards it in the same way as it forwards a unicast packet. When the packet reaches a switch that is directly connected to the target subnet, the switch checks to see whether IP directed broadcast is enabled on the interface that is directly connected to the target subnet:

- If IP directed broadcast is enabled on that interface, the switch broadcasts the packet on that subnet by rewriting the destination IP address as the configured broadcast IP address for the subnet. The switch converts the packet to a link-layer broadcast packet that every host on the network processes.
- If IP directed broadcast is disabled on the interface that is directly connected to the target subnet, the switch drops the packet.

IP Directed Broadcast Implementation

You configure IP directed broadcast on a per-subnet basis by enabling IP directed broadcast on the Layer 3 interface of the subnet's VLAN. When the switch that is connected to that subnet receives a packet that has the subnet's broadcast IP address as the destination address, the switch broadcasts the packet to all hosts on the subnet.

By default, IP directed broadcast is disabled.

When to Enable IP Directed Broadcast

IP directed broadcast is disabled by default. Enable IP directed broadcast when you want to perform remote management or administration services such as backups or WOL tasks on hosts in a subnet that does not have a direct connection to the Internet.

Enabling IP directed broadcast on a subnet affects only the hosts within that subnet. Only packets received on the subnet's Layer 3 interface that have the subnet's broadcast IP address as the destination address are flooded on the subnet.

When Not to Enable IP Directed Broadcast

Typically, you do not enable IP directed broadcast on subnets that have direct connections to the Internet. Disabling IP directed broadcast on a subnet's Layer 3 interface affects only that subnet. If you disable IP directed broadcast on a subnet and a packet that has the broadcast IP address of that subnet arrives at the switch, the switch drops the broadcast packet.

If a subnet has a direct connection to the Internet, enabling IP directed broadcast on it increases the network's susceptibility to denial-of-service (DoS) attacks.

For example, a malicious attacker can spoof a source IP address (use a source IP address that is not the actual source of the transmission to deceive a network into identifying the attacker as a legitimate source) and send IP directed broadcasts containing Internet Control Message Protocol (ICMP) echo (ping) packets. When the hosts on the network with IP directed broadcast enabled receive the ICMP echo packets, they all send replies to the victim that has the spoofed source IP address. This creates a flood of ping replies in a DoS attack that can overwhelm the spoofed source address; this is known as a *smurf* attack. Another common DoS attack on exposed networks with IP directed broadcast enabled is a *fraggle* attack, which is similar to a smurf attack except that the malicious packet is a User Datagram Protocol (UDP) echo packet instead of an ICMP echo packet.

Related Documentation

- Example: Configuring IP Directed Broadcast on a Switch on page 334
- Configuring IP Directed Broadcast for Switches on page 332
- Example: Configuring IP Directed Broadcast on QFX Series Switch on page 337

Configuring IP Directed Broadcast for Switches

NOTE: This task uses Junos OS for EX Series switches that does not support the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that supports ELS, see "Configuring IP Directed Broadcast for Switches" on page 332. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

You can use IP directed broadcast on an EX Series switch to facilitate remote network management by sending broadcast packets to hosts on a specified subnet without broadcasting to the entire network. IP directed broadcast packets are broadcast on only the target subnet. The rest of the network treats IP directed broadcast packets as unicast packets and forwards them accordingly.

Before you begin to configure IP directed broadcast:

- Ensure that the subnet on which you want broadcast packets using IP direct broadcast is not directly connected to the Internet.
- Configure a routed VLAN interface (RVI) for the subnet that will be enabled for IP direct broadcast. For EX Series, see *Configuring Routed VLAN Interfaces on Switches (CLI Procedure)*. For QFX Series, see*Configuring Integrated Routing and Bridging Interfaces on Switches (CLI Procedure)* or *Configuring VLANs on Switches with Enhanced Layer 2 Support*.

NOTE: **We recommend that you do not enable IP directed broadcast on subnets that have a direct connection to the Internet because of increased exposure to denial-of-service (DoS) attacks.**

To enable IP directed broadcast for a specified subnet:

NOTE: **In a mixed Virtual Chassis, when you configure targeted broadcast, you can only configure one interface. Otherwise, targeted broadcast will not work.**

1. Add the target subnet's logical interfaces to the VLAN:

```
[edit interfaces]
user@switch# set ge-0/0/0.0 family ethernet-switching vlan members v1
user@switch# set ge-0/0/1.0 family ethernet-switching vlan members v1
```

2. Configure the Layer 3 interface on the VLAN that is the target of the IP directed broadcast packets:

```
[edit interfaces]
user@switch# set vlan.1 family inet address 10.1.2.1/24
```

3. Associate a Layer 3 interface with the VLAN:

```
[edit vlans]
user@switch# set v1 l3-interface vlan.1
```

4. Enable the Layer 3 interface for the VLAN to receive IP directed broadcasts:

```
[edit interfaces]
user@switch# set vlan.1 family inet targeted-broadcast
```

Related Documentation

- Example: Configuring IP Directed Broadcast on a Switch on page 334

• Understanding IP Directed Broadcast on page 331

Example: Configuring IP Directed Broadcast on a Switch

IP directed broadcast provides a method of sending broadcast packets to hosts on a specified subnet without broadcasting those packets to hosts on the entire network.

This example shows how to enable a subnet to receive IP directed broadcast packets so you can perform backups and other network management tasks remotely:

• Requirements on page 334
• Overview and Topology on page 334
• Configuration on page 335

Requirements

This example uses the following software and hardware components:

- Junos OS Release 9.4 or later for EX Series switches or Junos OS Release 15.1X53-D10 for QFX10000 switches.
- One PC
- One EX Series switch or QFX10000 switch

Before you configure IP directed broadcast for a subnet:

- Ensure that the subnet does not have a direct connection to the Internet.
- Configure routed VLAN interfaces (RVIs) for the ingress and egress VLANs on the switch. See *Configuring Routed VLAN Interfaces on Switches (CLI Procedure)* or *Configuring VLANs for EX Series Switches (J-Web Procedure)*.

Overview and Topology

You might want to perform remote administration tasks such as backups and wake-on-LAN (WOL) application tasks to manage groups of clients on a subnet. One way to do this is to send IP directed broadcast packets targeted at the hosts in a particular target subnet.

The network forwards IP directed broadcast packets as if they were unicast packets. When the IP directed broadcast packet is received by a VLAN that is enabled for **targeted-broadcast**, the switch broadcasts the packet to all the hosts in its subnet.

In this topology (see Figure 10 on page 335), a host is connected to an interface on a switch to manage the clients in subnet **10.1.2.1/24**. When the switch receives a packet with the broadcast IP address of the target subnet as its destination address, it forwards the packet to the subnet's Layer 3 interface and broadcasts it to all the hosts within the subnet.

Figure 10: Topology for IP Directed Broadcast

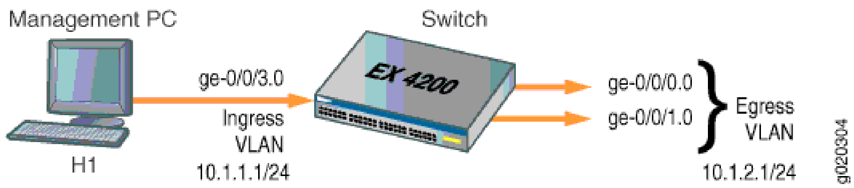


Table 38 on page 335 shows the settings of the components in this example.

Table 38: Components of the IP Directed Broadcast Topology

Property	Settings
Ingress VLAN name	v0
Ingress VLAN IP address	10.1.1.1/24
Egress VLAN name	v1
Egress VLAN IP address	10.1.2.1/24
Interfaces in VLAN **v0**	**ge-0/0/3.0**
Interfaces in VLAN **v1**	**ge-0/0/0.0** and **ge-0/0/1.0**

Configuration

To configure IP directed broadcast on a subnet to enable remote management of its hosts:

CLI Quick Configuration

To quickly configure the switch to accept IP directed broadcasts targeted at subnet **10.1.2.1/24**, copy the following commands and paste them into the switch's terminal window:

```
[edit]
set interfaces ge-0/0/0.0 family ethernet-switching vlan members v1
set interfaces ge-0/0/1.0 family ethernet-switching vlan members v1
set interfaces vlan.1 family inet address 10.1.2.1/24
set interfaces ge-0/0/3.0 family ethernet-switching vlan members v0
set interfaces vlan.0 family inet address 10.1.1.1/24
set vlans v1 l3-interface vlan.1
set vlans v0 l3-interface vlan.0
set interfaces vlan.1 family inet targeted-broadcast
```

Step-by-Step Procedure

To configure the switch to accept IP directed broadcasts targeted at subnet **10.1.2.1/24**:

1. Add logical interface **ge-0/0/0.0** to VLAN **v1**:

```
[edit interfaces]
user@switch# set ge-0/0/0.0 family ethernet-switching vlan members v1
```

2. Add logical interface **ge-0/0/1.0** to VLAN **v1**:

```
[edit interfaces]
user@switch# set ge-0/0/1.0 family ethernet-switching vlan members v1
```

3. Configure the IP address for the egress VLAN, **v1**:

```
[edit interfaces]
user@switch# set vlan.1 family inet address 10.1.2.1/24
```

4. Add logical interface **ge-0/0/3.0** to VLAN **v0**:

```
[edit interfaces]
user@switch# set ge-0/0/3.0 family ethernet-switching vlan members v0
```

5. Configure the IP address for the ingress VLAN:

```
[edit interfaces]
user@switch# set vlan.0 family inet address 10.1.1.1/24
```

6. To route traffic between the ingress and egress VLANs, associate a Layer 3 interface with each VLAN:

```
[edit vlans]
user@switch# set v1 l3-interface vlan.1
user@switch# set v0 l3–interface vlan.0
```

7. Enable the Layer 3 interface for the egress VLAN to receive IP directed broadcasts:

```
[edit interfaces]
user@switch# set vlan.1 family inet targeted-broadcast
```

Results Check the results:

```
user@switch# show
interfaces {
  ge-0/0/0 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members v1;
        }
      }
    }
  }
  ge-0/0/1 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members v1;
        }
      }
    }
  }
  ge-0/0/3 {
    unit 0 {
```



```
            family ethernet-switching {
                vlan {
                    members v0;
                }
            }
        }
    }
    vlan {
        unit 0 {
            family inet {
                targeted-broadcast;
                address 10.1.1.1/24;
            }
        }
        unit 1 {
            family inet {
                targeted-broadcast;
                address 10.1.2.1/24;
            }
        }
    }
vlans {
    default;
    v0 {
        l3-interface vlan.0;
    }
    v1 {
        l3-interface vlan.1;
    }
}
```

Related Documentation

• Configuring IP Directed Broadcast for Switches on page 332

Example: Configuring IP Directed Broadcast on QFX Series Switch

IP directed broadcast provides a method of sending broadcast packets to hosts on a specified subnet without broadcasting those packets to hosts on the entire network.

This example shows how to enable a subnet to receive IP directed broadcast packets so you can perform backups and other network management tasks remotely:

- Requirements on page 337
- Overview and Topology on page 338
- Configuration on page 338

Requirements

This example uses the following software and hardware components:

- Junos OS Release 15.1 or later for QFX Series switches
- One PC

- One QFX Series switch

Before you configure IP directed broadcast for a subnet:

- Ensure that the subnet does not have a direct connection to the Internet.
- Configure routed VLAN interfaces (RVIs) for the ingress and egress VLANs on the switch. See *Configuring VLANs on Switches with Enhanced Layer 2 Support*.

Overview and Topology

You might want to perform remote administration tasks such as backups and wake-on-LAN (WOL) application tasks to manage groups of clients on a subnet. One way to do this is to send IP directed broadcast packets targeted at the hosts in a particular target subnet.

The network forwards IP directed broadcast packets as if they were unicast packets. When the IP directed broadcast packet is received by a VLAN that is enabled for **targeted-broadcast**, the switch broadcasts the packet to all the hosts in its subnet.

In this topology, a host is connected to an interface on an EX Series switch to manage the clients in subnet **10.1.2.1/8**. When the switch receives a packet with the broadcast IP address of the target subnet as its destination address, it forwards the packet to the subnet's Layer 3 interface and broadcasts it to all the hosts within the subnet.

Table 38 on page 335 shows the settings of the components in this example.

Table 39: Components of the IP Directed Broadcast Topology

Property	Settings
Switch hardware	QFX Series switch
Ingress VLAN name	**v0**
Ingress VLAN IP address	**10.1.1.1/8**
Egress VLAN name	**v1**
Egress VLAN IP address	**10.1.2.1/8**
Interfaces in VLAN **v0**	**ge-0/0/3.0**
Interfaces in VLAN **v1**	**ge-0/0/0.0** and **ge-0/0/1.0**

Configuration

To configure IP directed broadcast on a subnet to enable remote management of its hosts:

CLI Quick Configuration

To quickly configure the switch to accept IP directed broadcasts targeted at subnet **10.1.2.1/8**, copy the following commands and paste them into the switch's terminal window:

```
[edit]
set interfaces ge-0/0/0.0 family ethernet-switching vlan members v1
set interfaces ge-0/0/1.0 family ethernet-switching vlan members v1
set interfaces vlan.1 family inet address 10.1.2.1/8
set interfaces ge-0/0/3.0 family ethernet-switching vlan members v0
set interfaces vlan.0 family inet address 10.1.1.1/8
set vlans v1 l3-interface vlan.1
set vlans v0 l3-interface vlan.0
set interfaces vlan.1 family inet targeted-broadcast
```

Step-by-Step Procedure

To configure the switch to accept IP directed broadcasts targeted at subnet **10.1.2.1/8**:

1. Add logical interface **ge-0/0/0.0** to VLAN **v1**:

   ```
   [edit interfaces]
   user@switch# set ge-0/0/0.0 family ethernet-switching vlan members v1
   ```

2. Add logical interface **ge-0/0/1.0** to VLAN **v1**:

   ```
   [edit interfaces]
   user@switch# set ge-0/0/1.0 family ethernet-switching vlan members v1
   ```

3. Configure the IP address for the egress VLAN, **v1**:

   ```
   [edit interfaces]
   user@switch# set vlan.1 family inet address 10.1.2.1/8
   ```

4. Add logical interface **ge-0/0/3.0** to VLAN **v0**:

   ```
   [edit interfaces]
   user@switch# set ge-0/0/3.0 family ethernet-switching vlan members v0
   ```

5. Configure the IP address for the ingress VLAN:

   ```
   [edit interfaces]
   user@switch# set vlan.0 family inet address 10.1.1.1/8
   ```

6. To route traffic between the ingress and egress VLANs, associate a Layer 3 interface with each VLAN:

   ```
   [edit vlans]
   user@switch# set v1 l3-interfacevlan.1
   user@switch# set v0 l3–interface vlan.0
   ```

7. Enable the Layer 3 interface for the egress VLAN to receive IP directed broadcasts:

   ```
   [edit interfaces]
   user@switch# set vlan.1 family inet targeted-broadcast
   ```

Results Check the results:

```
user@switch# show
interfaces {
  ge-0/0/0 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members v1;
        }
      }
    }
  }
  ge-0/0/1 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members v1;
        }
      }
    }
  }
  ge-0/0/3 {
    unit 0 {
      family ethernet-switching {
        vlan {
          members v0;
        }
      }
    }
  }
  vlan {
    unit 0 {
      family inet {
        targeted-broadcast;
        address 10.1.1.1/8;
      }
    }
    unit 1 {
      family inet {
        targeted-broadcast;
        address 10.1.2.1/8;
      }
    }
  }
vlans {
  default;
  v0 {
    l3-interface vlan.0;
  }
  v1 {
    l3-interface vlan.1;
  }
}
```

Related Documentation

- Configuring IP Directed Broadcast for Switches on page 332

Verifying IP Directed Broadcast Status

Purpose Verify that IP directed broadcast is enabled and is working on the subnet.

Action Use the **show vlans extensive** command to verify that IP directed broadcast is enabled and working on the subnet as shown in "Example: Configuring IP Directed Broadcast on a Switch" on page 334.

Related Documentation

- Configuring IP Directed Broadcast for Switches on page 332
- Configuring IP Directed Broadcast for Switches on page 332
- Example: Configuring IP Directed Broadcast on a Switch on page 334

CHAPTER 15

ARP

- Configuring Gratuitous ARP on page 343
- Configuring Static ARP Table Entries For Mapping IP Addresses to MAC Addresses on page 345
- Configuring Restricted and Unrestricted Proxy ARP on page 346

Configuring Gratuitous ARP

Gratuitous Address Resolution Protocol (ARP) requests help detect duplicate IP addresses. A gratuitous ARP is a broadcast request for a router's own IP address. If a router or switch sends an ARP request for its own IP address and no ARP replies are received, the router- or switch-assigned IP address is not being used by other nodes. However, if a router or switch sends an ARP request for its own IP address and an ARP reply is received, the router- or switch-assigned IP address is already being used by another node.

Gratuitous ARP replies are reply packets sent to the broadcast MAC address with the target IP address set to be the same as the sender's IP address. When the router or switch receives a gratuitous ARP reply, the router or switch can insert an entry for that reply in the ARP cache. By default, updating the ARP cache on gratuitous ARP replies is disabled on the router or switch.

To enable updating of the ARP cache for gratuitous ARPs:

1. In configuration mode, go to the **[edit interfaces interface-name]** hierarchy level.

   [edit]
   user@host# edit interfaces *interface-name*

2. Include the **gratuitous-arp-reply** statement.

   [edit interfaces *interface-name*]
   user@host# set gratuitous-arp-reply

To restore the default behavior, that is, to disable updating of the ARP cache for gratuitous ARP, delete the **gratuitous-arp-reply** statement from the configuration:

[edit interfaces *interface-name*]
user@host# delete gratuitous-arp-reply;

By default, the router or switch responds to gratuitous ARP requests. However, on Ethernet interfaces, you can disable responses to gratuitous ARP requests.

To disable responses to gratuitous ARP requests:

1. In configuration mode, go to the **[edit interfaces interface-name]** hierarchy level.

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Include the **no-gratuitous-arp-request** statement.

   ```
   [edit interfaces interface-name]
   user@host# set no-gratuitous-arp-request
   ```

To return to the default—that is, to respond to gratuitous ARP requests—delete the **no-gratuitous-arp-request** statement from the configuration:

```
[edit interfaces interface-name]
user@host# delete no-gratuitous-arp-request
```

Related Documentation

- *gratuitous-arp-reply*
- *no-gratuitous-arp-request*
- *Ethernet Interfaces Overview*
- Interfaces Overview for Switches on page 4
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Static ARP Table Entries For Mapping IP Addresses to MAC Addresses

By default, the device responds to an Address Resolution Protocol (ARP) request only if the destination address of the ARP request is on the local network of the incoming interface. For Fast Ethernet or Gigabit Ethernet interfaces, you can configure static ARP entries that associate the IP addresses of nodes on the same Ethernet subnet with their media access control (MAC) addresses. These static ARP entries enable the device to respond to ARP requests even if the destination address of the ARP request is not local to the incoming Ethernet interface.

Also, unlike dynamically learned ARP entries, static ARP entries do not age out. You can also configure static ARP entries in a troubleshooting situation or if your device is unable to learn a MAC address dynamically.

NOTE: By default, an ARP policer is installed that is shared among all the Ethernet interfaces on which you have configured the **family inet** statement. By including the **arp** statement at the **[edit interfaces *interface-name* unit *logical-unit-number* family inet policer]** hierarchy level, you can apply a specific ARP-packet policer to an interface. This feature is not available on EX Series switches.

To configure static ARP entries:

1. In the configuration mode, at the [**edit**] hierarchy level, configure the router interface on which the ARP table entries for the router is configured.

   ```
   [edit]
   user@host# edit interfaces interface-name
   ```

2. Configure the protocol family, the logical unit of the interface, and the interface address of the router interface at the [**edit interfaces *interface-name***] hierarchy level. While configuring the protocol family, specify **inet** as the protocol family.

   NOTE: When you need to conserve IP addresses, you can configure an Ethernet interface to be unnumbered by including the **unnumbered-address** statement at the **[edit interfaces *interface-name* unit *logical-unit-number* family inet]** hierarchy level.

   ```
   [edit interfaces interface-name]
   user@host# edit unit logical-unit-number family inet address interface-address
   ```

3. Configure a static ARP entry by specifying the IP address and the MAC address that are to be mapped to each other. The IP address specified must be part of the subnet defined in the enclosing **address** statement. The MAC address must be specified as hexadecimal bytes in the following formats: ***nnnn.nnnn.nnnn*** or ***nn:nn:nn:nn:nn:nn*** format. For instance, you can use either **0011.2233.4455** or **00:11:22:33:44:55**.

[edit interfaces *interface-name* unit *logical-unit-number* family inet address
interface-address
user@host# set arp *ip-address* mac *mac-address*

4. Configure another static ARP entry by specifying the IP address and the MAC address that are to be mapped to each other. You can also associate a multicast MAC address with a unicast IP address by including the **multicast-mac** option with the **arp** statement. You can optionally configure the router to respond to ARP requests for the specified IP address by using the **publish** option with the **arp** statement.

NOTE: For unicast MAC addresses only, if you include the **publish** option, the router or switch replies to proxy ARP requests.

[edit interfaces *interface-name* unit *logical-unit-number* family inet address
interface-address
user@host# set arp *ip-address* multicast-mac *mac-address* publish

NOTE: The Junos OS supports the IPv6 static neighbor discovery cache entries, similar to the static ARP entries in IPv4.

Related Documentation

- arp on page 656
- *Static ARP Table Entries Overview*
- *Management Ethernet Interface Overview*
- Interfaces Overview for Switches on page 4
- *Applying Policers*
- *Configuring an Unnumbered Interface*
- *Ethernet Interfaces Feature Guide for Routing Devices*

Configuring Restricted and Unrestricted Proxy ARP

To configure restricted or unrestricted proxy ARP, include the **proxy-arp** statement:

proxy-arp (restricted |unrestricted);

You can include this statement at the following hierarchy levels:

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

To return to the default—that is, to disable restricted or unrestricted proxy ARP—delete the **proxy-arp** statement from the configuration:


```
[edit]
user@host# delete interfaces interface-name unit logical-unit-number proxy-arp
```

You can track the number of restricted or unrestricted proxy ARP requests processed by the router or switch by issuing the **show system statistics arp** operational mode command.

NOTE: When proxy ARP is enabled as default or unrestricted, the router or switch responds to any ARP request as long as the device has an active route to the target address of the ARP request. This gratuitous ARP behavior can result in an error when the receiving interface and target response interface are the same and the end device (for example, a client) performs a duplicate address check. To prevent this error, configure the router or switch interface with the **no-gratuitous-arp-reply** statement. See "Configuring Gratuitous ARP" on page 343 for information about how to disable responses to gratuitous ARP requests.

Related Documentation

- proxy-arp on page 660
- *Restricted and Unrestricted Proxy ARP Overview*
- Configuring Gratuitous ARP on page 343
- *Ethernet Interfaces Feature Guide for Routing Devices*

CHAPTER 16

Resilient Hashing

- Understanding the Use of Resilient Hashing to Minimize Flow Remapping in Trunk/ECMP Groups on page 349
- Configuring Resilient Hashing for Trunk/ECMP Groups on page 351
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 362

Understanding the Use of Resilient Hashing to Minimize Flow Remapping in Trunk/ECMP Groups

You use resilient hashing to minimize flow remapping across members of a trunk/ECMP group in a load-balanced system. You can configure resilient hashing in link aggregation groups (LAGs) and in equal cost multipath (ECMP) groups.

- Why You Might Want to Use Resilient Hashing and How It Works with Static Hashing on page 349
- Limitations and Caveats for Resilient Hashing on page 350
- Resilient Hashing on LAGs on page 351
- Resilient Hashing on ECMP on page 351

Why You Might Want to Use Resilient Hashing and How It Works with Static Hashing

Resilient hashing works in conjunction with the default static hashing algorithm. When members are added to or deleted from a trunk/ECMP group, the static hashing algorithm might remap destination paths. Resilient hashing distributes traffic across all members of a group by tracking the flow's member utilization. When a flow is affected by a member change, the Packet Forwarding Engine rebalances the flow by reprogramming the flow set table.

Resilient hashing thus provides the following benefits:

- Minimizes traffic-distribution imbalances among members of a trunk/ECMP group when members are added to or deleted from the group.

- Minimizes the impact on flows bound to unaffected members when a new member is added or an existing member is deleted from the group.

In normal hash-based load balancing, with the static hashing algorithm used alone, flows are assigned to members through the mathematical mod (%) operation. Any increase or decrease in the number of group members results in a complete remapping of flows to member IDs, as shown in the following example:

- Member ID = Hash (key) mod (number of members in group)
- Example:
  - Hash (key) = 10
  - 10 mod 5 = 0 (member with ID 0 is selected for flow)
  - 10 mod 4 = 2 (member with ID 2 is selected for the same flow when the number of members is decreased by 1)

Resilient hashing minimizes the destination path remapping when a member in the trunk/ECMP group is added or deleted.

When the flow is affected by a member change in the group, resilient hashing rebalances the flow by reprogramming the flow set table.

Table 40: Destination Path Results for Static Hashing and for Resilient Hashing When Members Are Added to or Deleted from Trunk Groups

Trunk Group Size	Normal (Static) Hashing Result	Resilient Hashing Result	Notes
4	Hash(10) % 4 = 2 Flow is assigned to member ID 2.	Flow is assigned to one of four group members based on flow set table entries.	Original trunk/ECMP group size is 4.
3	Hash(10) % 3 = 1 Flow is assigned to member ID 1.	Flow is assigned to same member as in the previous case.	Delete one member from original trunk/ECMP group. Trunk/ECMP group size is 3.
5	Hash(10) % 5 = 0 Flow is assigned to member ID 0.	There is minimal redistribution of flows from other members to this newly added member.	Add one member to original trunk group. Trunk/ECMP group size is 5.

Limitations and Caveats for Resilient Hashing

Notice the following limitation and caveats for the resilient hashing feature:

- Resilient hashing applies only to unicast traffic.
- Resilient hashing supports a maximum of 1024 trunk groups, with each group having a maximum of 256 members.
- Resilient hashing does not guarantee that traffic distribution is even across all group members—it depends on the traffic pattern and on the organization of the resilient

hashing flow set table in hardware. Resilient hashing *minimizes* remapping of flows to destination links when members are added to or deleted from the group.

- If resilient hashing is enabled on a trunk group or ECMP group and if **set forwarding-options enhanced-hash-key** with one of the options **hash-mode**, **inet**, **inet6**, or **layer2** is used, some flows might change destination links, because the new hash parameters might generate new hash indexes for the flows, and hence the new destination links.
- Resilient hashing is not supported on Virtual Chassis port (VCP) links.
- LAG-based resilient hashing is not supported on QFX5200 and QFX5210 switches. ECMP-based resilient hashing is supported on those switches.

Resilient Hashing on LAGs

A LAG combines Ethernet interfaces (members) to form a logical point-to-point link that increases bandwidth, provides reliability, and allows load balancing. Resilient hashing minimizes destination remapping behavior when a new member is added or deleted from the LAG.

A resilient hashing configuration on LAGs is per-aggregated-Ethernet-interface–based.

Resilient Hashing on ECMP

An ECMP group for a route contains multiple next-hop equal cost addresses for the same destination in the routing table. (Routes of equal cost have the same preference and metric values.)

Junos OS uses the static hashing algorithm to choose one of the next-hop addresses in the ECMP group to install in the forwarding table. Resilient hashing enhances ECMPs by minimizing destination remapping behavior when a new member is added or deleted from the ECMP group.

A resilient hashing configuration on ECMP is global—it applies to all ECMP groups.

Related Documentation

- Configuring Resilient Hashing for Trunk/ECMP Groups on page 351

Configuring Resilient Hashing for Trunk/ECMP Groups

You use resilient hashing to minimize flow remapping across members of a trunk/ECMP group in a load-balanced system. You can configure resilient hashing in link aggregation groups (LAGs) and in equal cost multipath (ECMP) sets.

This topic includes:

1. Configuring Resilient Hashing on LAGs on page 352
2. Configuring Resilient Hashing on ECMP Groups on page 352

Configuring Resilient Hashing on LAGs

NOTE: LAG-based resilient hashing is not supported on QFX5200 and QFX5210 switches. ECMP-based resilient hashing is supported on those switches.

To enable resilient hashing for a LAG:

- Configure resilient hashing on the aggregated Ethernet interface:

```
[edit interfaces]
user@switch# set aex aggregated-ether-options resilient-hash
```

Configuring Resilient Hashing on ECMP Groups

To enable resilient hashing for ECMP groups:

- Configure resilient hashing for ECMP:

```
[edit forwarding-options]
user@switch# set enhanced-hash-key ecmp-resilient-hash
```

NOTE: When resilient hashing is configured, the traffic distribution across all members of an ECMP group for a given flow are reprogrammed and, as a result, some flows might be remapped to new ECMP group members. In this situation, TCP and UDP sessions are dropped and reset.

Related Documentation

- Understanding the Use of Resilient Hashing to Minimize Flow Remapping in Trunk/ECMP Groups on page 349

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.

NOTE: Platform support depends on the Junos OS release in your installation.

This topic contains the following sections:

- Understanding the Hashing Algorithm on page 353
- IP (IPv4 and IPv6) on page 354
- MPLS on page 355
- MAC-in-MAC Packet Hashing on page 356
- Layer 2 Header Hashing on page 357

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. LAG traffic uses a trunk hash while ECMP uses ECMP hashing. Both LAG and ECMP use the same RTAG7 seed but use different offsets of that 128B seed to avoid polarization. The initial config of

the HASH function to use the trunk and ECMP offset are set at the PFE Init time. 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 41 on page 354 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 41: IPv4 and IPv6 Hashing Fields

Fields	EX4300		QFX5100		QFX5110		QFX5200	
	LAG	ECMP	LAG	ECMP	LAG	ECMP	LAG	ECMP
Source MAC	X	X	X	X	X	X	X	X
Destination MAC	X	X	X	X	X	X	X	X
EtherType	X	X	X	X	X	X	X	X
VLAN ID	X (configurable)	X (configurable)	X (configurable)	X (configurable)	X (configurable)	X (configurable)	X (configurable)	X (configurable)
Source IP or IPv6	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)

Table 41: IPv4 and IPv6 Hashing Fields (continued)

Fields	EX4300		QFX5100		QFX5110		QFX5200	
Destination IP or IPv6	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Protocol (IPv4 only)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Next header (IPv6 only)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Layer 4 Source Port	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Layer 4 Destination Port	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
IPv6 Flow label (IPv6 only)	X	X	X	X	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. On the QFX5110 and QFX5200 switches, , LSR routers also support ECMP. ECMP uses these fields for hashing on an LSR router:

- Layer 3 VPN: MPLS Labels (top 3 labels), source IP, destination IP, and ingress port ID
- Layer 2 Circuit: MPLS Labels (top 3 labels) and ingress port ID

Table 42 on page 356 displays the MPLS 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.

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

The source IP and destination IP fields are not always used for hashing. For non-terminated MPLS packets, the payload is checked if the bottom of stack (BoS) flag is seen in the packet. 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 BoS flag is not seen in the packet, only the MPLS labels are used for hashing.

Table 42: MPLS Hashing Fields

Field	EX4300	QFX5100	QFX5110	QFX5200
Source MAC	X	X	X	X
Destination MAC	X	X	X	X
EtherType	X	X	X	X
VLAN ID	X	X	X	X
Source IP	✓	✓	✓	✓
Destination IP	✓	✓	✓	✓
Protocol (for IPv4 packets)	X	X	X	X
Next header (for IPv6 packets)	X	X	X	X
Layer 4 Source Port	X	X	X	X
Layer 4 Destination Port	X	X	X	X
IPv6 Flow lab	X	X	X	X
MPLS label 0	✓	✓	✓	✓
MPLS label 1	✓	✓	✓	✓
MPLS label 2	✓	✓	✓	✓
Ingress Port ID	X X	X	✓ (LSR and L2Circuit)	✓ (LSR and L2Circuit)

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 43 on page 357.

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 43: MAC-in-MAC Hashing Fields

Field	EX4300	QFX5100	QFX5110	QFX5200
Layer 2 Payload Source MAC	✓	✓	✓	✓
Layer 2 Payload Destination MAC	✓	✓	✓	✓
Layer 2 Payload EtherType	✓	✓	✓	✓
Layer 2 Payload Outer VLAN	X	X	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 44: Layer 2 Header Hashing Fields

Field	EX4300	QFX5100	QFX5110	QFX5200
Source MAC	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
Destination MAC	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
EtherType	✓ (configurable)	✓ (configurable)	✓ (configurable)	✓ (configurable)
VLAN ID	X (configurable)	X (configurable)	✓ (configurable)	✓ (configurable)

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 362

Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches)

Juniper Networks QFX 10002 and QFX 10008 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. You can configure some of the fields that are used by the hashing algorithm.

This topic contains the following sections:

- Understanding the Hashing Algorithm on page 358
- IP (IPv4 and IPv6) on page 359
- MPLS on page 360
- Layer 2 Header Hashing on the QFX10002 and QFX 10008 Switches on page 361

Understanding the Hashing Algorithm

The hashing algorithm is used to make traffic-forwarding decisions 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 to manage bandwidth by evenly load-balancing traffic across the the outgoing links

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 the hash seed value. 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

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. The hashing ensures that traffic is not polarized when a LAG bundle is part of the ECMP next-hop path.

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 table below displays the IPv4 and IPv6 payload fields that are used by the hashing algorithm, by default. All fields are configurable.

- ✓—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 45: IPv4 and IPv6 Hashing Fields for the QFX10002 Switch and QFX 10008 Switch

Fields	QFX10002 Switch and QFX 10008 Switch	
	LAG	**ECMP**
Source MAC (0:47)	X	X
Destination MAC (0:47)	X	X
EtherType (0:15)	✓	✓
VLAN ID (0:11)	✓	✓
Source IP [1](0:31)	✓	✓
Destination IP (0:31)	✓	✓
Incoming Port	✓	✓
Protocol (for IPv4 packets)(0:7)	X	X
Next header (for IPv6 packets)(0:7)	X	X
Layer 4 Source Port (0:15)	✓	✓

Table 45: IPv4 and IPv6 Hashing Fields for the QFX10002 Switch and QFX 10008 Switch (continued)

Fields	QFX10002 Switch and QFX 10008 Switch	
Layer 4 Destination Port (0:15)	✓	✓
IPv6 Flow label (0:19)	✓	✓

MPLS

The hashing algorithm hashes MPLS packets using the source IP, destination IP, MPLS label 0, MPLS label 1, and MPLS label 2 fields.

The table below displays the MPLS 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.

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

The source IP and destination IP fields are not always used for hashing. For non-terminated MPLS packets, the payload is checked if the bottom of stack (BoS) flag is seen in the packet. 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 BoS flag is not seen in the packet, only the MPLS labels are used for hashing.

Table 46: MPLS Hashing Fields for the QFX10002 Switch and QFX 10008 Switch

Fields	QFX10002 Switch	
	LAG	ECMP
Source MAC (0:47)	X	X
Destination MAC (0:47)	X	X
EtherType (0:15)	✓	✓
VLAN ID (0:11)	✓	✓
Source IP [1](0:31)	✓	✓
Destination IP (0:31)	✓	✓
Incoming Port	✓	✓
Protocol (for IPv4 packets)(0:7)	X	X

Table 46: MPLS Hashing Fields for the QFX10002 Switch and QFX 10008 Switch (continued)

Fields	QFX10002 Switch	
Next header (for IPv6 packets)(0:7)	X	X
Layer 4 Source Port (0:15)	✓	✓
Layer 4 Destination Port (0:15)	✓	✓
IPv6 Flow label (0:19)	✓	✓
MPLS label 0 (0:19)	✓	✓
MPLS label 1 (0:19)	✓	✓
MPLS label 2 (0:19)	✓	✓

Layer 2 Header Hashing on the QFX10002 and QFX 10008 Switches

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.

Table 47: Layer 2 Header Hashing Fields for the QFX10002 Switch

Fields	QFX10002 and QFX 10008 Switches	
	LAG	**ECMP**
Source MAC (0:47)	X	X
Destination MAC (0:47)	X	X
EtherType (0:15)	✓	✓
Inner VLAN ID	X	X
VLAN ID (0:11)	✓	✓
Source IP [1] (0:31)	X	X
Destination IP (0:31)	X	X

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352

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.. 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.

NOTE: Configuring the hash mode is not supported on QFX10002 and QFX10008 switches.

- Configuring the Hashing Algorithm to Use Fields in the Layer 2 Header for Hashing on page 362
- Configuring the Hashing Algorithm to Use Fields in the IP Payload for Hashing on page 363
- Configuring the Hashing Algorithm to Use Fields in the IPv6 Payload for Hashing on page 363

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 352
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- *Understanding Aggregated Ethernet Interfaces and LACP*

CHAPTER 17

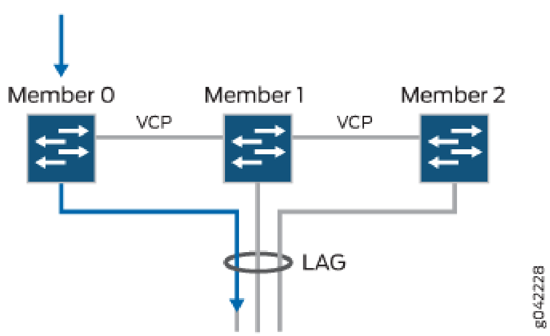
Local Link Bias

- Understanding Local Link Bias on page 365
- Configuring Local Link Bias (CLI Procedure) on page 367
- Understanding Local Minimum Links on page 367

Understanding Local Link Bias

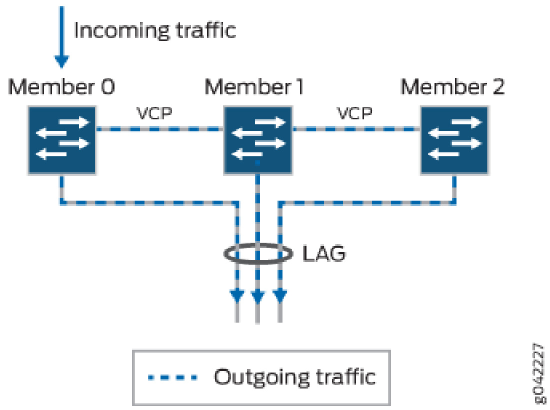
Local link bias conserves bandwidth on Virtual Chassis ports (VCPs) by using local links to forward unicast traffic exiting a Virtual Chassis or Virtual Chassis Fabric (VCF) that has a Link Aggregation group (LAG) bundle composed of member links on different member switches in the same Virtual Chassis 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 11 on page 365.

Figure 11: 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 12 on page 366.

Figure 12: Egress Traffic Flow without Local Link Bias



Starting in Junos OS Release 14.1X53-D25, local link bias can be enabled globally for all LAG bundles in a Virtual Chassis or VCF, or individually per LAG bundle in a Virtual Chassis. In prior Junos OS releases, local link bias could be enabled individually per LAG bundle only.

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.

Release History Table

Release	Description
14.1X53-D25	Starting in Junos OS Release 14.1X53-D25, local link bias can be enabled globally for all LAG bundles in a Virtual Chassis or VCF, or individually per LAG bundle in a Virtual Chassis.

Related Documentation

- Configuring Local Link Bias (CLI Procedure) on page 367

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.

Local link bias can be enabled or disabled globally or per LAG bundle on a Virtual Chassis or VCF. In cases where local link bias is enabled at both the global and per LAG bundle levels, the per LAG bundle configuration takes precedence. For instance, if local link bias is enabled globally but disabled on a LAG bundle named **ae1**, local link bias is disabled on the LAG bundle named **ae1**.

To enable local link bias on a LAG bundle:

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

where ***aex*** 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 365

Understanding Local Minimum Links

NOTE: When describing the local minimum links feature, *member links* are links that are part of an aggregated Ethernet bundle (LAG), *member switches* are chassis that are members in a Virtual Chassis or Virtual Chassis Fabric (VCF), and *local member links* (or simply *local links*) are member links of the same LAG that are local to a particular Virtual Chassis or VCF member switch.

A link aggregation group (LAG) can include member links on different chassis, and multiple local member links on member switches in a Virtual Chassis or VCF. If member links in the LAG fail, the LAG continues to carry traffic over the remaining member links that are still active. When multiple member links are local to one chassis and one or more of those links fail, LAG traffic coming into that chassis will be redistributed over the remaining local links. However, the remaining active local links can suffer traffic loss if the failed links result in sufficiently reduced total bandwidth through the chassis.

Introduced in Junos OS Release 14.1X53-D40, the local minimum links feature helps avoid traffic loss due to asymmetric bandwidth on LAG forwarding paths through a Virtual Chassis or VCF member switch when one or more local member links have failed.

NOTE: **The local minimum links feature is supported on Virtual Chassis or VCFs with QFX5100 member switches only.**

Based on a user-configured threshold value, when one or more member links fail, this feature marks any remaining active local links as “down,” forcing LAG traffic to be redistributed only through member links on *other* chassis. To enable this feature on a particular aggregated Ethernet interface (ae*x*), you set the **local-minimum-links-threshold** configuration statement with a threshold value that represents the percentage of local member links that must be up on a chassis for *any* local member links on that chassis to continue to be active in the aggregated Ethernet bundle.

The configured threshold value:

- Applies to a specified aggregated Ethernet interface.
- Applies to any chassis that has links in the specified aggregated Ethernet bundle.
- Represents a percentage of active local member links out of the total number of local member links for the chassis.

When the local minimum links feature is enabled for a LAG, if one or more member links on a chassis fail, the feature compares the percentage of local member links that are still up to the threshold. If the percentage of “up” links is less than the threshold, the feature forces down the remaining active local links, and no traffic for the aggregated Ethernet interface will be forwarded through the member links on that chassis. If the percentage of links that are “up” is greater than or equal to the threshold, the status of the active links remains unchanged, and LAG traffic will continue to be distributed over available member links on that chassis.

For example, consider a member switch in a Virtual Chassis Fabric that has four links that are active member links of a LAG, and the local minimum links feature is enabled with the threshold set to 60:

- If one member link goes down, 75 percent (three out of four) of the links are still up, which is greater than the threshold (60 percent), so the remaining links stay up.
- If two member links go down, only 50 percent (two out of four) of the links are “up”, so the local minimum links feature forces the remaining two active links “down.” The same is true if three member links fail, the remaining link is forced down as well.

The local minimum links feature tracks whether links are down because the link failed or the link was forced down, as well as when active, failed, or forced-down member links are added or removed. As a result, the feature can respond dynamically when:

- Failed local member links come back up.
- You change the configured threshold value, or you disable the local minimum links feature.
- Adding or removing local member links changes the total number of local member links, or changes the ratio of "up" links to total local member links as compared to the threshold.

For example, if a failed member link causes all local member links to be forced down, then that link comes back up and brings the percentage of "up" links above the current threshold, the system adjusts the status of the forced-down links to mark them up again as well.

You should enable this feature only if your system closely manages ingress and egress traffic forwarding paths on LAGs for individual chassis in a Virtual Chassis and VCFs, especially where local link bias is also enabled.

- Configuring Local Minimum Links on page 369
- Local Minimum Links Effect on LAG Minimum Links on page 369
- Local Minimum Links and Local Link Bias on page 370

Configuring Local Minimum Links

The local minimum links feature is disabled by default. To enable this feature for a LAG bundle (which then applies to any chassis that has local member links in the LAG), simply configure a threshold value for the LAG interface, as follows:

```
[edit interfaces]
user@switch# set aggregated-ether-options aex local-minimum-links-threshold threshold-value
```

To update the threshold value, use the same command with the new threshold value.

To disable the local minimum links feature, delete the **local-minimum-links-threshold** statement from the configuration. Any links that were forced down by this feature are automatically brought up again within a few seconds.

Local Minimum Links Effect on LAG Minimum Links

The per-chassis local minimum links threshold is similar to the **minimum-links** setting for a LAG bundle, which configures the minimum number of member links in the bundle that should be up for the aggregated Ethernet interface as a whole to be considered "up." (See "Configuring Link Aggregation" on page 153 for details.) Local member links that fail or are forced down by the local minimum links feature contribute to the count of "up" links for the LAG as a whole. As a result, this feature can cause the entire LAG to be brought down if enough local links are forced down. Enabling and configuring the local minimum links feature is independent of LAG minimum links configuration, but you should carefully consider the combined potential effect on the LAG as a whole when configuring both features.

Local Minimum Links and Local Link Bias

The local minimum links and local link bias features operate independently, but can influence each other's traffic forwarding results. For example, when local link bias is enabled and would otherwise favor forwarding traffic out of local links in the aggregated Ethernet bundle, but those links are down because the local minimum links threshold is not currently met, outgoing traffic will be redirected through the VCPs to other Virtual Chassis or VCF member switches for forwarding. In that case, unanticipated increased VCP traffic can impact Virtual Chassis or VCF performance.

See "Understanding Local Link Bias" on page 365 for details on the local link bias feature.

Related Documentation

- **local-minimum-links-threshold on page 555**
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- Configuring Link Aggregation on page 153
- Understanding Local Link Bias on page 365

CHAPTER 18

Generic Routing Encapsulation (GRE)

- Understanding Generic Routing Encapsulation on page 371
- Configuring Generic Routing Encapsulation Tunneling on page 375
- Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly on page 376
- Configuring Generic Routing Encapsulation Tunneling (CLI Procedure) on page 377

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 on page 371
- GRE Tunneling on page 372
- Using a Firewall Filter to De-encapsulate GRE Traffic on a QFX5100, QFX10000, and OCX Series Switches on page 374
- Configuration Limitations on page 374

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 374.)

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 372
- Number of Source and Destination Tunnels Allowed on a Switch on page 372
- Class of Service on GRE Tunnels on page 373
- Applying Firewall Filters to GRE Traffic on page 373

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 and OCX Series 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 48 on page 373 identifies these constraints.

Table 48: 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, QFX10000, and OCX Series Switches

You can also use a firewall filter to de-encapsulate GRE traffic on switches . 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* for information about how to configure a firewall filter for this purpose.

Configuration Limitations

Table 49 on page 374 lists features that are not supported with GRE.

Table 49: 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	On QFX10002 , QFX10008 and QFX5K Series switches, If you configure GRE tunneling with the underlying ECMP next-hop instead of a Unicast next-hop, GRE tunnel encapsulation fails and network traffic is dropped
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.	
	QFX series switches do not support configuring GRE interface and the underlying tunnel source interface in two different routing instances.

Related Documentation

- Configuring Generic Routing Encapsulation Tunneling (CLI Procedure) on page 377
- Configuring Generic Routing Encapsulation Tunneling on page 375

- *Configuring a Firewall Filter to De-Encapsulate GRE Traffic*

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 QFX5100 and OCX Series switches. 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*.

This topic describes:

1. Configuring a GRE Tunnel on page 375

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.

NOTE: On QFX10002 and QFX10008 switches, If you configure GRE tunneling with the underlying ECMP next-hop instead of Unicast next-hop, GRE tunnel encapsulation fails and the network traffic is dropped.

NOTE: Indirect egress next-hops is currently not supported in the GRE implementation for QFX10000 switches.

Related Documentation

- Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly on page 376
- Understanding Generic Routing Encapsulation on page 371

- *Configuring a Firewall Filter to De-Encapsulate GRE Traffic*

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: 10.0.0.0
```

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) on page 377

Configuring Generic Routing Encapsulation Tunneling (CLI Procedure)

Tunneling provides a private, secure path for transporting packets through an otherwise public network by encapsulating packets inside a transport protocol known as an *IP encapsulation protocol*. Generic routing encapsulation (GRE) is an IP encapsulation protocol that is used to transport packets over a network. Information is sent from one network to the other through a GRE tunnel.

GRE tunneling is accomplished through routable tunnel endpoints that operate on top of existing physical and other logical endpoints. GRE tunnels connect one endpoint to another and provide a clear data path between them.

This topic describes:

1. Configuring a GRE Tunnel Port on page 377
2. Configuring Tunnels to Use Generic Routing Encapsulation on page 378

Configuring a GRE Tunnel Port

To configure GRE tunnels on a switch, you convert a network port or uplink port on the switch to a GRE tunnel port for tunnel services. Each physical tunnel port, named gr-*fpc/pic/port*, can have one or more logical interfaces, each of which is a GRE tunnel.

After conversion to a GRE tunnel port, the physical port cannot be used for network traffic.

To configure a GRE tunnel port on a switch:

1. Determine the network port or uplink port on your switch to convert to a GRE tunnel port.

2. Configure the port as a tunnel port for GRE tunnel services:

```
[edit chassis]
user@switch# set fpc slot pic pic-number tunnel-port port-number tunnel-services
```

NOTE: On EX3200 switches and standalone EX4200, EX4500, and EX4550 switches, the FPC number is 0 because it refers to the switch itself. On EX4200, EX4500, and EX4550 Virtual Chassis, the FPC number is the member ID of the Virtual Chassis member on which you are configuring the port. On EX6200 and EX8200 switches, the FPC number is the number of the slot containing the line card on which you are configuring the port.

For built-in ports on EX3200, EX4200, EX4500, and EX4550 switches and on EX6200 and EX8200 switches, the PIC number is 0. For uplink ports on EX3200 and EX4200 switches, the PIC number is 1.

Configuring Tunnels to Use Generic Routing Encapsulation

Normally, a GRE tunnel port comes up as soon as it is configured and stays up as long as a valid tunnel source address exists or an interface is operational. Each logical interface you configure on the port can be configured as the source or as the endpoint of a GRE tunnel.

To configure a tunnel port to use GRE:

1. Configure a physical GRE port with a logical interface name and address:
   - For IPv4 over GRE, specify the protocol family **inet**:

     [edit interfaces]
     user@switch# **set gr-*fpc/pic/port* unit *number* family inet *address***
   - For IPv6 over GRE, specify the protocol family **inet6**:

     [edit interfaces]
     user@switch# **set gr-*fpc/pic/port* unit *number* family inet6 *address***
2. Specify the tunnel source address for the logical interface:

   [edit interfaces]
   user@switch# **set gr-*fpc/pic/port* unit *number*** tunnel source ***source-address***
3. Specify the destination address:

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

Related Documentation

- Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly on page 376
- Understanding Generic Routing Encapsulation on page 371

PART 5

Troubleshooting Information

- Monitoring and Troubleshooting Ethernet Interfaces on page 381
- Monitoring and Troubleshooting Aggregated Ethernet Interfaces on page 393
- Troubleshooting Unicast RPF on page 397

CHAPTER 19

Monitoring and Troubleshooting Ethernet Interfaces

- Monitoring Interface Status and Traffic on page 381
- Monitoring System Process Information on page 381
- Monitoring System Properties on page 382
- Troubleshooting Network Interfaces on page 384
- Troubleshooting Network Interfaces on EX3200 Switches on page 384
- Troubleshooting Network Interfaces on EX4200 Switches on page 386
- Tracing Operations of an Individual Router or Switch Interface on page 387
- Tracing Operations of the Interface Process on page 387
- Troubleshooting Interface Configuration and Cable Faults on page 389
- Diagnosing a Faulty Twisted-Pair Cable (CLI Procedure) on page 390

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**.

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 50 on page 382 summarizes the output fields in the system process information display.

The display includes the total CPU load and total memory utilization.

Table 50: 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.
Start Time	Time of day when the process started.

Related Documentation

- Monitoring System Properties on page 382
- *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 51 on page 383 summarizes key output fields in the system properties display.

Table 51: 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).	
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.	

Table 51: Summary of Key System Properties Output Fields (continued)

Field	Values	Additional Information
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 381
- *show system processes*

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 switch 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.

Troubleshooting Network Interfaces on EX3200 Switches

This topic provides troubleshooting information for specific problems related to interfaces on EX3200 switches.

- The interface on one of the last four built-in network ports in an EX3200 switch (for example, interface ge-0/0/23) is down on page 385
- The interface on the port in which an SFP or SFP+ transceiver is installed in an SFP+ uplink module is down on page 385

The interface on one of the last four built-in network ports in an EX3200 switch (for example, interface ge-0/0/23) is down

Problem

Description: The interface on one of the last four built-in ports (**ge-0/0/20** through **ge-0/0/23** on 24-port models or **ge-0/0/44** through **ge-0/0/47** on 48-port models) of an EX3200 switch is down.

Environment: An SFP or SFP+ uplink module is installed in the switch and a transceiver is installed in one of the ports on the uplink module.

Symptoms: When you check the status with the CLI command **show interfaces ge** or with the J-Web user interface, the disabled port is not listed.

Cause

The last four built-in ports use the same ASIC as the SFP uplink module. Therefore, if you install a transceiver in an SFP or SFP+ uplink module installed in an EX3200 switch, a corresponding base port from the last four built-in ports is disabled.

Solution

If you need to use the disabled built-in port, you must remove the transceiver from the SFP or SFP+ uplink module. Alternatively, you can install an XFP uplink module instead of an SFP or SFP+ uplink module. There is no conflict between the built-in network ports and the ports on the XFP uplink modules.

The interface on the port in which an SFP or SFP+ transceiver is installed in an SFP+ uplink module is down

Problem

Description: The interface on the port in which an SFP or SFP+ transceiver is installed in an SFP+ uplink module installed in an EX3200 switch is down.

Symptoms: When you check the status with the CLI command **show interfaces ge** or with the J-Web user interface, the disabled port is not listed.

Cause

By default, the SFP+ uplink module operates in the 10-gigabit mode and supports only SFP+ transceivers. The operating mode for the module is incorrectly set.

Solution

Either SFP+ or SFP transceivers can be installed in SFP+ uplink modules. You must configure the operating mode of the SFP+ uplink module to match the type of transceiver you want to use. For SFP+ transceivers, configure the 10-gigabit operating mode and for SFP transceivers, configure the 1-gigabit operating mode. See "Setting the Mode on an SFP+ or SFP+ MACSec Uplink Module (CLI Procedure)" on page 66.

Related Documentation

- *Troubleshooting Uplink Module Installation or Replacement on EX3200 Switches*
- *Monitoring Interface Status and Traffic*

- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Removing a Transceiver*
- *Uplink Modules in EX3200 Switches*
- Interfaces Overview for Switches on page 4

Troubleshooting Network Interfaces on EX4200 Switches

This topic provides troubleshooting information for specific problems related to interfaces on EX4200 switches.

- The interface on the port in which an SFP or SFP+ transceiver is installed is down on page 386

The interface on the port in which an SFP or SFP+ transceiver is installed is down

Problem

Description: The interface on the port in which an SFP or SFP+ transceiver is installed in an uplink module installed in an EX4200 switch is down.

Symptoms: When you check the status with the CLI command **show interfaces ge** or with the J-Web user interface, the disabled port is not listed.

Cause

By default, the SFP+ and SFP+ MACsec uplink modules operate in the 10-gigabit mode and support only SFP+ transceivers. The operating mode for the module is incorrectly set.

Solution

Either SFP+ or SFP transceivers can be installed in the uplink modules. You must configure the operating mode of the SFP+ or SFP+ MACsec uplink module to match the type of transceiver you want to use. For SFP+ transceivers, configure the 10-gigabit operating mode and for SFP transceivers, configure the 1-gigabit operating mode. See “Setting the Mode on an SFP+ or SFP+ MACSec Uplink Module (CLI Procedure)” on page 66.

Related Documentation

- *Troubleshooting Virtual Chassis Port Connectivity on an EX4200 Switch*
- *Monitoring Interface Status and Traffic*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Removing a Transceiver*
- *Uplink Modules in EX4200 Switches*
- Interfaces Overview for Switches on page 4

Tracing Operations of an Individual Router or Switch Interface

To trace the operations of individual router or switch interfaces, include the **traceoptions** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
traceoptions {
  flag flag;
}
```

You can specify the following interface tracing flags:

- **all**—Trace all interface operations.
- **event**—Trace all interface events.
- **ipc**—Trace all interface interprocess communication (IPC) messages.
- **media**—Trace all interface media changes.

The interfaces **traceoptions** statement does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system **syslog** files.

Related Documentation

- Tracing Operations of the Interface Process on page 387
- *Tracing Interface Operations Overview*

Tracing Operations of the Interface Process

To trace the operations of the router or switch interface process, dcd, perform the following steps:

1. In configuration mode, go to the **[edit interfaces]** hierarchy level:

   ```
   [edit]
   user@host# edit interfaces
   ```

2. Configure the **traceoptions** statement.

   ```
   [edit interfaces]
   user@host# edit traceoptions
   ```

3. Configure the **no-remote-trace** option to disable remote tracing.

   ```
   [edit interfaces traceoptions]
   user@host# set no-remote-trace
   ```

4. Configure the **file *filename*** option.

   ```
   [edit interfaces traceoptions]
   user@host# edit file
   ```


5. Configure the **files** ***number*** option, **match** ***regular-expression*** option, **size** ***size*** option, and **world-readable | no-world-readable** option.

   [edit interfaces traceoptions file]
   user@host# **set files** ***number***
   user@host# **set match** ***regular-expression***
   user@host# **set size** ***size***
   user@host# **set word-readable | no-world-readable**

6. Configure the tracing flag.

   [edit interfaces traceoptions]
   user@host# **set flag** ***flag-option***

7. Configure the **disable** option in **flag** ***flag-option*** statement to disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as **all**.

   [edit interfaces traceoptions]
   user@host# **set flag** ***flag-option*** **disable**

You can specify the following flags in the **interfaces traceoptions** statement:

- **all**—Enable all configuration logging.
- **change-events**—Log changes that produce configuration events.
- **gres-events**—Log the events related to GRES.
- **resource-usage**—Log the resource usage for different states.
- **config-states**—Log the configuration state machine changes.
- **kernel**—Log configuration IPC messages to kernel.
- **kernel-detail**—Log details of configuration messages to kernel.
- **select-events**—Log the events on select state machine.

By default, interface process operations are placed in the file named dcd and three 1-MB files of tracing information are maintained.

For general information about tracing, see the tracing and logging information in the *Junos OS Administration Library*.

Related Documentation

- *Tracing Interface Operations Overview*
- *Tracing Operations of an Individual Router Interface*
- traceoptions on page 464

Troubleshooting Interface Configuration and Cable Faults

NOTE: This topic applies only to the J-Web Application package.

Troubleshooting interface configuration and connectivity on the EX Series switch:

1. Interface Configuration or Connectivity Is Not Working on page 389

Interface Configuration or Connectivity Is Not Working

Problem **Description:**

NOTE: This topic applies only to the J-Web Application package.

You encounter errors when you attempt to configure an interface on the switch, or the interface is exhibiting connectivity problems.

Solution Use the port troubleshooter feature in the J-Web interface to identify and rectify port configuration and connectivity related problems.

To use the J-Web interface port troubleshooter:

1. Select the option **Troubleshoot** from the main menu.
2. Click **Troubleshoot Port**. The Port Troubleshooting wizard is displayed. Click **Next**.
3. Select the ports to troubleshoot.
4. Select the test cases to be executed on the selected port. Click **Next**.

   When the selected test cases are executed, the final result and the recommended action is displayed.

If there is a cable fault, the port troubleshooter displays details and the recommended action. For example, the cable must be replaced.

If the port configuration needs to be modified, the port troubleshooter displays details and the recommended action.

Related Documentation

- *Monitoring Interface Status and Traffic*
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*

- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- *Connecting and Configuring an EX Series Switch (CLI Procedure)*
- *Connecting and Configuring an EX Series Switch (J-Web Procedure)*

Diagnosing a Faulty Twisted-Pair Cable (CLI Procedure)

Problem

Description: A 10/100/1000BASE-T Ethernet interface has connectivity problems that you suspect might be caused by a faulty cable.

Solution

Use the time domain reflectometry (TDR) test to determine whether a twisted-pair Ethernet cable is faulty.

The TDR test:

- Detects and reports faults for each twisted pair in an Ethernet cable. Faults detected include open circuits, short circuits, and impedance mismatches.
- Reports the distance to fault to within 1 meter.
- Detects and reports pair swaps, pair polarity reversals, and excessive pair skew.

The TDR test is supported on the following switches and interfaces:

- EX2200, EX3200, EX3300, and EX4200 switches—RJ-45 network interfaces. The TDR test is not supported on management interfaces and SFP interfaces.
- EX6200 and EX8200 switches—RJ-45 network interfaces on line cards.

NOTE: We recommend running the TDR test on an interface when there is no traffic on the interface.

To diagnose a cable problem by running the TDR test:

1. Run the **request diagnostics tdr** command.

```
user@switch> request diagnostics tdr start interface ge-0/0/10

Interface TDR detail:
Test status                     : Test successfully executed  ge-0/0/10
```

2. View the results of the TDR test with the **show diagnostics tdr** command.

```
user@switch> show diagnostics tdr interface ge-0/0/10

Interface TDR detail:
Interface name                  : ge-0/0/10
Test status                     : Passed
Link status                     : Down
```



```
MDI pair                          : 1-2
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : N/A
  Skew time                       : N/A
MDI pair                          : 3-6
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : N/A
  Skew time                       : N/A
MDI pair                          : 4-5
  Cable status                    : Open
  Distance fault                  : 1 Meters
  Polartiy swap                   : N/A
  Skew time                       : N/A
MDI pair                          : 7-8
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : N/A
  Skew time                       : N/A
Channel pair                      : 1
  Pair swap                       : N/A
Channel pair                      : 2
  Pair swap                       : N/A
Downshift                         : N/A
```

3. Examine the **Cable status** field for the four MDI pairs to determine if the cable has a fault. In the preceding example, the twisted pair on pins 4 and 5 is broken or cut at approximately one meter from the **ge-0/0/10** port connection.

NOTE: The **Test Status** field indicates the status of the TDR test, not the cable. The value **Passed** means the test completed—it does not mean that the cable has no faults.

The following is additional information about the TDR test:

- The TDR test can take some seconds to complete. If the test is still running when you execute the **show diagnostics tdr** command, the **Test status** field displays **Started**. For example:

  ```
  user@switch> show diagnostics tdr interface ge-0/0/22

  Interface TDR detail:
  Interface name                  : ge-0/0/22
  Test status                     : Started
  ```

- You can terminate a running TDR test before it completes by using the **request diagnostics tdr abort interface *interface-name*** command. The test terminates with no results, and the results from any previous test are cleared.
- You can display summary information about the last TDR test results for all interfaces on the switch that support the TDR test by not specifying an interface name with the **show diagnostics tdr** command. For example:

```
user@switch> show diagnostics tdr
Interface    Test status    Link status  Cable status  Max distance fault
 ge-0/0/0         Passed      UP           OK             0
 ge-0/0/1    Not Started     N/A          N/A           N/A
 ge-0/0/2         Passed      UP           OK             0
 ge-0/0/3    Not Started     N/A          N/A           N/A
 ge-0/0/4         Passed      UP           OK             0
 ge-0/0/5         Passed      UP           OK             0
 ge-0/0/6         Passed      UP           OK             0
 ge-0/0/7    Not Started     N/A          N/A           N/A
 ge-0/0/8         Passed     Down          OK             0
 ge-0/0/9    Not Started     N/A          N/A           N/A
ge-0/0/10         Passed     Down         Fault           1
ge-0/0/11         Passed      UP           OK             0
ge-0/0/12    Not Started     N/A          N/A           N/A
ge-0/0/13    Not Started     N/A          N/A           N/A
ge-0/0/14    Not Started     N/A          N/A           N/A
ge-0/0/15    Not Started     N/A          N/A           N/A
ge-0/0/16    Not Started     N/A          N/A           N/A
ge-0/0/17    Not Started     N/A          N/A           N/A
ge-0/0/18    Not Started     N/A          N/A           N/A
ge-0/0/19         Passed     Down          OK             0
ge-0/0/20    Not Started     N/A          N/A           N/A
ge-0/0/21    Not Started     N/A          N/A           N/A
ge-0/0/22         Passed      UP           OK             0
ge-0/0/23    Not Started     N/A          N/A           N/A
```

Related Documentation

- Troubleshooting Interface Configuration and Cable Faults on page 389
- request diagnostics tdr on page 728
- show diagnostics tdr on page 730

CHAPTER 20

Monitoring and Troubleshooting Aggregated Ethernet Interfaces

- Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface on page 393
- Troubleshooting an Aggregated Ethernet Interface on page 394
- Troubleshooting an Aggregated Ethernet Interface on page 395

Monitor Statistics for a Fast Ethernet or Gigabit Ethernet Interface

Purpose To monitor statistics for a Fast Ethernet or Gigabit Ethernet interface, use the following Junos OS CLI operational mode command:

Action user@host> **monitor interface (fe-*fpc/pic/port* | ge-*fpc/pic/port*)**

CAUTION: We recommend that you use the **monitor interface fe-*fpc/pic/port*** or **monitor interface ge-*fpc/pic/port*** command only for diagnostic purposes. Do not leave these commands on during normal router operations because real-time monitoring of traffic consumes additional CPU and memory resources.

Sample Output

The following sample output is for a Fast Ethernet interface:

```
user@host> monitor interface fe-2/1/0
Interface: fe-2/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100mbps
Traffic statistics:                                         Current Delta
  Input bytes:             282556864218 (14208 bps)               [40815]
  Output bytes:             42320313078 (384 bps)                   [890]
  Input packets:              739373897 (11 pps)                    [145]
  Output packets:             124798688 (1 pps)                      [14]
Error statistics:
  Input errors:                       0                               [0]
  Input drops:                        0                               [0]
  Input framing errors:               0                               [0]
  Policed discards:             6625892                               [6]
  L3 incompletes:                    75                               [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
Input MAC/Filter statistics:
  Unicast packets            464751787                            [154]
  Packet error count                 0                              [0]
```

Meaning Use the information from this command to help narrow down possible causes of an interface problem.

NOTE: **If you are accessing the router from the console connection, make sure you set the CLI terminal type using the set cli terminal command.**

The statistics in the second column are the cumulative statistics since the last time they were cleared using the **clear interfaces statistics** ***interface-name*** command. The statistics in the third column are the cumulative statistics since the **monitor interface** ***interface-name*** command was executed.

If the input errors are increasing, verify the following:

1. Check the cabling to the router and have the carrier verify the integrity of the line. To verify the integrity of the cabling, make sure that you have the correct cables for the interface port. Make sure you have single-mode fiber cable for a single-mode interface and multimode fiber cable for a multimode interface.
2. For a fiber-optic connection, measure the received light level at the receiver end and make sure that it is within the receiver specification of the Ethernet interface. See *Fiber-Optic Ethernet Interface Specifications* for the fiber-optic Ethernet interface specifications.
3. Measure the transmit light level on the Tx port to verify that it is within specification. See *Fiber-Optic Ethernet Interface Specifications* for the optical specifications.

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).

NOTE: Layer 2 LAGs are not supported on OCX Series switches.

- 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 157
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179

Troubleshooting an Aggregated Ethernet Interface

Troubleshooting issues for aggregated Ethernet interfaces:

- Show Interfaces Command Shows the LAG is Down on page 395
- Logical Interface Statistics Do Not Reflect All Traffic on page 395
- IPv6 Interface Traffic Statistics Are Not Supported on page 396
- SNMP Counters ifHCInBroadcastPkts and ifInBroadcastPkts Are Always 0 on page 396

Show Interfaces Command Shows the LAG is Down

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 (or the same Virtual Chassis).

Logical Interface Statistics Do Not Reflect All Traffic

Problem **Description:** The traffic statistics for a logical interface do not include all of the traffic.

Solution Traffic statistics fields for logical interfaces in **show interfaces** commands show only control traffic; the traffic statistics do not include data traffic. You can view the statistics for all traffic only per physical interface.

IPv6 Interface Traffic Statistics Are Not Supported

Problem **Description:** The **IPv6 transit statistics** in the **show interfaces** command display all **0** values.

Solution EX Series switches do not support the collection and reporting of IPv6 transit statistics.

SNMP Counters ifHCInBroadcastPkts and ifInBroadcastPkts Are Always 0

Problem **Description:** The values for the SNMP counters ifHCInBroadcastPkts and ifInBroadcastPkts are always 0.

Solution The SNMP counters ifHCInBroadcastPkts and ifInBroadcastPkts are not supported for aggregated Ethernet interfaces on EX Series switches.

Related Documentation

- *Verifying the Status of a LAG Interface*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169

CHAPTER 21

Troubleshooting Unicast RPF

- Troubleshooting Unicast RPF on page 397

Troubleshooting Unicast RPF

Troubleshooting issues for unicast reverse-path forwarding (RPF) on EX Series switches include:

1. Legitimate Packets Are Discarded on page 397

Legitimate Packets Are Discarded

Problem **Description:** The switch filters valid packets from legitimate sources, which results in the switch's discarding packets that should be forwarded.

Solution The interface or interfaces on which legitimate packets are discarded are asymmetrically routed interfaces. An asymmetrically routed interface uses different paths to send and receive packets between the source and the destination, so the interface that receives a packet is not the same interface the switch uses to reply to the packet's source.

Unicast RPF works properly only on symmetrically routed interfaces. A symmetrically routed interface is an interface that uses the same route in both directions between the source and the destination. Unicast RPF filters packets by checking the forwarding table for the best return path to the source of an incoming packet. If the best return path uses the same interface as the interface that received the packet, the switch forwards the packet. If the best return path uses a different interface than the interface that received the packet, the switch discards the packet.

NOTE: On EX3200, EX4200, and EX4300 switches, unicast RPF works properly only if all switch interfaces—including aggregated Ethernet interfaces (also referred to as link aggregation groups or LAGs), integrated routing and bridging (IRB) interfaces, and routed VLAN interfaces (RVIs)—are symmetrically routed, because unicast RPF is enabled globally on all switch interfaces.

Related Documentation

- Verifying Unicast RPF Status on page 323
- Understanding Unicast RPF on page 300

PART 6

Configuration Statements and Operational Commands

- Configuration Statements: Interfaces on page 401
- Configuration Statements: Gigabit Ethernet Interfaces on page 481
- Configuration Statements: OTN Interfaces on page 485
- Configuration Statements: Aggregated Ethernet Interfaces on page 509
- Configuration Statements: Channelizing Interfaces on page 577
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- Configuration Statements: Link Fault Management and Uplink Failure Detection for Interfaces on page 609
- Configuration Statements: Unicast Reverse Path Forwarding (uRPF) on page 633
- Configuration Statements: IP Directed and Targeted Broadcast on page 647
- Configuration Statements: ARP on page 655
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- Configuration Statements: Generic Routing Encapsulation (GRE) on page 675
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- Operational Commands on page 705

CHAPTER 22

Configuration Statements: Interfaces

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accounting-profile

Syntax accounting-profile *name*;

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

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 15.1F6 for PTX Series routers with third-generation FPCs installed.

Description Enable collection of accounting data for the specified physical or logical interface or interface range.

Options *name*—Name of the accounting profile.

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

Related Documentation

- *Applying an Accounting Profile to the Physical Interface*
- *Applying an Accounting Profile to the Logical Interface*

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;
  virtual-gateway-address
  (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.

NOTE: If you configure the same address on multiple interfaces in the same routing instance, Junos OS uses only the first configuration, and the remaining address configurations are ignored and can leave interfaces without an address. Interfaces that do not have an assigned address cannot be used as a donor interface for an unnumbered Ethernet interface.

For example, in the following configuration the address configuration of interface xe-0/0/1.0 is ignored:

```
interfaces {
  xe-0/0/0 {
    unit 0 {
      family inet {
        address 192.168.1.1/8;
      }
    }
  }
  xe-0/0/1 {
    unit 0 {
     family inet {
       address 192.168.1.1/8;
     }
  }
}
```

For more information on configuring the same address on multiple interfaces, see "Configuring the Interface Address" on page 43.

- In Junos OS Release 13.3 and later, when you configure an IPv6 host address and an IPv6 subnet address on an interface, the commit operation fails.
- In releases earlier than Junos OS Release 13.3, when you use the same configuration on an interface, the commit operation succeeds, but only one of the IPv6 addresses that was entered is assigned to the interface. The other address is not applied.

Options *address*—Address of the interface.

The remaining statements are explained separately. Search for a statement in CLI Explorer or click a linked statement in the Syntax section for details.

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*
- *Junos OS Administration Library*
- *family*
- *negotiate-address*
- *unnumbered-address (Ethernet)*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Explicitly enable or disable autonegotiation. Autonegotiation is enabled by default, and will autonegotiate the speed with the link partner. We recommend that you keep autonegotiation enabled for interfaces operating at 100M, 1G, and 10G.

NOTE: In Junos OS Release 14.1X53-D35 on QFX5100-48T-6Q devices using 10-Gigabit Ethernet Copper interfaces, autonegotiation is disabled by default on the copper ports, and the interfaces operate at a speed of 100M. You can, however, enable auto-negotiation by issuing the **set interface *name* ether-options auto-negotiation** command on the interface for which you want to change the interface speed. With autonegotiation enabled, the interface auto-detects the speed in which to operate.

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

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 472
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- *Junos OS Network Interfaces Library for Routing Devices*

autostate-exclude

Syntax autostate-exclude;

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

Release Information Statement introduced in Junos OS Release 14.1x53-D40 and Junos OS Release 17.3R1 on QFX5100 switches.

Description Specify not to include an IRB interface in the state calculation for VLAN members. The default behavior is not to exclude an IRB interface in the state calculation unless all the ports on the interface go down. Because an IRB interface often has multiple ports in a single VLAN, the state calculation for a VLAN member might include a port that is down, possibly resulting in traffic loss. This feature enables you to exclude a trunk or access interface from the state calculation, which results in the IRB interface being marked as down as soon as the port specifically assigned to a VLAN goes down.

IRB interfaces are used to bind specific VLANs to Layer 3 interfaces, enabling a switch to forward packets between those VLANs— without having to configure another device, such as a router, to connect VLANs. In a typical scenario, a port on the interface is assigned to a specific VLAN, while a different port on that interface is assigned to an 802.1Q trunk interface to carry traffic between multiple VLANs, and a third port on that interface is assigned to an access interface used to connect the VLAN to network devices.

To ensure that an interface is marked as down and thereby excluded from the state calculation for VLAN members when the port assigned to the VLAN goes down, configure this statement on the trunk or access interface. The trunk or port interface is automatically excluded from the state calculation of the IRB interface. In this way, when a port assigned to a specified VLAN goes down, the IRB interface assigned to that VLAN is also marked as down.

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

Related Documentation

- *Excluding an IRB Interface from State Calculations on a QFX Series Switch*
- port-mode on page 602
- *show ethernet-switching interface*

bandwidth (Interfaces)

Syntax bandwidth *rate*;

Hierarchy Level [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.

Description Configure the bandwidth value for an interface. This statement is valid for all logical interface types except multilink and aggregated interfaces.

NOTE: We recommend that you be careful when setting this value. Any interface bandwidth value that you configure using the **bandwidth** statement affects how the interface cost is calculated for a dynamic routing protocol, such as OSPF. By default, the interface cost for a dynamic routing protocol is calculated using the following formula:

cost = reference-bandwidth/bandwidth,

where bandwidth is the physical interface speed. However, if you specify a value for bandwidth using the **bandwidth** statement, that value is used to calculate the interface cost, rather than the actual physical interface bandwidth.

Options *rate*—Peak rate, in bits per second (bps) or cells per second (cps). You can specify a value 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). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation **c**; values expressed in cells per second are converted to bits per second by means of the formula 1 cps = 384 bps.

Range: Not limited.

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 Bandwidth on page 57

broadcast

Syntax broadcast *address*;

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

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Set the broadcast address on the network or subnet. On a subnet you cannot specify a host address of 0 (0.0.0.0), nor can you specify a broadcast address (255.255.255.255). For example, in the statement **set interface ge-0/0/0 unit 0 family inet address 10.1.1.0/24**, the subnet address **10.1.1.0** has the host address of 0. Hence, you cannot configure this address. Similarly, for the subnet, you cannot use the broadcast address **10.1.1.255/24**.

Default The default broadcast address has a host portion of all ones.

Options *address*—Broadcast address. The address must have a host portion of either all ones or all zeros. You cannot specify the addresses **0.0.0.0** or **255.255.255.255**.

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 Interface Address on page 43

ccc

Syntax ccc;

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

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

Description Configure the logical interface as a circuit cross-connect (CCC).

NOTE: **On QFX10002 switches, circuit cross-connects are not supported on aggregated Ethernet interfaces.**

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.

configured-flow-control

Syntax

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

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

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

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 remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *congestion-notification-profile*
- flow-control on page 535
- *Configuring CoS Asymmetric Ethernet PAUSE Flow Control*

- *Enabling and Disabling CoS Symmetric Ethernet PAUSE Flow Control*
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*

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 Metro Routers.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

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 on page 52
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- *Using DHCP Relay Agent Option 82 Information*
- *Junos OS Network Interfaces Library for Routing Devices*
- *Example: Connecting Access Switches with ELS Support to a Distribution Switch with ELS Support*

disable (Interface)

Syntax disable;

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 12.2 for ACX Series Universal Metro Routers.

Description Disable a physical or a logical interface, effectively unconfiguring it.

CAUTION:

- Dynamic subscribers and logical interfaces use physical interfaces for connection to the network. The Junos OS allows you to set the interface to disable and commit the change while dynamic subscribers and logical interfaces are still active. This action results in the loss of all subscriber connections on the interface. Use care when disabling interfaces.
- If aggregated SONET links are configured between a T1600 router and a T4000 router, interface traffic is disrupted when you disable the physical interface configured on the T1600 router. If you want to remove the interface, we recommend that you deactivate the interface instead of disabling it.

NOTE:

- When you use the **disable** statement at the **[edit interfaces]** hierarchy level, depending on the PIC type, the interface might or might not turn off the laser. Older PIC transceivers do not support turning off the laser, but newer Gigabit Ethernet (GE) PICs with SFP and XFP transceivers and ATM MIC with SFP do support it and the laser will be turned off when the interface is disabled. If the ATM MIC with SFP is part of an APS group, then the laser will not be turned off when you use the **disable** statement at the **[edit interfaces]** hierarchy level..
- When you disable or deactivate an interface, then all the references made to the deactivated interface must be removed from the routing instance.
- For abstracted fabric interfaces, the **disable** command disables AF interface on the local GNF only.

WARNING: Do not stare into the laser beam or view it directly with optical instruments even if the interface has been disabled.

Required Privilege Level

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

Related Documentation

- Disabling a Physical Interface on page 54
- Disabling a Logical Interface on page 56

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure alarms for an Ethernet interface.

Options

The remaining statements are explained separately. Search for a statement in CLI Explorer or click a linked statement in the Syntax section for details.

Required Privilege Level

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

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. See CLI Explorer.

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 for EX4600 and QFX Series Switches on page 69
- *JUNOS Software Network Interfaces Configuration Guide*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 on page 43

family

Syntax The **ethernet-switching** statement and all of its substatements are not supported on OCX Series switches.

```
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);
    }
  }
  fibre-channel {
    port-mode (f-port | np-port);
  }
  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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

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

Default

NOTE: **The ethernet-switching statement and all of its substatements are not asupported on OCX Series switches.**

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**)

NOTE: **Routed VLAN interfaces, also referred to as integrated routing and bridging (IRB) interfaces, are not supported on OCX Series switches.**

- 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 for EX4600 and QFX Series Switches on page 69
- Configuring Link Aggregation on page 153
- *Configuring IRB Interfaces on Switches*
- *Junos OS Network Interfaces Library for Routing Devices*

forward-and-send-to-re

Syntax forward-and-send-to-re;

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

Release Information Statement introduced in Junos OS Release 10.2.

Description Specify that IP packets destined for a Layer 3 broadcast address be forwarded to an egress interface and the Routing Engine. The packets are broadcast only if the egress interface is a LAN interface.

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

Related Documentation

- Configuring Targeted Broadcast on page 328
- **targeted-broadcast on page 648**
- Understanding Targeted Broadcast on page 327

forward-only

Syntax forward-only;

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

Release Information Statement introduced in Junos OS Release 10.2.

Description Specify that IP packets destined for a Layer 3 broadcast address be forwarded to an egress interface only. The packets are broadcast only if the egress interface is a LAN interface.

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

Related Documentation

- Configuring Targeted Broadcast on page 328
- **targeted-broadcast on page 648**
- Understanding Targeted Broadcast on page 327

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.

Description

NOTE: On EX Series switches, the **group**, **input-list**, **output-filter** statements are not supported under the **[edit interfaces *interface-name* unit *logical-unit-number* family inet]**, **[edit interfaces *interface-name* unit *logical-unit-number* family inet6]**, and **[edit interfaces *interface-name* unit *logical-unit-number* family mpls]** hierarchies.

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.

Options

group *filter-group-number*—Define an interface to be part of a filter group. The default filter group number is 0.

Range: 0 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. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Applying a Filter to an Interface*
- *Junos OS Administration Library*

- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Firewall Filters (CLI Procedure)*
- *family*

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.
Statement introduced in Junos OS Release 10.4R5 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 Metro Routers.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 12.1 for the SRX Series.

Description Specify the **hold-time** value to use to damp shorter interface transitions milliseconds. The hold timer enables interface damping by not advertising interface transitions until the hold timer duration has passed. When a hold-down timer is configured and the interface goes from up to down, the down hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still down, then the router begins to advertise the interface as being down. Similarly, when a hold-up timer is configured and an interface goes from down to up, the up hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still up, then the router begins to advertise the interface as being up.

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.

NOTE: On MX Series routers with MPC3E and MPC4E, we recommend that you do not configure the hold-down timer to be less than 1 second. On MX Series routers with MPC5EQ-100G10G (MPC5EQ) or MPC6E (MX2K-MPC6E) with 100-Gigabit Ethernet MIC with CFP2 OTN interfaces, we recommend that you do not configure the hold-down timer to be less than 3 seconds.

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

Default: 0 (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

Default: 0 (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 (EX Series switches) on page 440**
- *Physical Interface Damping Overview*
- Damping Shorter Physical Interface Transitions on page 53
- *Damping Longer Physical Interface Transitions*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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. See CLI Explorer.

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

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80

interface (Multichassis Protection)

Syntax interface *interface-name*;

Hierarchy Level [edit multi-chassis multi-chassis-protection peer]

Release Information Statement introduced in Junos OS Release 9.6 for MX Series routers.
Statement introduced in Junos OS Release 12.2 for the QFX Series.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Specify the name of the interface that is being used as an interchassis link-protection link (ICL-PL). The two switches hosting a multichassis link aggregation group (MC-LAG) use this link to pass Inter-Chassis Control Protocol (ICCP) and data traffic.

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

interface-mode

Syntax interface-mode (access | trunk <inter-switch-link>);

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.
Statement introduced in Junos OS Release 15.1.
inter-switch-link option introduced in Junos OS Release 14.2 for MX240, MX480, and MX960 routers in enhanced LAN mode.

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 *Using the Enhanced Layer 2 Software CLI*.

QFX3500 and QFX3600 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.

trunk inter-switch-link—For a private VLAN, configure the InterSwitch Link protocol (ISL) on a trunk port of the primary VLAN in order to connect the switches composing the PVLAN to each other. You do not need to configure an ISL when a PVLAN is configured on a single switch. This configuration specifies whether the particular interface assumes the role of interswitch link for the PVLAN domains of which it is a member. This option is supported only on MX240, MX480, and MX960 routers in enhanced LAN mode.

Required Privilege Level

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

Related Documentation

- *Configuring Access Mode on a Logical Interface*
- *Configuring a Logical Interface for Trunk Mode*
- *Example: Connecting Access Switches with ELS Support to a Distribution Switch with ELS Support*
- *Tunnel Services Overview*
- *Tunnel Interface Configuration on MX Series Routers Overview*

interface-range

Syntax

The **vlan-id** statement is not supported on OCX Series switches.

```
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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

NOTE: The vlan-id statement and Fibre Channel interfaces are not supported on OCX Series switches.

NOTE: The interface range definition is supported only for Gigabit Ethernet, 10-Gigabit Ethernet, and Fibre Channel interfaces. Interface ranges are not supported on channelized interfaces.

Group interfaces that share a common configuration profile.

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. See CLI Explorer.

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

Related Documentation

- Understanding Interface Ranges for Switches on page 22
- Interfaces Overview for Switches on page 4
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- *Junos OS Network Interfaces Library for Routing Devices*

interfaces (QFX Series)

Syntax The following statements and their associated substatements are not supported on OCX Series switches: **auto-negotiation**, **speed**, **ethernet-switching**, **fcoe-lag**, **fibre-channel**, **fibrechannel-options**, **mc-ae**, **vlan**, **vlan-id**, and **vlan-tagging**.

```
interfaces {
  aex {
    disable;
      aggregated-ether-options {
      configured-flow-control {
        rx-buffers (on | off);
        tx-buffers (on | off);
      }
      (fcoe-lag | no-fcoe-lag);
      flexible-vlan-tagging;
      (flow-control | no-flow-control);
      lacp mode {
        admin-key key;
        force-up;
        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);
      }
      flexible-vlan-tagging;
      (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;
    mac
```



```
    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);
          }
          flexible-vlan-tagging;
          (flow-control | no-flow-control);
          loopback;
          no-loopback;
        }
        (gratuitous-arp-reply| no-gratuitous-arp-reply
        hold-time milliseconds down milliseconds;
        mac
        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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Configure the interfaces on the QFX Series and OCX Series.

The following statements and their associated substatements are not supported on OCX Series switches: **auto-negotiation**, **ethernet-switching**, **fcoe-lag**, **fibre-channel**, **fibrechannel-options**, **mc-ae**, **speed**, **vlan**, **vlan-id**, and **vlan-tagging**

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. See CLI Explorer.

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

Related Documentation

- Interfaces Overview for Switches on page 4
- Understanding Interface Ranges for Switches on page 22
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Link Aggregation on page 153
- Configuring a Layer 3 Logical Interface on page 270

interfaces (EX Series switches)

Syntax

interfaces ae on page 440
interfaces ge on page 440
interfaces interface-range on page 442
interfaces lo0 on page 442
interfaces me0 on page 443
interfaces traceoptions on page 443
interfaces vlan on page 443
interfaces vme on page 444
interfaces xe on page 445

interfaces ae

```
aex {
  accounting-profile name;
  aggregated-ether-options {
    (flow-control | no-flow-control);
    lacp {
      (active | passive);
      admin-key key;
      periodic interval;
      system-id mac-address;
    }
    (link-protection | no-link-protection);
    link-speed speed;
    (loopback | no-loopback);
    minimum-links number;
  }
  description text;
  disable;
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  mtu bytes;
  no-gratuitous-arp-request;
  traceoptions {
    flag flag;
  }
  (traps | no-traps);
  unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    family family-name {...}
    proxy-arp (restricted | unrestricted);
    (traps | no-traps);
    vlan-id vlan-id-number;
  }
  vlan-tagging;
}
```

interfaces ge

```
ge-fpc/pic/port {
  accounting-profile name;
  description text;
  disable;
  ether-options {
```



```
      802.3ad {
        aex;
        (backup | primary);
        lacp {
          force-up;
        }
      }
      (auto-negotiation | no-auto-negotiation);
      (flow-control | no-flow-control);
      ieee-802-3az-eee;
      link-mode mode;
      (loopback | no-loopback);
      speed (auto-negotiation | speed);
    }
    (gratuitous-arp-reply | no-gratuitous-arp-reply);
    hold-time up milliseconds down milliseconds;
    media-type;
    mtu bytes;
    no-gratuitous-arp-request;
    traceoptions {
      flag flag;
    }
    (traps | no-traps);
    unit logical-unit-number {
      accounting-profile name;
      bandwidth rate;
      description text;
      disable;
      family family-name {...}
      proxy-arp (restricted | unrestricted);
      (traps | no-traps);
      vlan-id vlan-id-number;
    }
    vlan-tagging;
  }
```

interfaces interface-range

```
interface-range name {
  accounting-profile name;
  description text;
  disable;
  ether-options {
    802.3ad {
      aex;
      (backup | primary);
      lacp {
        force-up;
      }
    }
    (auto-negotiation | no-auto-negotiation);
    (flow-control | no-flow-control);
    ieee-802-3az-eee;
    link-mode mode;
    (loopback | no-loopback);
    speed (auto-negotiation | speed);
  }
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
  member interface-name;
  member-range starting-interface name to ending-interface name;
  mtu bytes;
  unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    family family-name {...}
    proxy-arp (restricted | unrestricted);
    (traps | no-traps);
    vlan-id vlan-id-number;
  }
  vlan-tagging;
}
```

interfaces lo0

```
lo0 {
  accounting-profile name;
  description text;
  disable;
  hold-time up milliseconds down milliseconds;
  traceoptions {
    flag flag;
  }
  (traps | no-traps);
  unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    family family-name {...}
    (traps | no-traps);
  }
}
```


interfaces me0

```
me0 {
  accounting-profile name;
  description text;
  disable;
  (gratuitous-arp-reply | no-gratuitous-arp-reply);
  hold-time up milliseconds down milliseconds;
  no-gratuitous-arp-request;
  traceoptions {
    flag flag;
  }
  (traps | no-traps);
  unit logical-unit-number {
    accounting-profile name;
    bandwidth rate;
    description text;
    disable;
    family family-name {...}
    (traps | no-traps);
    vlan-id vlan-id-number;
  }
  vlan-tagging;
}
```

interfaces traceoptions

```
traceoptions {
  file <filename> <files number> <match regular-expression> <size size> <world-readable |
    no-world-readable>;
  flag flag <disable>;
  no-remote-trace;
}
```

interfaces vlan

```
vlan {
  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;
    family family-name {...}
    proxy-arp (restricted | unrestricted);
    (traps | no-traps);
  }
}
```


interfaces vme

```
vme {
  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;
    family family-name {...}
    (traps | no-traps);
    vlan-id vlan-id-number;
  }
  vlan-tagging;
}
```


interfaces xe

```
xe-fpc/pic/port {
  accounting-profile name;
  description text;
  disable;
  ether-options {
    802.3ad {
      aex;
      (backup | primary);
      lacp {
        force-up;
      }
    }
    (flow-control | no-flow-control);
    link-mode mode;
    (loopback | no-loopback);
  }
  (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;
    family family-name {...}
    proxy-arp (restricted | unrestricted);
    (traps | no-traps);
    vlan-id vlan-id-number;
  }
  vlan-tagging;
}
```

Hierarchy Level [edit]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure interfaces on EX Series switches.

Options See Table 52 on page 446 for the interface types and protocol-family options supported on the switch. Different protocol families support different subsets of the interface types on the switch. See the **family** statement for syntax of the protocol families supported for switch interfaces.

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

Table 52: Interface Types and Their Supported Protocol Families

Interface Type	Description	Supported Protocol Families					
		ccc	ethernet-switching	inet	inet6	iso	mpls
ae	Aggregated Ethernet interface (also referred to as a link aggregation group [LAG])	✓*	✓	✓	✓	✓	✓
ge	Gigabit Ethernet interface	✓	✓	✓	✓	✓	✓
interface-range	Interface-range configuration	Supported protocol families are the ones supported by the interface types that compose the range.					
lo0	Loopback interface			✓	✓	✓	✓
me0	Management Ethernet interface		✓	✓	✓	✓	✓
vlan	Routed VLAN interface (RVI)			✓	✓	✓	
vme	Virtual management Ethernet interface			✓	✓	✓	✓
xe	10-Gigabit Ethernet interface	✓	✓	✓	✓	✓	✓
		*Supported on EX8200 switches only					

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring a Layer 3 Subinterface (CLI Procedure) on page 266
- *Configuring Routed VLAN Interfaces on Switches (CLI Procedure)*
- *Configuring the Virtual Management Ethernet Interface for Global Management of an EX Series Virtual Chassis (CLI Procedure)*
- Interfaces Overview for Switches on page 4
- *Junos OS Interfaces Fundamentals Configuration Guide*
- *Junos OS Ethernet Interfaces Configuration Guide*

irb (Interfaces)

Syntax

```
irb {
  accounting-profile name;
  arp-l2-validate;
  description  text;

  (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;
    enhanced-convergence;
    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. See CLI Explorer.

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

loopback (Aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet)

Syntax (loopback | no-loopback);

Hierarchy Level [edit interfaces *interface-name* aggregated-ether-options],
[edit interfaces *interface-name* ether-options],
[edit interfaces *interface-name* fastether-options],
[edit interfaces *interface-name* gigether-options],
[edit interfaces interface-range *name* ether-options]

For QFX Series and EX Series:

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

For SRX Series Devices and vSRX:

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

Release Information Statement introduced before Junos OS Release 7.4 for MX Series.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement modified in Junos OS Release 9.2 for the SRX Series.

Description For aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces, enable or disable loopback mode.

NOTE:

- By default, local aggregated Ethernet, Fast Ethernet, Tri-Rate Ethernet copper, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces connect to a remote system.
- IPv6 Neighbor Discovery Protocol (NDP) addresses are not supported on Gigabit Ethernet interfaces when loopback mode is enabled on the interface. That is, if the **loopback** statement is configured at the **[edit interfaces ge-*fpc/pic/port* gigether-options]** hierarchy level, an NDP address cannot be configured at the **[edit interfaces ge-*fpc/pic/port* unit *logical-unit-number* family inet6 address]** hierarchy level.

Default By default, loopback is disabled.

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*
- *Understanding Interfaces*

mac

Syntax

mac *mac-address*;

Hierarchy Level

[edit interfaces *interface-name*]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Set the MAC address of the interface.

Use this statement at the **[edit interfaces ... ps0]** hierarchy level to configure the MAC address for a pseudowire logical device that is used for subscriber interfaces over point-to-point MPLS pseudowires.

Options

mac-address—MAC address. Specify the MAC address as six hexadecimal bytes in one of the following formats: ***nnnn.nnnn.nnnn*** or ***nn*:*nn*:*nn*:*nn*:*nn*:*nn***. For example, **0000.5e00.5355** or **00:00:5e:00:53:55**.

Required Privilege Level

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

Related Documentation

- *Configuring the MAC Address on the Management Ethernet Interface*
- *Configuring a Pseudowire Subscriber Logical Interface Device*

media-type (Dual-Purpose Uplink Ports)

Syntax media-type (copper | fiber);

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced in Junos OS Release 11.3 for EX Series switches.
Statement introduced in Junos OS Release 12.2 for ACX1000 Universal Metro Routers.

Description (EX2200-C switch only) Configure the media type for a dual-purpose uplink port (one RJ-45 port and one SFP port) on an EX2200 switch. If you use the media-type for a dual-purpose uplink port, the alternate media type cannot be used with the port.

(ACX1000 routers only) Select the media type (copper or fiber) for the 1-Gigabit Ethernet interfaces.

Default When **media-type** is not set, the port accepts either type of connection. The media type is fiber if a transceiver is installed in the SFP connection. If no transceiver is installed, the media type is fiber.

Options **copper**—The dual-purpose uplink port accepts only a 10/100/1000BASE-T copper connection.

fiber—The dual-purpose uplink port accepts only an SFP fiber 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 Media Type on Dual-Purpose Uplink Ports (CLI Procedure) on page 67

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 for EX4600 and QFX Series Switches on page 69
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80
- Interfaces Overview for Switches on page 4
- *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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 for Switches on page 22
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for OCX Series Switches on page 80
- Interfaces Overview for Switches on page 4
- Interfaces Overview for Switches on page 4
- *Junos OS Network Interfaces Library for Routing Devices*

mode (Interfaces)

Syntax mode loose;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family (inet | inet6) rpf-check]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 15.1F6 for PTX Series routers with third-generations FPCs installed.

Description Check whether the packet has a source address with a corresponding prefix in the routing table. If a corresponding prefix is not found, unicast reverse path forwarding (RPF) loose mode does not accept the packet. Unlike strict mode, loose mode does not check whether the interface expects to receive a packet with a specific source address prefix.

Default If you do not include this statement, unicast RPF is in strict mode.

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

Related Documentation
- Configuring Unicast RPF Strict Mode on page 307

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 QFX3500, QFX3600, QFX5100, and OCX Series switches, 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.

NOTE: **RVIs are not supported on OCX Series switches.**

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 for EX4600 and QFX Series Switches on page 69
- *Junos OS Network Interfaces Library for Routing Devices*

nd6-stale-time

Syntax nd6-stale-time *seconds*;

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

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

Description Set the stale timer for IPv6 neighbor reachability confirmation. Reachability of the IPv6 neighbors is confirmed only after the stale timer has expired. For example, by setting the stale timer to 180 seconds, users can specify that IPv6 neighbor reachability be confirmed every 180 seconds.

NOTE: When the Routing Engine sends a control packet to an IPv6 neighbor, the stale timer is the maximum interval in which neighbor reachability is confirmed. In such cases, IPv6 neighbor reachability is confirmed before the stale timer expires.

Default Default is 20 minutes (1200 seconds)

Options ***seconds***—Duration in seconds.

Range: 1 to 18000

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

Related Documentation

- *IPv6 Neighbor Discovery Overview*
- *show ipv6 neighbors*

no-redirects

Syntax no-redirects;

Hierarchy Level [edit 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.

Description Do not send protocol redirect messages on the interface.

To disable the sending of protocol redirect messages for the entire router or switch, include the **no-redirects** statement at the **[edit system]** hierarchy level.

Default Interfaces send protocol redirect messages.

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

Related Documentation

- *Disabling the Transmission of Redirect Messages on an Interface*
- *Junos OS Administration Library*

policer (MAC)

Syntax

```
policer {
  input cos-policer-name;
  output cos-policer-name;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* accept-source-mac
mac-address *mac-address*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*
accept-source-mac mac-address *mac-address*]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

For Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router), and 100-Gigabit Ethernet Type 5 PIC with CFP, configure MAC policing.

NOTE:
On MX Series routers with Gigabit Ethernet or Fast Ethernet PICs, the following considerations apply:

- Interface counters do not count the 7-byte preamble and 1-byte frame delimiter in Ethernet frames.
- In MAC statistics, the frame size includes MAC header and CRC before any VLAN rewrite/imposition rules are applied.
- In traffic statistics, the frame size encompasses the L2 header without CRC after any VLAN rewrite/imposition rule.

Options

input *cos-policer-name*—Name of one policer to specify the premium bandwidth and aggregate bandwidth.

output *cos-policer-name*—Name of one policer to specify the premium bandwidth and aggregate bandwidth.

Required Privilege Level

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

Related Documentation

- *Configuring MAC Address Filtering*

preferred

Syntax preferred;

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

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description Configure this address to be the preferred address on the interface. If you configure more than one address on the same subnet, the preferred source address is chosen by default as the source address when you initiate frame transfers to destinations on the subnet.

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

Default The lowest-numbered address on the subnet is the preferred address.

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 on page 43

primary (Address on Interface)

Syntax

primary;

Hierarchy Level

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

Release Information

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

Description

Configure this address to be the primary address of the protocol on the interface. If the logical unit has more than one address, the primary address is used by default as the source address when packet transfer originates from the interface and the destination address does not indicate the subnet.

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

Default

For unicast traffic, the primary address is the lowest non-127 (in other words, non-loopback) preferred address on the unit.

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 on page 43

traceoptions (Individual Interfaces)

List of Syntax

Syntax (Individual interfaces with PTX Series, EX Series, ACX Series) on page 464
Syntax (Individual interfaces with QFX Series, OCX1100, EX4600, NFX Series) on page 464
Syntax (OAMLFM with EX Series, QFX Series, NFX Series) on page 464
Syntax (Interface process with ACX Series, SRX Series, MX Series, M Series, T Series) on page 464

Syntax (Individual interfaces with PTX Series, EX Series, ACX Series)

```
traceoptions {
  file filename <files name> <size size> <world-readable | no-world-readable>;
  flag flag;
  match;
}
```

Syntax (Individual interfaces with QFX Series, OCX1100, EX4600, NFX Series)

```
traceoptions {
  flag flag;
}
```

Syntax (OAMLFM with EX Series, QFX Series, NFX Series)

```
traceoptions {
  file filename <files number> <match regex> <size size> <world-readable |
    no-world-readable>;
  flag flag ;
  no-remote-trace;
}
```

Syntax (Interface process with ACX Series, SRX Series, MX Series, M Series, T Series)

```
traceoptions {
  file <filename> <files number> <match regular-expression> <size size> <world-readable |
    no-world-readable>;
  flag flag <disable>;
  no-remote-trace;
}
```

Hierarchy Level (Individual interfaces with PTX Series, EX Series, ACX Series, QFX Series, OCX1100, EX4600, NFX Series)

[edit interfaces *interface-name*]

Hierarchy Level (Interface process with ACX Series, SRX Series, MX Series, M Series, T Series)

[edit interfaces]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in JUNOS Release 10.2 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Define tracing operations for individual interfaces.

To specify more than one tracing operation, include multiple **flag** statements.

The interfaces **traceoptions** statement 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/dcd*** .

On EX Series, QFX Series, and NFX Series platforms, configure tracing options the link fault management.

On ACX Series, SRX Series, MX Series, M Series, and T Series platforms define tracing operations for the interface process (dcd).

Default If you do not include this statement, no interface-specific tracing operations are performed.

Options Table 53 on page 467 lists options for traceoption command for the following platforms:

Table 53: Options for traceoptions

Option	Individual interfaces with PTX Series, ACX Series, EX Series	Individual interfaces with QFX Series, QFabric System, OCX1100, EX4600, NFX Series	Interface Process with OAMLFM with EX Series, QFX Series, NFX Series	Interface process with ACX Series, SRX Series, MX Series, M Series, T Series
file ***filename***	—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory ***/var/log/dcd*** . By default, interface process tracing output is placed in the file.		—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory ***/var/log/dcd*** .	—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory***/var/log/dcd*** . By default, interface process tracing output is placed in the file **dcd**.
files *number*	—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed **trace-file.0**, then **trace-file.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.		—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum *xk* to specify KB, *xm* to specify MB, or *xg* to specify GB number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the size option.	—(Optional) Maximum number of trace files. When a trace file named ***trace-file*** reaches its maximum size, it is renamed ***trace-file*****.0**, then ***trace-file*****.1**, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the **size** option. *Range:* 2 through 1000 *Default:* 3 files
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	—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	—Tracing operation to perform. To specify more than one tracing operation, include multiple ***flag*** statements. You can include the following flags: • **action-profile**—Trace action profile invocation events. • **all**—Trace all events. • **configuration**—Trace configuration events. • **protocol**—Trace	—Tracing operation to perform. To specify more than one tracing operation, include multiple ***flag*** statements. You can include the following flags: • **all** • **change-events**—Log changes that produce configuration events • **config-states**—Log the configuration

Table 53: Options for traceoptions (continued)

Option	Individual interfaces with PTX Series, ACX Series, EX Series	Individual interfaces with QFX Series, QFabric System, OCX1100, EX4600, NFX Series	Interface Process with OAMLFM with EX Series, QFX Series, NFX Series	Interface process with ACX Series, SRX Series, MX Series, M Series, T Series
	communication (IPC) messages • **media**—Interface media changes • **q921**—Trace ISDN Q.921 frames • **q931**—Trace ISDN Q.931 frames	communication (IPC) messages • **media**—Interface media changes • **q921**—Trace ISDN Q.921 frames • **q931**—Trace ISDN Q.931 frames	protocol processing events. • **routing socket**—Trace routing socket events.	state machine changes • **kernel**—Log configuration IPC messages to kernel • **kernel-detail**—Log details of configuration messages to kernel
match	—(Optional) Regular expression for lines to be traced.		—(Optional) Refine the output to log only those lines that match the given regular expression.	
size *size*	—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches this size, it is renamed **trace-file.0**. When the **trace-file** again reaches its maximum size, **trace-file.0** is renamed **trace-file.1** and **trace-file** is renamed **trace-file.0**. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten.		—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten. If you specify a maximum number of files, you also must specify a maximum file size with the files option. *Syntax: x*k to specify KB, *x*m to specify MB, or *x*g to specify GB *Range:* 10 KB through 1 GB *Default:* 128 KB *Default:* If you do not include this option, tracing output is appended to an existing trace file.	

Table 53: Options for traceoptions (continued)

Option	Individual interfaces with PTX Series, ACX Series, EX Series	Individual interfaces with QFX Series, QFabric System, OCX1100, EX4600, NFX Series	Interface Process with OAMLFM with EX Series, QFX Series, NFX Series	Interface process with ACX Series, SRX Series, MX Series, M Series, T Series
				—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named ***trace-file*** reaches this size, it is renamed ***trace-file*.0**. When the ***trace-file*** again reaches its maximum size, ***trace-file*.0** is renamed ***trace-file*.1** and ***trace-file*** is renamed ***trace-file*.0**. This renaming scheme continues until the maximum number of trace files is reached. Then, the oldest trace file is overwritten. If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option. *Syntax:* ***x*k** to specify kilobytes, ***x*m** to specify megabytes, or ***x*g** to specify gigabytes *Range:* 10 KB through the maximum file size supported on your router *Default:* 1 MB
no-world-readable	—(Optional) Prevent any user from reading the log file.		—(Optional) Restrict file access to the user who created the file.	—(Optional) Disallow any user to read the log file.
world-readable	—(Optional) Allow any user to read the log file.		—(Optional) Enable unrestricted file access.	—(Optional) Allow any user to read the log file.
disable				

Table 53: Options for traceoptions (continued)

Option	Individual interfaces with PTX Series, ACX Series, EX Series	Individual interfaces with QFX Series, QFabric System, OCX1100, EX4600, NFX Series	Interface Process with OAMLFM with EX Series, QFX Series, NFX Series	Interface process with ACX Series, SRX Series, MX Series, M Series, T Series
				—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as **all**.
no-remote-trace			—(Optional) Disable the remote trace.	-
match *regex*				—(Optional) Refine the output to include only those lines that match the given regular expression.

Required Privilege Level

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

Related Documentation

- *Tracing Operations of an Individual Router Interface*
- Tracing Operations of an Individual Router or Switch Interface on page 387
- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282
- Tracing Operations of the Interface Process on page 387

reflective-relay

Syntax reflective-relay;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family ethernet-switching]

Release Information Statement introduced in Junos OS Release 12.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D35 for the EX Series.

Description Configure a switch interface to return packets back to a device on the same interface that was used to deliver the packets.

Default Switch interfaces are not configured for reflective relay.

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

Related Documentation

- *Example: Configuring Reflective Relay for Use with VEPA Technology on QFX Switches*
- *Configuring Reflective Relay on Switches*

speed (Ethernet)

List of Syntax

Syntax (EX Series) on page 472
Syntax (EX2300 and EX4300) on page 472
Syntax (EX Series, ACX Series, MX Series) on page 472
Syntax (QFX Series, OCX1100, EX4600) on page 472

Syntax (EX Series)

speed (auto-negotiation | *speed*) ;

Syntax (EX2300 and EX4300)

speed *speed*;

Syntax (EX Series, ACX Series, MX Series)

speed (10m |10g | 100m | 1g | 2.5g |5g |auto | auto-10m-100m);

Syntax (QFX Series, OCX1100, EX4600)

speed (10g | 1g | 100m)

Hierarchy Level (EX Series)

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

Hierarchy Level (EX2300 and EX4300)

[edit interfaces *interface-name*]

Hierarchy Level (ACX Series, EX Series, MX Series)

[edit interfaces *interface-name*],
[edit interfaces ge-*pim*/0/0 switch-options switch-port *port-number*]

Hierarchy Level (QFX Series, EX4600, OCX Series)

[edit interfaces *interface-name*]

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 Metro Routers.
Statement introduced in Junos OS Release 13.2X50-D10 for EX Series switches.
Speed option 2.5Gbps introduced in Junos OS Release 18.1R2 for EX2300 switch.
Speed option 10Gbps and 5Gbps introduced in Junos OS Release 18.2R1 for EX4300 switch.

Description

Configure the interface speed. This statement applies to the management Ethernet interface (**fxp0** or **em0**), Fast Ethernet 12-port and 48-port PICs, the built-in Fast Ethernet port on the FIC (M7i router), Combo Line Rate DPCs and Tri-Rate Ethernet Copper interfaces on MX Series routers, and Gigabit Ethernet interfaces on EX Series switches.

When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled. When you configure 100BASE-FX SFP, you must set the port speed at 100 Mbps.

NOTE: On MX Series routers with Tri-rate Enhanced DPC (DPCE-R-40GE-TX), when you configure the interface speed using the **auto-10m-100m** option, the speed is negotiated to the highest value possible (100 Mbps), if the same value is configured on both sides of the link. However, when you view the interface speed of the DPC, using the **show interfaces** command, the value of the speed is not accurately displayed. For instance, if you configure the speed of the Tri-rate enhanced DPC, as 100Mbps on both sides of the link, the interface speed of the DPC is negotiated to 100 Mbps. However, the interface speed of the DPC displays 1 bps. This is an issue with the **show interfaces** command only. The actual interface speed is 100 Mbps.

On 10-Gigabit Ethernet SFP interfaces, autonegotiation is enabled by default and auto-detects the speed to be either 1 Gbps or 10 Gbps. On QFX5100-48S, QFX5100-96S, and QFX5100-24Q devices using 10-Gigabit Ethernet SFP interfaces, the speed is set to 10 Gbps by default and cannot be configured to operate in a different speed. On QFX5100-48S and QFX5100-96S devices using 1-Gigabit Ethernet SFP interfaces, the speed is set to 1 Gbps by default and cannot be configured to operate in a different speed.

NOTE: In Junos OS Release 14.1X53-D35 on QFX5100-48T-6Q devices using 10-Gigabit Ethernet Copper interfaces, autonegotiation is disabled by default on the copper ports, and the interfaces operate at a speed of 100M. You can, however, enable auto-negotiation by issuing the **set interface *name* ether-options auto-negotiation** command on the interface for which you want to change the interface speed. With autonegotiation enabled, the interface auto-detects the speed in which to operate.

NOTE: Only 10 Gbps and 40 Gbps interfaces are supported on OCX Series switches.

NOTE: When displaying interface information with **show interfaces** commands, you might see speed values for 1 Gbps interfaces displayed as **1000mbps**.

(For EX2300 only) Starting in Junos OS Release 18.1R2, the multi-rate speed is supported on EX2300-48MP and EX2300-24MP switches. The speed configuration statement is supported on both multi-rate gigabit ethernet interface (mge) and gigabit ethernet (ge) interface. The mge interface is a rate-selectable (multirate) Gigabit Ethernet interface that can support speeds of 10-Gbps, 5-Gbps, and 2.5-Gbps over CAT5e/CAT6/CAT6a cables. In the EX2300, the mge interface supports 100-Mbps, 1-Gbps, and 2.5-Gbps speeds, which can be configured by using the speed configuration statement. Note that 10Mbps speed is supported only on **ge** interfaces of EX2300 switch.

On EX2300-24MP and EX2300-48MP switches, if both Energy Efficient Ethernet (EEE) and 100-Mbps speed are configured on a rate-selectable (or multirate) Gigabit Ethernet (mge) port, the port operates only at 100-Mbps speed but EEE is not enabled on that port. EEE is supported only on mge interfaces that operate at 1-Gbps and 2.5-Gbps speeds.

Default (EX Series) If the **auto-negotiation** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level is enabled, the auto-negotiation option is enabled by default.

Options You can specify the speed as either **10m** (10 Mbps), **100m** (100 Mbps), and on MX Series routers, **1g** (1 Gbps). You can also specify the **auto** option on MX Series routers.

For Gigabit Ethernet interfaces on EX Series switches, you can specify one of the following options:

Table 54: Options for speed

Platforms	Speed Supported	Auto-negotiation
EX Series Switches	**100m**—100 Mbps **10m**—10 Mbps **1g**—1 Gbps	auto-negotiation—Automatically negotiate the speed based on the speed of the other end of the link. This option is available only when the **auto-negotiation** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level is enabled.
ACX, MX Series	**100m**—100 Mbps **10m**—10 Mbps **1g**—1 Gbps	**auto**—Automatically negotiate the speed (10 Mbps, 100 Mbps, or 1 Gbps) based on the speed of the other end of the link. **auto-10m-100m**—Automatically negotiate the speed (10 Mbps or 100 Mbps) based on the speed of the other end of the link.
EX4600, QFX Series, QFabric, OCX100, QFX Series	**10g**—10 Gbps **1g**—1 Gbps **100m**—100 Mbps	auto-negotiation—Automatically negotiate the speed based on the speed of the other end of the link. This option is available only when the **auto-negotiation** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level is enabled.
EX2300	**10m**—10 Mbps (supported on EX series switches and only on **ge** interfaces of EX2300 switch) **100m**—100 Mbps **1g**—1 Gbps **2.5g**—2.5 Gbps (supported only on **mge** interfaces of E2300 switch) **10g**—10 Gbps (supported only on **mge** interfaces for EX4300 switches) **5g**—5 Gbps (supported only on **mge** interfaces for EX4300 switches)	*speed*—Specify the interface speed. If the **auto-negotiation** statement at the **[edit interfaces *interface-name* ether-options]** hierarchy level is disabled, you must specify a specific value. This value sets the speed that is used on the link. If the **auto-negotiation** statement is enabled, you might want to configure a specific speed value to advertise the desired speed to the remote end.

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

Release History Table

Release	Description
18.2R1	Starting in Junos OS Release 18.1R2, the multi-rate speed is supported on EX2300-48MP and EX2300-24MP switches.

Related Documentation

- *Configuring the Interface Speed*
- *Configuring the Interface Speed on Ethernet Interfaces*
- *Configuring Gigabit Ethernet Autonegotiation*
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- **auto-negotiation on page 405**
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- *Junos OS Network Interfaces Library for Routing Devices*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Junos OS Ethernet Interfaces Configuration Guide*

traps

Syntax (traps | no-traps);

Hierarchy Level (ACX Series, MX Series, T Series, M Series, SRX Series, EX Series)

[edit dynamic-profiles *profile-name* interfaces *interface-name*],
[edit interfaces *interface-name*],
[edit interfaces *interface-name* unit *logical-unit-number*],
[edit interfaces interface-range *name*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Hierarchy Level (QFX Series, EX4600)

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

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 Metro Routers.
Support at the **[edit dynamic-profiles *profile-name* interfaces*interface-name*]** hierarchy level introduced in Junos OS Release 15.1R3 on MX Series routers for enhanced subscriber management.

Description

Enable or disable the sending of Simple Network Management Protocol (SNMP) notifications when the state of the connection changes.

(Enhanced subscriber management for MX Series routers) To enable SNMP notifications, you must first configure the **interface-mib** statement at the **[edit dynamic-profiles *profile-name* interfaces *interface-name*]** hierarchy level. If **interface-mib** is not configured, the **traps** statement has no effect.

BEST PRACTICE: **To achieve maximum performance when enhanced subscriber management is enabled, we recommend that you *not* enable SNMP notifications on all dynamic subscriber interfaces.**

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 on page 56
- Enabling or Disabling SNMP Notifications on Logical Interfaces on page 57

unidirectional

Syntax unidirectional;

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

Release Information Statement introduced in Junos OS Release 8.5.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Create two new, unidirectional (transmit-only and receive-only) physical interfaces subordinate to the original parent interface. Unidirectional links are currently supported only on 10-Gigabit Ethernet interfaces on the following hardware:

- 4-port 10-Gigabit Ethernet DPC on the MX960 router
- 10–Gigabit Ethernet IQ2 PIC and 10–Gigabit Ethernet IQ2E PIC on the T Series router

Default Disabled.

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

Related Documentation

- *Understanding Unidirectional Traffic Flow on Physical Interfaces*
- *Enabling Unidirectional Traffic Flow on Physical Interfaces*

unit

Syntax

The **ethernet-switching** and **fibre-channel** statements and all of their substatements are not supported on OCX Series switches.

```
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 (QFX Series) *interface-name*],
[edit interfaces (QFX Series) interface-range *interface-range-name*]

Release Information

Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

NOTE: **The ethernet-switching and fibre-channel statements and all of their substatements are not supported on OCX Series switches.**

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. See CLI Explorer.

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

Related Documentation

- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring Link Aggregation on page 153
- *Junos OS Network Interfaces Library for Routing Devices*

CHAPTER 23

Configuration Statements: Gigabit Ethernet Interfaces

- container-devices on page 481
- craft-lockout on page 482
- no-neighbor-learn on page 483

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*

no-neighbor-learn

Syntax

```
no-neighbor-learn {
  accounting {
    destination-class-usage;
    source-class-usage direction;
  }
  address address;
  dhcp{
    client-identifier (ascii ascii | hexadecimal hexadecimal);
    lease-time (seconds | infinte);
    retransmission-attempt  number;
    retransmission-interval seconds;
    server-address ip-address;
    update-server;
    vendor-id vendor-id;
  }
  filter {
    input filter-name;
    output filter-name;
  }
  mtu bytes;
  no-redirects;
  primary;
  rpf-check;
  targeted-broadcast;
}
```

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

Description Disable neighbor address learning on this interface for all addresses or for the named address.

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

Related Documentation

- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Routed VLAN Interfaces on Switches (CLI Procedure)*

CHAPTER 24

Configuration Statements: OTN Interfaces

- alarm low-light-alarm on page 486
- encoding on page 487
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alarm low-light-alarm

Syntax

```
alarm low-light–alarm {
  (link-down | syslog);
}
```

Hierarchy Level

[edit interfaces *interface-name* optics-options]

Release Information

Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX 10016 switches.
Statement introduced in Junos OS Release 18.2R1 for PTX10K-LC1104 on the PTX10008 and PTX10016 routers.
Statement introduced in Junos OS Release 18.2R1 for PTX10K-LC1105 on the PTX10008 routers.

Description

Specify the action to take if the receiving optics signal is below the optics low-light alarm threshold.

Options

link-down—Drop the 10-Gigabit Ethernet link and marks link as down.

syslog—Write the optics information to the system log.

Required Privilege Level

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

Related Documentation

- *Configuring 10-Gigabit Ethernet Link Down Notification for Optics Options Alarm or Warning*
- *100-Gigabit Ethernet OTN Options Configuration Overview*

encoding

Syntax encoding (differential | non-differential);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches. Statement introduced in Junos OS Release 18.3R1 for PTX10K-LC1104 on the PTX10008 and PTX10016 routers.

Description Specify the encoding mode.

Options **differential**—Differential phase line encoding.

non-differential—Non-differential phase line encoding.

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

Related Documentation

- *Configuring 10-Gigabit Ethernet Link Down Notification for Optics Options Alarm or Warning*
- *100-Gigabit Ethernet OTN Options Configuration Overview*

fec

Syntax fec (efec | gfec | gfec-sdfec |hgfec | sd-fec | ufec | none);

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Enable forward error correction (FEC) mode.

Default The default value is **gfec**.

Options efec—Enhanced forward error correction (EFEC) is configured to detect and correct bit errors. This mode is supported only on 10G ports and not supported on the 40G and 100G ports.

gfec—Gneric forward error correction (GFEC) mode is configured to detect and correct bit errors.

gfec-sdfec—GFEC and soft-decision forward error correction (SD-FEC) modes are configured to detect and correct bit errors.

hgfec—High gain forward error correction mode is configured to detect and correct bit errors.

sdfec—Soft-decision forward error correction mode is configured to detect and correct bit errors.

none—FEC mode is not configured.

ufec—Ultra Forward Error Correction (UFEC) mode is configured to detect and correct bit errors. This mode is supported only on 10G ports and not supported on the 40G and 100G ports.

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

Related Documentation

- *10-Gigabit Ethernet OTN Options Configuration Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*
- *Understanding Pre-FEC BER Monitoring and BER Thresholds*

laser-enable

Syntax (laser-enable | no-laser-enable);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Specify whether lasers are enabled or disabled.

Default If you omit the laser-enable statement, lasers are disabled.

Options **laser-enable**—Enable lasers.

no-laser-enable—Do not enable lasers.

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

Related Documentation

- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

line-loopback

Syntax (line-loopback-enable | no-line-loopback);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Specify whether line-loopback is enabled or disabled.

Default If you omit the line-loopbback-enable statement, line-loopback is disabled.

Options **line-loopback-enable**—Enable line-loopback.

no-line-loopback—Disable line-loopback.

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

Related Documentation

- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

link-adjacency-loss

Syntax link-adjacency-loss;

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile event]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure **loss of adjacency** event with the IEEE 802.3ah link fault management (LFM) peer. When included, the loss of adjacency event triggers the action specified under the action statement.

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

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

link-discovery

Syntax link-discovery (active | passive);

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Specify the discovery mode used for IEEE 802.3ah Operation, Administration, and Maintenance (OAM) link fault management (LFM) support. The discovery process is triggered automatically when OAM 802.3ah functionality is enabled on an interface. Link monitoring is done when the interface sends periodic OAM PDUs.

Options *active*—In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality.

passive—In passive mode, the peer initiates the discovery process.

Once the discovery process is initiated, both sides participate in discovery.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

link-down

Syntax link-down;

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile action]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Mark the interface as down for transit traffic.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

link-event-rate

Syntax

```
link-event-rate {
  frame-error count;
  frame-period count;
  frame-period-summary count;
  symbol-period count;
}
```

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile event]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the number of link fault management (LFM) events per second.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

link-fault-management

Syntax

```
link-fault-management {
  action-profile profile-name;
    action {
      syslog;
      link-down;
    }
    event {
      link-adjacency-loss;
      link-event-rate {
        frame-error count;
        frame-period count;
        frame-period-summary count;
        symbol-period count;
      }
    }
  interface interface-name {
    link-discovery (active | passive);
    pdu-interval interval;
    pdu-threshold threshold-value;
    remote-loopback;
    event-thresholds {
      frame-errorcount;
      frame-period count;
      frame-period-summary count;
      symbol-period count;
    }
    negotiation-options {
      allow-remote-loopback;
      no-allow-link-events;
    }
  }
}
```

Hierarchy Level [edit protocols oam ethernet]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure Ethernet OAM link fault management (LFM) for all interfaces or for specific interfaces.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

modulation-format

Syntax modulation-format (qpsk | 8qam | 16qam);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.
Statement introduced in Junos OS Release 18.3R1 for PTX10K-LC1104 on the PTX10008 and PTX10016 routers.

Description Specify the modulation format.

Options **qpsk**—Quadrature Phase Shift Keying modulation format.

8qam—8 quadrature amplitude modulation format.

16qam—16 quadrature amplitude modulation.

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

Related Documentation

- *Configuring 10-Gigabit Ethernet Link Down Notification for Optics Options Alarm or Warning*
- *100-Gigabit Ethernet OTN Options Configuration Overview*

optics-options

Syntax

```
alarm low-light-alarm {
  (link-down | syslog);
  }
tca tca-identifier (enable-tca | no-enable-tca) (threshold number | threshold-24hrs number);
tx-power dbm;
warning low-light-warning {
  (link-down | syslog);
}
wavelength nm;
```

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description For 10-Gigabit Ethernet or 100-Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces only, configure full C-band International Telecommunication Union (ITU)-Grid tunable optics.

Options The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *Ethernet DWDM Interface Wavelength Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*

prbs

Syntax (prbs | no-prbs);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Specify whether OTN payload Pseudo-Random Binary Sequence (PBRS) is enabled or disabled.

Default By default, OTN payload prbs is disabled.

Options **prbs**—Enable OTN payload PBRS.

no-prbs—Disable OTN payload PBRS.

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

Related Documentation

- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

preemptive-fast-reroute

Syntax

```
preemptive-fast-reroute {
   (backward-frr-enable | no-backward-frr-enable);
   (signal-degrade-monitor-enable | no-signal-degrade-monitor-enable);
   (odu-backward-frr-enable | no-odu-backward-frr-enable);
   (odu-signal-degrade-monitor-enable |no-odu-signal-degrade-monitor-enable);
}
```

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX 10016 switches.

Description Enable or disable preemptive fast reroute options.

Default By default, backward fast reroute insertion and signal degradation monitoring are disabled.

Options The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *10-Gigabit Ethernet OTN Options Configuration Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

signal-degrade

Syntax

```
signal-degrade {
  ber-threshold-clear value;
  ber-threshold-signal-degrade value;
  interval value;
}
```

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX 10016 switches.

Description Specify bit error rate (BER) signal degradation thresholds and time interval for raising and clearing alarms for optical transport network (OTN) links.

Default If you omit the **signal-degrade** statement, the default threshold values are used.

Options The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *10-Gigabit Ethernet OTN Options Configuration Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

tca

Syntax

tca *tca-identifier* (enable-tca | no-enable-tca) (threshold *number* | threshold-24hrs *number*)

Hierarchy Level

[edit interfaces *interface-name* optics-options]

[edit interfaces *interface-name* otn-options]

Release Information

Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description

TCAs can give the management system an early indication as to the state of the associated entity when it crosses a certain threshold. TCAs can be set for both minimum and maximum values for gauges and only maximum values for counters. The timely detection of TCAs is essential to proactively manage the interface. TCAs are not an indication of a fault, but rather an indication that the entity may be close to a fault. You can choose which TCAs you want monitored by enabling the TCA. You can either keep the default threshold settings or change the settings.

Enable threshold crossing alerts (TCAs) for the following:

- Laser power
- Laser temperature

Default

By default, TCAs are not enabled.

Options

tca-identifier —At the optics-options hierarchy level, it can be one of the following:

- **carrier-frequency-offset-high-tca**—Carrier frequency high threshold setting trigger
- **carrier-frequency-offset-low-tca**—Carrier frequency low threshold setting trigger
- **rx-power-high-tca**—Rx power high threshold setting trigger
- **rx-power-low-tca**—Rx power low threshold setting trigger
- **temperature-high-tca**—Temperature high threshold setting trigger
- **temperature-low-tca**—Temperature low threshold setting trigger
- **tx-power-high-tca**—Tx power high threshold setting trigger
- **tx-power-low-tca**—Tx power low threshold setting trigger

enable-tca | no-enable-tca—To enable or disable the threshold crossing alert.

threshold | threshold-24hrs:

- threshold *number*—Set the 15-minute interval threshold.
- threshold-24hrs *number*—Set the 24-hour interval threshold.

Required Privilege Level

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

Related Documentation

- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*
- optics-options on page 567

trigger

Syntax trigger *trigger-identifier* (hold-time *hold-time-value* | ignore);

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX 10016 switches.

Description Specify defect triggers.

Default By default, triggers are ignored.

Options *trigger-identifier*—Trigger identifier. It can be one of the following:

- **oc-lof**—Optical channel Loss of Frame defect trigger.
- **oc-lom**—Optical channel Loss of Multiframe defect trigger.
- **oc-los**—Optical channel Loss of Signal defect trigger.
- **oc-tsf**—Optical channel TOE security functionality (TSF) defect trigger.
- **oc-wavelength-lock**—Optical channel Wavelength Lock defect trigger.
- **odu-ais**—ODU Alarm Indication Signal defect trigger.
- **odu-bdi**—ODU Backward Defect Indication defect trigger.
- **odu-bei**—ODU Backward Error Indication defect trigger.
- **odu-iae**—ODU IAE defect trigger.
- **odu-lck**—ODU Locked defect trigger.
- **odu-oci**—ODU Open Connection Indication defect trigger.
- **odu-sd**—ODU Signal Degrade defect trigger.
- **odu-ttim**—ODU Trail Trace Identifier Mismatch defect trigger.
- **opu-ptim**—Payload Type Identifier Mismatch defect trigger.
- **otu-ais**—OTU Alarm Indication Signal defect trigger.
- **otu-bdi**—OTU Backward Defect Indication defect trigger.
- **otu-fec-deg**—OTU FEC Degrade defect trigger.
- **otu-fec-exe**—OTU FEC Excessive Error defect trigger.
- **otu-iae**—OTU Incoming Alignment defect trigger.

hold-time *hold-time-value*—Hold time value. It can be one of the following:

- **down**—Delay before marking interface down when defect occurs (1..65534 milliseconds).

- **up**—Delay before marking interface up when defect is absent (1..65534 milliseconds).

NOTE: **The trigger hold time value alone does not mark an interface to be up when the defect is absent or mark an interface to be down when the defect occurs. The hold time value only impacts the alarm reporting time. To mark an interface up or down, you must also configure the physical interface hold time at the [edit interfaces *interface-name* hierarchy level].**

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

Related Documentation
- *10-Gigabit Ethernet OTN Options Configuration Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Configuring 100-Gigabit DWDM OTN PICs*

tx-power

Syntax tx-power *dbm*;

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Transmit laser output power (dBm).

Default If you don't specify a value, the default transmit laser output power is –2 dBm.

Options *dbm*—Transmit power value.

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

Related Documentation
- *Ethernet DWDM Interface Wavelength Overview*
- optics-options on page 567
- *100-Gigabit Ethernet OTN Options Configuration Overview*

warning

Syntax

```
warning low-light-warning {
  (link-down | syslog);
}
```

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

Release Information Statement introduced in Junos OS Release 17.2R1 for QFX10008 and QFX10016 switches.

Description Specifies the action to take if the receiving optics signal is below the optics low-light warning threshold.

Options **link-down**—Drop the 10-Gigabit Ethernet link and marks link as down.

syslog—Write the optics information to the system log.

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

Related Documentation

- *Configuring 10-Gigabit Ethernet Link Down Notification for Optics Options Alarm or Warning*
- optics-options on page 567
- *100-Gigabit Ethernet OTN Options Configuration Overview*

wavelength

Syntax wavelength *nm*;

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

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 PTX Series routers.

Description For 10-Gigabit or 100-Gigabit Ethernet DWDM interfaces only, configure full C-band ITU-Grid tunable optics.

Options *nm*—Wavelength value. It can be one of the following:

NOTE: **All values are displayed. However, if you configure a value that is not supported by the device, an error message is displayed and the device is not tuned to the specified wavelength.**

- **1528.38**—1528.38 nanometers (nm), corresponds to a 50-GHz grid
- **1528.77**—1528.77 nm, corresponds to 50-GHz and 100-GHz grids
- **1529.16**—1529.16 nm, corresponds to a 50-GHz grid
- **1529.55**—1529.55 nm, corresponds to 50-GHz and 100-GHz grids
- **1529.94**—1529.94 nm, corresponds to a 50-GHz grid
- **1530.33**—1530.33 nm, corresponds to 50-GHz and 100-GHz grids
- **1530.72**—1530.72 nm, corresponds to a 50-GHz grid
- **1531.12**—1531.12 nm, corresponds to 50-GHz and 100-GHz grids
- **1531.51**—1531.51 nm, corresponds to a 50-GHz grid
- **1531.90**—1531.90 nm, corresponds to 50-GHz and 100-GHz grids
- **1532.29**—1532.29 nm, corresponds to a 50-GHz grid
- **1532.68**—1532.68 nm, corresponds to 50-GHz and 100-GHz grids
- **1533.07**—1533.07 nm, corresponds to a 50-GHz grid
- **1533.47**—1533.47 nm, corresponds to 50-GHz and 100-GHz grids
- **1533.86**—1533.86 nm, corresponds to a 50-GHz grid
- **1534.25**—1534.25 nm, corresponds to 50-GHz and 100-GHz grids
- **1534.64**—1534.64 nm, corresponds to a 50-GHz grid

- **1535.04**—1535.04 nm, corresponds to 50-GHz and 100-GHz grids
- **1535.43**—1535.43 nm, corresponds to a 50-GHz grid
- **1535.82**—1535.82 nm, corresponds to 50-GHz and 100-GHz grids
- **1536.22**—1536.22 nm, corresponds to a 50-GHz grid
- **1536.61**—1536.61 nm, corresponds to 50-GHz and 100-GHz grids
- **1537.00**—1537.00 nm, corresponds to a 50-GHz grid
- **1537.40**—1537.40 nm, corresponds to 50-GHz and 100-GHz grids
- **1537.79**—1537.79 nm, corresponds to a 50-GHz grid
- **1538.19**—1538.19 nm, corresponds to 50-GHz and 100-GHz grids
- **1538.58**—1538.58 nm, corresponds to a 50-GHz grid
- **1538.98**—1538.98 nm, corresponds to 50-GHz and 100-GHz grids
- **1539.37**—1539.37 nm, corresponds to a 50-GHz grid
- **1539.77**—1539.77 nm, corresponds to 50-GHz and 100-GHz grids
- **1540.16**—1540.16 nm, corresponds to a 50-GHz grid
- **1540.56**—1540.56 nm, corresponds to 50-GHz and 100-GHz grids
- **1540.95**—1540.95 nm, corresponds to a 50-GHz grid
- **1541.35**—1541.35 nm, corresponds to 50-GHz and 100-GHz grids
- **1541.75**—1541.75 nm, corresponds to a 50-GHz grid
- **1542.14**—1542.14 nm, corresponds to 50-GHz and 100-GHz grids
- **1542.54**—1542.54 nm, corresponds to a 50-GHz grid
- **1542.94**—1542.94 nm, corresponds to 50-GHz and 100-GHz grids
- **1543.33**—1543.33 nm, corresponds to a 50-GHz grid
- **1543.73**—1543.73 nm, corresponds to 50-GHz and 100-GHz grids
- **1544.13**—1544.13 nm, corresponds to a 50-GHz grid
- **1544.53**—1544.53 nm, corresponds to 50-GHz and 100-GHz grids
- **1544.92**—1544.92 nm, corresponds to a 50-GHz grid
- **1545.32**—1545.32 nm, corresponds to 50-GHz and 100-GHz grids
- **1545.72**—1545.72 nm, corresponds to a 50-GHz grid
- **1546.12**—1546.12 nm, corresponds to 50-GHz and 100-GHz grids
- **1546.52**—1546.52 nm, corresponds to a 50-GHz grid
- **1546.92**—1546.92 nm, corresponds to 50-GHz and 100-GHz grids
- **1547.32**—1547.32 nm, corresponds to a 50-GHz grid
- **1547.72**—1547.72 nm, corresponds to 50-GHz and 100-GHz grids

- **1548.11**—1548.11 nm, corresponds to a 50-GHz grid
- **1548.51**—1548.51 nm, corresponds to 50-GHz and 100-GHz grids
- **1548.91**—1548.91 nm, corresponds to a 50-GHz grid
- **1549.32**—1549.32 nm, corresponds to 50-GHz and 100-GHz grids
- **1549.72**—1549.72 nm, corresponds to a 50-GHz grid
- **1550.12**—1550.12 nm, corresponds to 50-GHz and 100-GHz grids
- **1550.52**—1550.52 nm, corresponds to a 50-GHz grid
- **1550.92**—1550.92 nm, corresponds to 50-GHz and 100-GHz grids
- **1551.32**—1551.32 nm, corresponds to a 50-GHz grid
- **1551.72**—1551.72 nm, corresponds to 50-GHz and 100-GHz grids
- **1552.12**—1552.12 nm, corresponds to a 50-GHz grid
- **1552.52**—1552.52 nm, corresponds to 50-GHz and 100-GHz grids
- **1552.93**—1552.93 nm, corresponds to a 50-GHz grid
- **1553.33**—1554.33 nm, corresponds to 50-GHz and 100-GHz grids
- **1553.73**—1554.73 nm, corresponds to a 50-GHz grid
- **1554.13**—1554.13 nm, corresponds to 50-GHz and 100-GHz grids
- **1554.54**—1554.54 nm, corresponds to a 50-GHz grid
- **1554.94**—1554.94 nm, corresponds to 50-GHz and 100-GHz grids
- **1555.34**—1555.34 nm, corresponds to a 50-GHz grid
- **1555.75**—1555.75 nm, corresponds to 50-GHz and 100-GHz grids
- **1556.15**—1556.15 nm, corresponds to a 50-GHz grid
- **1556.55**—1556.55 nm, corresponds to 50-GHz and 100-GHz grids
- **1556.96**—1556.96 nm, corresponds to a 50-GHz grid
- **1557.36**—1557.36 nm, corresponds to 50-GHz and 100-GHz grids
- **1557.77**—1557.77 nm, corresponds to a 50-GHz grid
- **1558.17**—1558.17 nm, corresponds to 50-GHz and 100-GHz grids
- **1558.58**—1558.58 nm, corresponds to a 50-GHz grid
- **1558.98**—1558.98 nm, corresponds to 50-GHz and 100-GHz grids
- **1559.39**—1559.39 nm, corresponds to a 50-GHz grid
- **1559.79**—1559.79 nm, corresponds to 50-GHz and 100-GHz grids
- **1560.20**—1560.20 nm, corresponds to a 50-GHz grid
- **1560.61**—1560.61 nm, corresponds to 50-GHz and 100-GHz grids
- **1561.01**—1561.01 nm, corresponds to a 50-GHz grid

- **1561.42**—1561.42 nm, corresponds to 50-GHz and 100-GHz grids
- **1561.83**—1561.83 nm, corresponds to a 50-GHz grid
- **1562.23**—1562.23 nm, corresponds to 50-GHz and 100-GHz grids
- **1562.64**—1562.64 nm, corresponds to a 50-GHz grid
- **1563.05**—1563.05 nm, corresponds to 50-GHz and 100-GHz grids
- **1563.45**—1563.45 nm, corresponds to a 50-GHz grid
- **1563.86**—1563.86 nm, corresponds to 50-GHz and 100-GHz grids
- **1564.27**—1564.27 nm, corresponds to a 50-GHz grid
- **1564.68**—1564.68 nm, corresponds to 50-GHz and 100-GHz grids
- **1565.09**—1565.09 nm, corresponds to a 50-GHz grid
- **1565.50**—1565.50 nm, corresponds to 50-GHz and 100-GHz grids
- **1565.90**—1565.90 nm, corresponds to a 50-GHz grid
- **1566.31**—1566.31 nm, corresponds to 50-GHz and 100-GHz grids
- **1566.72**—1566.72 nm, corresponds to a 50-GHz grid
- **1567.13**—1567.13 nm, corresponds to 50-GHz and 100-GHz grids
- **1567.54**—1567.54 nm, corresponds to a 50-GHz grid
- **1567.95**—1567.95 nm, corresponds to 50-GHz and 100-GHz grids
- **1568.36**—1568.36 nm, corresponds to a 50-GHz grid
- **1568.77**—1568.77 nm, corresponds to 50-GHz and 100-GHz grids

Default: 1550.12—1550.12 nm, corresponds to 50-GHz and 100-GHz grids

Required Privilege Level

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

Related Documentation

- *Ethernet DWDM Interface Wavelength Overview*
- *Configuring the 10-Gigabit or 100-Gigabit Ethernet DWDM Interface Wavelength*
- *show interfaces diagnostics optics (Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, 100-Gigabit Ethernet, and Virtual Chassis Port)*

CHAPTER 25

Configuration Statements: Aggregated Ethernet Interfaces

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802.3ad

Syntax (EX Series)

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

Syntax (NFX, OCX, and QFX Series)

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

Hierarchy Level (EX Series)

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

Hierarchy Level (NFX, OCX, and QFX Series)

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

Release Information

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 14.1X53-D20 for the OCX Series.

Description

Specify the aggregated Ethernet logical interface number.

NOTE:

- The port-priority statement is not supported on QFabric systems.
- The force-up statement is not supported on QFX10002 switches.

Options

- ae*x*—Name of the LAG. Aggregated Ethernet logical interface number.
- backup—Designate the interface as the backup interface for link-protection mode.
- primary—Designate the interface as the primary interface for link-protection mode.

The remaining statements are described separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- Example: Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Interfaces on EX8200 Switches on page 174
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
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- Configuring Link Aggregation on page 153
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- Troubleshooting an Aggregated Ethernet Interface on page 394
- *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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 *Configurable PIC Alarm Conditions*.

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*

aggregated-devices

List of Syntax

Syntax (EX Series) on page 514
Syntax (QFX Series, EX4600, OCX1100, NFX Series) on page 514

Syntax (EX Series)

```
aggregated-devices {
  ethernet (Aggregated Devices) {
    device-count number;
    lacp
  }
}
```

Syntax (QFX Series, EX4600, OCX1100, NFX Series)

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

Hierarchy Level (EX Series, QFX Series)

[edit chassis (EX Series)]

Release Information

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 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 14.2R3

Description

Configure properties for aggregated devices on the switch.

The remaining statements are explained separately. See CLI Explorer.

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 for Switches on page 92
- Configuring Link Aggregation on page 153
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- *Junos OS Network Interfaces Library for Routing Devices*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96

- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Understanding Aggregated Ethernet Interfaces and LACP*
- *Junos OS Ethernet Interfaces Configuration Guide*

aggregated-ether-options

List of Syntax

Syntax (EX, MX Series) on page 516
Syntax (NFX, QFX Series, EX4600, OCX1100, QFabric) on page 516

Syntax (EX, MX Series)

```
aggregated-ether-options {
  ethernet-switch-profile {
    tag-protocol-id;
  }
  (flow-control | no-flow-control);
  lacp {
    (active | passive);
    admin-key key;
    periodic interval;
    system-id mac-address;
  }
  (link-protection | no-link-protection);
  link-speed speed;
  local-bias;
  logical-interface-fpc-redundancy;
  (loopback | no-loopback);
  mc-ae {
    chassis-id chassis-id;
    events {
      iccp-peer-down {
        force-icl-down;
        prefer-status-control-active;
      }
    }
    init-delay-time seconds;
    mc-ae-id mc-ae-id;
    mode (active-active | active-standby);
    redundancy-group group-id;
    revert-time revert-time;
    status-control (active | standby);
    switchover-mode (non-revertive |revertive);
  }
  minimum-links number;
  system-priority
}
```

Syntax (NFX, QFX Series, EX4600, OCX1100, QFabric)

The **fcoe-lag** and **mc-ae** statements are not supported on OCX Series switches.

```
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;
        force-up;
        }
    }
    (link-protection | no-link-protection);
    link-speed speed;
    local-bias;
    local-minimum-links-threshold threshold-value;
    (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;
    resilient-hash;
    source-address-filter filter;
    (source-filtering | no-source-filtering);
}
```

Hierarchy Level (EX Series, QFX Series)

[edit interfaces ae*x*]

Release Information

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 12.3R2.
Statements **fcoe-lag** and **no-fcoe-lag** introduced in Junos OS Release 13.2X52-D10 for the QFX Series.
Statements **force-up**, **lacp**, and **resilient-hash** introduced in Junos OS Release 14.1X53-D10 for the QFX Series.
Statement **local-minimum-links-threshold** introduced in Junos OS Release 14.1X53-D40 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure the aggregated Ethernet properties of a specific aggregated Ethernet interface.

NOTE:

- The **fcoe-lag** and **mc-ae** statements are not supported on OCX Series switches.
- The **force-up** statement is not supported on QFX10002 switches.
- The **resilient-hash** statement is not supported on QFX10002 switches.

The remaining statements are explained separately. See CLI Explorer.

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 for Switches on page 92
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184
- *Junos OS Network Interfaces Library for Routing Devices*
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Configuring Q-in-Q Tunneling on EX Series Switches with ELS Support (CLI Procedure)*
- *Junos OS Ethernet Interfaces Configuration Guide*

backup-liveness-detection

Syntax

```
backup-liveness-detection {
  backup-peer-ip ipv4-address;
}
```

Hierarchy Level [edit protocols iccp peer]

Release Information

Statement introduced in Junos OS Release 12.2 for the QFX Series.
Statement introduced in Junos OS Release 13.2R1 for EX Series switches.
Statement introduced in Junos OS Release 15.2R1 for MX Series routers.

Description

Determine whether a peer is up or down by exchanging keepalive messages over the management link between the two Inter-Chassis Control Protocol (ICCP) peers.

When an ICCP connection is operationally down, the status of the peers hosting a multichassis link aggregation group (MC-LAG) is detected by sending liveness detection requests to each other. Peers must respond to liveness detection requests within a specified amount of time. If the responses are not received within that time for a given number of consecutive attempts, the liveness detection check fails, and a failure action is implemented. Backup liveness detection must be configured on both peers hosting the MC-LAG.

The remaining statement is explained separately. See CLI Explorer.

NOTE: **If backup liveness detection is configured, the peer status is always up when either the ICCP TCP Connection is established, or Bidirectional Forwarding Protocol (BFD) is configured and the peer is up. The backup liveness check is only performed when the ICCP connection is down.**

Required Privilege Level

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

Related Documentation

- *Configuring Multichassis Link Aggregation on MX Series Routers*

backup-peer-ip

Syntax backup-peer-ip *ipv4-address*;

Hierarchy Level [edit protocols iccp peer backup-liveness-detection]

Release Information Statement introduced in Junos OS Release 12.2 for the QFX Series.
Statement introduced in Junos OS Release 13.2R1 for EX Series switches.

Description Specify the IP address of the peer being used as a backup peer in the Bidirectional Forwarding Detection (BFD) configuration.

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

bfd-liveness-detection (LAG)

Syntax

```
bfd-liveness-detection {
  authentication {
    algorithm algorithm-name;
    key-chain key-chain-name;
    loose-check;
  }
  detection-time {
    threshold milliseconds;
  }
  holddown-interval milliseconds;
  local-address bfd-local-address;
  minimum-interval milliseconds;
  minimum-receive-interval milliseconds;
  multiplier number;
  neighbor bfd-neighbor-address;
  no-adaptation;
  transmit-interval {
    minimum-interval milliseconds;
    threshold milliseconds;
  }
  version (1 | automatic);
}
```

Hierarchy Level **[edit interfaces aex aggregated-ether-options]**

Release Information Statement introduced in Junos OS Release 13.3.

Description Configure Bidirectional Forwarding Detection (BFD) timers and authentication for aggregated Ethernet interfaces.

Options

holddown-interval *milliseconds*— Specify a time limit, in milliseconds, indicating the time that a BFD session remains up before a state change notification is sent. If the BFD session goes down and then comes back up during the hold-down interval, the timer is restarted.

Range: 0 through 255,000

Default: 0

local-address *bfd-local-address*— Specify the loopback address or the AE interface address of the source of the BFD session.

NOTE: Beginning with Release 16.1R2, Junos OS checks and validates the configured micro BFD **local-address** against the interface or loopback IP address before the configuration commit. Junos OS performs this check on both IPv4 and IPv6 micro BFD address configurations, and if they do not match, the commit fails.

minimum-interval ***milliseconds***— Specify a minimum time interval after which the local routing device transmits a BFD packet and then expects to receive a reply from the BFD neighbor. Optionally, instead of using this statement, you can configure the minimum transmit and receive intervals separately using the **transmit-interval minimum-interval** statement.

Range: 1 through 255,000

minimum-receive-interval ***milliseconds***— Specify the minimum time interval after which the routing device expects to receive a reply from the BFD neighbor.

Range: 1 through 255,000

multiplier ***number***— Specify the number of BFD packets that were not received by the BFD neighbor before the originating interface is declared down.

Range: 1 through 255

neighbor ***bfd-neighbor-address***— Specify the loopback address or the AE interface address of a remote destination to send BFD packets.

no-adaptation— Disable the BFD adaptation. Include this statement if you do not want the BFD sessions to adapt to changing network conditions. We recommend that you do not disable BFD adaptation unless it is preferable not to have BFD adaptation enabled in your network.

version— Configure the BFD version to detect (BFD version 1) or autodetect (the BFD version).

NOTE: **The version option is not supported on the QFX Series.**

Default: automatic

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *authentication*
- *detection-time*
- *transmit-interval*
- Configuring Independent Micro BFD Sessions for LAG on page 115
- *Example: Configuring Independent Micro BFD Sessions for LAG*
- Understanding Independent Micro BFD Sessions for LAG on page 112

chassis (EX Series)

Syntax

```
chassis {
  aggregated-devices {
    ethernet (Aggregated Devices) {
      device-count number;
    }
  }
  auto-image-upgrade;
  fpc slot {
    pic pic-number {
      sfpplus {
        pic-mode mode;
      }
    }
    power-budget-priority priority;
  }
  lcd-menu {
    fpc slot-number {
      menu-item (menu-name | menu-option) {
        disable;
      }
    }
  }
  nssu {
    upgrade-group group-name {
      fpcs (NSSU Upgrade Groups) (slot-number | [list-of-slot-numbers]);
      member (NSSU Upgrade Groups) member-id {
        fpcs (NSSU Upgrade Groups) (slot-number | [list-of-slot-numbers]);
      }
    }
  }
  psu {
    redundancy {
      n-plus-n (Power Management);
    }
  }
  redundancy {
    graceful-switchover;
  }
}
```

Hierarchy Level [edit]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure chassis-specific properties for the switch.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- *Upgrading Software by Using Automatic Software Download for Switches*
- *Configuring the LCD Panel on EX Series Switches (CLI Procedure)*
- *Configuring Graceful Routing Engine Switchover in a Virtual Chassis (CLI Procedure)*
- *Configuring Power Supply Redundancy (CLI Procedure)*
- *Configuring Line-Card Upgrade Groups for Nonstop Software Upgrade (CLI Procedure)*

chassis (QFabric System)

Syntax

```
chassis {
  interconnect-device {
    alarm {
      (ethernet (Alarm) | management-ethernet) {
        link-down (red | yellow | ignore);
      }
    }
    container-devices {
      device-count number;
    }
    craft-lockout {
      alarm {
        interface-type {
          link-down (red | yellow | ignore);
        }
      }
      container-devices {
        device-count number;
      }
      fpc slot {
        power (on | off);
      }
      routing-engine {
        on-disk-failure {
          disk-failure-action (halt | reboot);
        }
      }
    }
    fpc slot {
      power (on | off);
    }
    routing-engine {
      on-disk-failure {
        disk-failure-action (halt | reboot);
      }
    }
  }
  node-group name {
    aggregated-devices {
      ethernet {
        device-count number;
      }
    }
    alarm {
      interface-type {
        link-down (ignore | red | yellow);
      }
    }
    container-devices {
      device-count number;
    }
    node-device name {
```

```
          fibre-channel {
            port-range {
              port-range-low port-range-high;
            }
          }
          pic pic-number {
            fte {
              port port-number;
              port-range port-range-low port-range-high;
            }
            xe {
              port port-number;
              port-range port-range-low port-range-high;
            }
            xle {
              port port-number;
              port-range port-range-low port-range-high;
            }
          }
        }
        routing-engine {
          on-disk-failure {
            disk-failure-action (halt | reboot);
          }
        }
      }
    }
```

Hierarchy Level [edit]

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

Description Configure chassis-specific properties for the switch.

The remaining statements are explained separately. See CLI Explorer.

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

chassis (QFX Series)

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 14.2R3

Description Configure chassis-specific properties for the switch.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Understanding Link Aggregation and Link Aggregation Control Protocol in a Junos Fusion*
- Configuring Link Aggregation on page 153

device-count

Syntax (EX, NFX, QFX Series, EX4600, OCX1100, QFabric System)

device-count *number*;

Hierarchy Level (EX Series)

[edit chassis (EX Series) aggregated-devices ethernet (Aggregated Devices)]

Hierarchy Level (EX, NFX, QFX Series, EX4600, OCX1100, QFabric System)

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

Release Information

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Range updated in Junos OS Release 9.5 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 14.2R3

Description

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

Options

number—Maximum number of aggregated Ethernet logical interfaces on the switch.

Range: 1 through 32 for EX2200, EX3200, and standalone EX3300 switches and for EX3300 Virtual Chassis

Range: 1 through 64 for standalone EX4200, standalone EX4500, and EX6200 switches and for EX4200 and EX4500 Virtual Chassis

Range: 1 through 239 for EX8200 Virtual Chassis

Range: 1 through 255 for standalone EX8200 switches

Range: 1 through 480 for standalone EX9200 switches

Required Privilege Level

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

Related Documentation

- *Understanding Link Aggregation and Link Aggregation Control Protocol in a Junos Fusion*
- Configuring Link Aggregation on page 153
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- *Junos OS Network Interfaces Configuration Guide*

disable (Link Protection)

Syntax disable;

Hierarchy Level [edit interfaces ae*X* aggregated-ether-options lacp link-protection]

Release Information Statement introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 11.4 for EX Series switches.
Statement introduced in Junos OS Release 15.1F4 for PTX Series routers.

Description Disable LACP link protection on 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 LACP for Aggregated Ethernet Interfaces*
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

disk-failure-action

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

Hierarchy Level [edit chassis routing-engine on-disk-failure],
[edit chassis node-group *name* routing-engine on-disk-failure],
[edit chassis interconnect-device *name* routing-engine on-disk-failure]

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

Description Halt or reboot when the Routing Engine hard disk fails.

Options **halt**—Stop the Routing Engine.

reboot—Reboot the Routing Engine.

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*

disable (Multicast Load Balancing)

Syntax disable;

Hierarchy Level [edit chassis multicast-loadbalance]

Release Information Statement introduced in Junos OS Release 12.2 for EX Series switches.

Description (EX8200 switches only) Disable multicast load balancing. After you configure this statement and commit it, multicast load balancing no longer balances traffic on aggregated 10-gigabit Ethernet interfaces that are currently configured as well as those that are configured later.

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

Related Documentation

- *Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Links on EX8200 Switches (CLI Procedure)*

ether-options

Syntax

The **auto-negotation** and **speed** statements are not supported on the OCX Series.

```
ether-options {
  802.3ad aex {
    lacp {
      force-up;
      (primary |backup);
    }
  }
  (auto-negotiation| no-auto-negotiation);
  autostate-exclude
  configured-flow-control {
    rx-buffers (on | off);
    tx-buffers (on | off);
  }
  ethernet-switch-profile
    storm-control storm-control-profile;
  }
  (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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
autostate-exclude option introduced in Junos OS Release 14.1x53-D40 for QFX5100 switches only.

Description

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

NOTE: **The auto-negotation and speed statements are not supported on the OCX Series.**

The remaining statements are explained separately. See CLI Explorer.

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 for EX4600 and QFX Series Switches on page 69

- *Junos OS Network Interfaces Library for Routing Devices*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 14.2R3

Description

Configure properties for aggregated Ethernet devices on the switch.

The remaining statement is explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Understanding Link Aggregation and Link Aggregation Control Protocol in a Junos Fusion*
- Configuring Link Aggregation on page 153
- *Junos OS Network Interfaces Library for Routing Devices*

ethernet (Aggregated Devices)

Syntax

```
ethernet {
device-count number;
lacp {
  link-protection {
    non-revertive;
  }
  system-priority;
}
```

Hierarchy Level [edit chassis (EX Series) aggregated-devices]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.

Description Configure properties for Ethernet aggregated devices on the switch.

The remaining statement is explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Junos OS Ethernet Interfaces Configuration Guide*

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.

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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.

OCX Series switches do not support PFC.

- **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 410
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- *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 10.0 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 16.1 for EX9200 switches.

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 for Switches on page 92
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184
- *Junos OS Network Interfaces Library for Routing Devices*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Understanding Aggregated Ethernet Interfaces and LACP*
- *Junos OS Ethernet Interfaces Configuration Guide*

interconnect-device (Chassis)

Syntax

```
interconnect-device {
  alarm {
    (ethernet (Alarm) | management-ethernet) {
      link-down (red | yellow | ignore);
    }
  }
  container-devices {
    device-count number;
  }
  craft-lockout {
    alarm {
      interface-type {
        link-down (red | yellow | ignore);
      }
    }
    container-devices {
      device-count number;
    }
    fpc slot {
      power (on | off);
    }
    routing-engine {
      on-disk-failure {
        disk-failure-action (halt | reboot);
      }
    }
  }
  fpc slot {
    power (on | off);
  }
  routing-engine {
    on-disk-failure {
      disk-failure-action (halt | reboot);
    }
  }
}
```

Hierarchy Level [edit chassis]

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

Description Configure properties specific to a QFabric system Interconnect device.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *Understanding Interconnect Devices*

iccp

Syntax

```
iccp {
  authentication-key string;
  local-ip-addr local-ip-addr;
  peer ip-address{
    authentication-key string;
    backup-liveness-detection {
      backup-peer-ip ip-address;
    }
    liveness-detection {
      detection-time {
        threshold milliseconds;
      }
      minimum-interval milliseconds;
      minimum-receive-interval milliseconds;
      multiplier number;
      no-adaptation;
      transmit-interval {
        minimum-interval milliseconds;
        threshold milliseconds;
      }
      version (1 | automatic);
    }
    local-ip-addr ipv4-address;
    session-establishment-hold-time seconds;
  }
  session-establishment-hold-time seconds;
  traceoptions {
    file <filename> <files number> <match regular-expression> <microsecond-stamp>
      <size size> <world-readable | no-world-readable>;
    flag flag;
    no-remote-trace;
  }
}
```

Hierarchy Level [edit protocols]

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure Inter-Chassis Control Protocol (ICCP) between the multichassis link aggregation group (MC-LAG) peers. ICCP replicates forwarding information, validates configurations, and propagates the operational state of the MC-LAG members.

NOTE: Backup liveness detection is not supported on MX Series routers.

The remaining statements are explained separately. See CLI Explorer.

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

lacp (802.3ad)

Syntax

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

Hierarchy Level (EX Series)

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

[edit interfaces ae*X* aggregated-ether-options]

[edit chassis aggregated-devices ethernet]

Hierarchy Level (QFX Series)

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

Release Information

Statement introduced in Junos OS Release 10.0 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Support for LACP link protection introduced in Junos OS Release 11.4 for EX Series switches.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure the Link Aggregation Control Protocol (LACP) parameters for aggregated Ethernet interfaces on the global level (for all the aggregated Ethernet interfaces on the switch) or for a specific aggregated Ethernet interface.

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.

NOTE: The force-up statement is not supported on QFX10002 switches.

Required Privilege Level

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

Related Documentation

- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Example: Configuring Aggregated Ethernet High-Speed Uplinks with LACP Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 169

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Understanding Aggregated Ethernet Interfaces and LACP*
- *Junos OS Ethernet Interfaces Configuration Guide*
- Configuring Link Aggregation on page 153
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92

lacp (Aggregated Ethernet)

List of Syntax

Syntax (NFX Series) on page 543
Syntax (EX Series) on page 543

Syntax (NFX Series)

```
lacp (active | passive) {
  admin-key key;
  fast-failover;
  link-protection {
    disable;
    (revertive | non-revertive);
  }
  periodic interval
  system-ID mac-address;
  system-priority priority;
  force-up;
}
```

Syntax (EX Series)

```
lacp {
  (active | passive);
  admin-key key;
  accept-data;
  fast-failover;
    link-protection {
    disable;
    (revertive |non-revertive);
  }
  periodic interval;
  system-id mac-address;
  system-priority priority;
}
```

Hierarchy Level (EX Series)

[edit interfaces ae*x* aggregated-ether-options]
[edit logical-systems *logical-system-name* interfaces ae*X* aggregated-ether-options]

Hierarchy Level (NFX Series)

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

Release Information

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 14.1X53-D20 for the OCX Series.

Description

Configure the Link Aggregation Control Protocol (LACP) parameters for interfaces. The remaining statement is explained separately.

For EX Series, when you configure the **accept-data** statement at the **[edit interfaces ae*X* aggregated-ether-options lacp]** hierarchy level, the router processes packets received on a member link irrespective of the LACP state if the aggregated Ethernet bundle is up.

NOTE: When you configure the **accept-data** statement at the **[edit interfaces ae*X* aggregated-ether-options lacp]** hierarchy level, this behavior occurs:

- By default, the **accept-data** statement is not configured when LACP is enabled.
- You can configure the **accept-data** statement to improve convergence and reduce the number of dropped packets when member links in the bundle are enabled or disabled.
- When LACP is down and a member link receives packets, the router or switch does not process packets as defined in the IEEE 802.1ax standard. According to this standard, the packets should be dropped, but they are processed instead because the **accept-data** statement is configured.

NOTE: The force-up statement is not supported on QFX10002 switches.

Default If you do not specify LACP as either **active** or **passive**, LACP remains passive.

Options **active**—Initiate transmission of LACP packets.

admin-key ***number***—Specify an administrative key for the router or switch.

NOTE: You must also configure multichassis link aggregation (MC-LAG) when you configure the **admin-key**.

fast-failover—Specify to override the IEEE 802.3ad standard and allow the standby link to receive traffic. Overriding the default behavior facilitates subsecond failover.

passive—Respond to LACP packets.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Link Aggregation on page 153
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- *Configuring LACP for Aggregated Ethernet Interfaces*

link-down

Syntax link-down (red | yellow | ignore);

Hierarchy Level [edit chassis alarm ethernet (Alarm)],
[edit chassis alarm fibre-channel],
[edit chassis interconnect-device *name* alarm ethernet (Alarm)],
[edit chassis node-group *name* alarm fibre-channel]

Release Information Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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.

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 for EX4600 and QFX Series Switches on page 69
- *Junos OS Network Interfaces Library for Routing Devices*

link-protection

Syntax

```
link–protection {
  disable;
  (revertive |non-revertive);
}
```

Hierarchy Level

[edit interfaces ae*x* aggregated-ether-options]
[edit interfaces ae*x* aggregated-ether-options *lacp*]

Release Information

Statement introduced in Junos OS Release 8.3.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 15.1F4 for PTX Series routers.
Support for **disable**, **revertive**, and **non-revertive** statements added in Junos OS Release 9.3.

Description

On the router, for aggregated Ethernet interfaces only, configure link protection. In addition to enabling link protection, a primary and a secondary (backup) link must be configured to specify what links egress traffic should traverse. To configure primary and secondary links on the router, include the **primary** and **backup** statements at the **[edit interfaces ge-*fpc/pic/port* gigether-options 802.3ad ae*x*]** hierarchy level or the **[edit interfaces fe-*fpc/pic/port* fastether-options 802.3ad ae*x*]** hierarchy level.

On the switch, you can configure either Junos OS link protection for aggregated Ethernet interfaces or the LACP standards link protection for aggregated Ethernet interfaces.

For Junos OS link protection, specify **link-protection** at the following hierarchy levels:

- **[edit interfaces ge-*fpc/pic/port* ether-options 802.3ad ae*x*]**
- **[edit interfaces xe-*fpc/pic/port* ether-options 802.3ad ae*x*]** hierarchy level or at the **[edit interfaces xe-*fpc/pic/port* ether-options 802.3ad ae*x*]** hierarchy level.

  To disable link protection, use the **delete interface ae aggregate-ether-options link-protection** statement at the **[edit interfaces ae*x* aggregated-ether-options]** hierarchy level or the **[edit interfaces ae*x* aggregated-ether-options *lacp*]]** hierarchy level.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Configuring Aggregated Ethernet Link Protection on page 105
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

link-protection-sub-group (802.3ad)

Syntax link-protection-sub-group *group-name*;

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

Release Information Statement introduced in Junos OS Release 14.1X53-D10 for EX Series switches.

Description Add an interface in an aggregated Ethernet bundle into a link-protection subgroup.

A link protection subgroup is created and named using the **link-protection-sub-group** statement in the **[edit interfaces ae*x* aggregated-ether-options]** hierarchy.

Options ***group-name***—Name of the link protection subgroup that will include this interface after this statement is entered. The link protection subgroup is named when it is created using the **link-protection-sub-group** statement in the **[edit interfaces ae*x* aggregated-ether-options]** hierarchy.

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

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- *Q-in-Q Support on Redundant Trunk Links Using LAGs with Link Protection*

link-protection-sub-group (aggregated-ether-options)

Syntax

```
link-protection-sub-group group-name {
  [primary | backup];
}
```

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 14.1X53-D10 for EX Series switches.

Description Create and name a link protection subgroup.

Link protection subgroups allow you to provide link protection to a collection of Ethernet links within a link aggregation group (LAG). If you need to provide link protection to a single link in a LAG, you do not need to configure link protection subgroups.

A link protection subgroup includes multiple links within the LAG. If one link in the primary link protection subgroup fails, traffic is forwarded over the links in the backup link protection subgroup.

Links within the LAG are added to the link protection subgroup using the link-protection-sub-group statement in the [**edit interfaces *interface-name* ether-options 802.3ad**] hierarchy.

Options *group-name*—User-provided name of the link protection subgroup.

primary—Subgroup is the primary subgroup.

backup—Subgroup is the backup subgroup.

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

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

- *Q-in-Q Support on Redundant Trunk Links Using LAGs with Link Protection*

link-speed

Syntax

link-speed *speed*;

Hierarchy Level (QFX, NFX, EX Series, QFabric System, OCX1100, EX4600)

[edit interfaces ae*x* aggregated-ether-options]

Hierarchy Level (EX Series)

[edit interfaces ae*x* aggregated-ether-options],
[edit interfaces interface-range *name* aggregated-ether-options],
[edit interfaces interface-range *name* aggregated-sonet-options]

Release Information

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 14.1X53-D20 for the OCX Series.

Description

For aggregated Ethernet interfaces only, set the required link speed.

Options

speed—For aggregated Ethernet links, you can specify ***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).

Aggregated Ethernet links on the M120 router can have one of the following speeds:

- **100m**—Links are 100 Mbps.
- **10g**—Links are 10 Gbps.
- **1g**—Links are 1 Gbps.
- **oc192**—Links are OC192 or STM64c.

Aggregated Ethernet links on EX Series switches can be configured to operate at one of the following speeds:

- **10m**—Links are 10 Mbps.
- **100m**—Links are 100 Mbps.
- **1g**—Links are 1 Gbps.
- **10g**—Links are 10 Gbps.

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 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.

Aggregated Ethernet links on T Series, MX Series, PTX Series routers, and QFX5100, QFX10002, QFX10008, and QFX10016 switches can be configured to operate at one of the following speeds:

- **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.
- **mixed**—Links are of various speeds.
- **oc192**—Links are OC192.

mixed—Enables bundling of different Ethernet rate links in the same Aggregated Ethernet interface.

NOTE: **OCX Series switches only support 10g and 40g interfaces. Mixed rate aggregated Ethernet interfaces are not support on the OCX Series.**

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 153
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162

liveness-detection

Syntax

```
liveness-detection {
  detection-time {
    threshold milliseconds;
  }
  minimum-interval milliseconds;
  minimum-receive-interval milliseconds;
  multiplier number;
  no-adaptation;
  transmit-interval {
    minimum-interval milliseconds;
    threshold milliseconds;
  }
  version (1 | automatic);
}
```

Hierarchy Level [edit protocols iccp peer]

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Enable Bidirectional Forwarding Detection (BFD). BFD enables rapid detection of communication failures between peers.

The remaining statements are explained separately. See CLI Explorer.

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

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 367
- Understanding Local Link Bias on page 365

local-ip-addr (ICCP)

Syntax local-ip-addr *local-ip-address*;

Hierarchy Level [edit protocols iccp],
[edit protocols iccp peer *peer-IP-address*]

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Specify the local IP address of the interchassis link (ICL) interface that Inter-Chassis Control Protocol (ICCP) uses to communicate to the peers that host a multichassis link aggregation group (MC-LAG).

Options ***local-ip-address***—Default local IP address to be used by all peers.

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

local-minimum-links-threshold

Syntax local-minimum-links-threshold *threshold-value*

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options]

Release Information Statement introduced in Junos OS Release 14.1X53-D40 for QFX5100 switches.

Description For an aggregated Ethernet interface (LAG bundle) with member links spanning multiple chassis (member switches) in a Virtual Chassis or Virtual Chassis Fabric (VCF), set a threshold for the percentage of member links local to any particular chassis that must be up for that chassis to continue to be active in the aggregated Ethernet bundle.

NOTE: This statement is available only on member switches in a non-mixed mode QFX5100 Virtual Chassis or VCF.

You configure a threshold for a particular aggregated Ethernet interface (ae*x*). When set, the threshold applies locally to any chassis with links in the specified LAG bundle. The threshold value represents a percentage of active local member links out of the total number of local member links for the chassis. When one or more member links on a chassis go down, the system compares the percentage of local member links that are “up” to the threshold. If the percentage of local member links that are “up” is less than the threshold, any remaining active local links are forced down as well, to prevent forwarding traffic for the aggregated Ethernet interface through any member links on that chassis. If the percentage of “up” links is greater than or equal to the threshold, the status of the active links remains unchanged and they can forward LAG traffic.

For example, consider a case where the threshold is set to 52, and one local LAG member link goes down on one switch in a Virtual Chassis Fabric that has a total of four local LAG member links. In this case, 75 percent of the links are still up (greater than the threshold, 52 percent), so the remaining local member links stay up. However, if two local member links go down, only 50 percent of the links are up, so the local minimum links feature forces the remaining two active local member links down as well.

This feature also adjusts local member link status accordingly when failed links come up again, if you reconfigure the threshold value, or if you add or remove local member links in the LAG bundle.

The local minimum links feature helps avoid traffic loss due to asymmetric bandwidth on the forwarding paths across a chassis when some local aggregated Ethernet member links fail and some remain active. Enable this feature only if you want to closely manage ingress and egress traffic forwarding paths on aggregated Ethernet interfaces, especially where local link bias is also enabled.

Default The local minimum links feature is disabled by default.

Options

threshold-value—Percentage of member links in an aggregated Ethernet bundle local to a chassis that must be up for any local member links on that chassis to be active in the aggregated Ethernet bundle.

Range: 1 through 100 (decimal)

Default: none—This option is not enabled by default.

Required Privilege Level

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

Related Documentation

- Understanding Local Minimum Links on page 367

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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.

minimum-interval (Liveness Detection)

Syntax minimum-interval *milliseconds*;

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure simultaneously the minimum interval at which the peer transmits liveness detection requests and the minimum interval at which the peer expects to receive a reply from a peer with which it has established a Bidirectional Forwarding Detection (BFD) session. Optionally, instead of using this statement, you can specify the minimum transmit and receive intervals separately by using the **transmit-interval minimal-interval** and **minimum-receive-interval** statements, respectively.

Options ***milliseconds***—Specify the minimum interval value for Bidirectional Forwarding Detection (BFD).

Range: 1 through 255,000

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

minimum-links

Syntax (SRX, MX, T, M, EX, QFX Series, EX4600, Qfabric System)

minimum-links *number*;

Hierarchy Level (EX Series)

[edit interfaces ae*x* aggregated-ether-options],
[edit interfaces ae*x* aggregated-sonet-options],
[edit interfaces *interface-name* mlfr-uni-nni-bundle-options],
[edit interfaces *interface-name* unit *logical-unit-number*],
[edit interfaces interface-range *range* aggregated-ether-options],
[edit interfaces interface-range *range* aggregated-sonet-options],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]

Hierarchy Level (QFX Series)

[edit interfaces ae*x* aggregated-ether-options]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 11.1 for the QFX Series.

Description

For aggregated Ethernet, SONET/SDH, multilink, link services, and voice services interfaces only, set the minimum number of links that must be up for the bundle to be labeled up.

Options

number—Number of links.

Range: On M120, M320, MX Series, T Series, and TX Matrix routers with Ethernet interfaces, the valid range for minimum-links number is 1 through 64. When the maximum value (16) is specified, all configured links of a bundle must be up for the bundle to be labeled up.On all other routers and on EX Series switches, other than EX8200 switches, the range of valid values for minimum-links number is 1 through 8. When the maximum value (8) is specified, all configured links of a bundle must be up for the bundle to be labeled up.On EX8200 switches, the range of valid values for minimum-links number is 1 through 12. When the maximum value (12) is specified, all configured links of a bundle must be up for the bundle to be labeled up.On EX4600, QFX Series and Q Fabric Systems , the range of valid values for minimum-links number is 1 through 8. When the maximum value (8) is specified, all configured links of a bundle must be up for the bundle to be labeled up.

Default: 1

Required Privilege Level

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

Related Documentation

- Configuring Aggregated Ethernet Minimum Links on page 110
- *Configuring Aggregated SONET/SDH Interfaces*
- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96

- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- *Junos OS Services Interfaces Library for Routing Devices*
- Configuring Link Aggregation on page 153

minimum-receive-interval (Liveness Detection)

Syntax minimum-receive-interval *milliseconds*;

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure the minimum interval at which the peer must receive a reply from a peer with which it has established a Bidirectional Forwarding Detection (BFD) session.

Options *milliseconds*—Specify the minimum interval value.

Range: 1 through 255,000

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

multicast-loadbalance

Syntax

```
multicast-loadbalance {
  disable (Multicast Load Balancing);
  hash-mode mode;
}
```

Hierarchy Level [edit chassis]

Release Information Statement introduced in Junos OS Release 12.2 for EX Series switches.

Description (EX8200 switches only) Enable multicast load balancing to evenly distribute the Layer 3 routed multicast traffic on aggregated 10-gigabit Ethernet interfaces. When multicast load balancing is enabled on the EX8200 switch, it takes effect on aggregated 10-gigabit Ethernet interfaces that are currently configured as well as those that are configured later.

Crc-sgip mode is the default. If the default mode is implemented and the Layer 3 routed multicast traffic on the aggregated interfaces is not evenly distributed, you can try the other hashing algorithms. Use the algorithm that best balances your Layer 3 routed multicast traffic.

NOTE: **If you change the hashing algorithm when multicast load balancing is disabled, the new algorithm takes effect after you reenable multicast load balancing.**

Default Multicast load balancing is enabled.

Options **hash-mode *mode***—Specify one of these hashing algorithms:

balanced—Use a round-robin method to determine the aggregated Ethernet links with the least amount of traffic.

crc-gip —Use multicast packets' group IP address as a key to a CRC algorithm to get the hash index. The hashing algorithm used is CRC.

crc-sgip —Use multicast packets' source IP address and group IP address for hashing. The hashing algorithm used is CRC.

crc-sip —Use multicast packets' source IP address for hashing. The hashing algorithm used is CRC.

simple-gip—Use multicast packets' group IP address for hashing. The hashing algorithm used is XOR.

simple-sgip—Use multicast packets' GIP bits to calculate the hash index. The hashing algorithm used is XOR.

simple-sip—Use multicast packets' source IP address bits for hashing. The hashing algorithm used is XOR.

The remaining statement is explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Example: Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Interfaces on EX8200 Switches on page 174
- *Configuring Multicast Load Balancing for Use with Aggregated 10-Gigabit Ethernet Links on EX8200 Switches (CLI Procedure)*

multiservice

Syntax

```
multiservice {
  source-mac;
  destination-mac;
  payload {
    ip {
      layer3-only;
      layer-3 (source-ip-only | destination-ip-only);
      layer-4;
      inner-vlan-id;
      outer-vlan-id;
    }
  }
}
```

Hierarchy Level [edit chassis fpc *slot-number* pic *pic-number* hash-key family]

Release Information Statement introduced in Junos OS Release 15.1X53-D10 for the QFX10000 switches.

Description (QFX10000 switches only) Configure data used in a hash key for the **multiservice** protocol family when configuring PIC-level hashing for load balancing on an 802.3ad Link Aggregation Group.

Options **destination-mac**—Include destination MAC address in the hash key.

payload—Include payload data in the hash key. This option has the following suboptions:

- **ip**—Include the IP address of the IPv4 or IPv6 payload into the hash key.
- **layer-3**—Include Layer 3 IP information in the hash key.
- **layer-4**—Include Layer 4 IP information in the hash key.
- **outer-vlan-id**—Include outer VLAN ID information in the hash key.
- **inner-vlan-id**—Include inner VLAN ID information in the hash key.

source-mac—Include source MAC address in the hash key.

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

Related Documentation

- *Configuring PIC-Level Symmetrical Hashing for Load Balancing on 802.3ad LAGs for MX Series Routers*

node-device (Chassis)

Syntax

```
node-device name {
  fibre-channel {
    port-range {
      port-range-low port-range-high;
    }
  }
  pic pic-number {
    fte {
      port port-number;
      port-range port-range-low port-range-high;
    }
    xe {
      port port-number;
      port-range port-range-low port-range-high;
    }
  }
}
```

Hierarchy Level [edit chassis node-group]

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

Description Configure properties specific to a Node device in a QFabric system.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Link Aggregation on page 153

node-group (Chassis)

Syntax

```
node-group name {
  aggregated-devices {
    ethernet {
      device-count number;
    }
  }
  alarm {
    interface-type {
      link-down (ignore | red | yellow);
    }
  }
  container-devices {
    device-count number;
  }
  node-device name {
    fibre-channel {
      port-range {
        port-range-low port-range-high;
      }
    }
  }
  pic pic-number {
    fte {
      port port-number;
      port-range port-range-low port-range-high;
    }
    xe {
      port port-number;
      port-range port-range-low port-range-high;
    }
  }
  routing-engine {
    on-disk-failure {
      disk-failure-action (halt | reboot);
    }
  }
}
```

Hierarchy Level [edit chassis]

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

Description Configure properties specific to a Node group.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Link Aggregation on page 153

non-revertive (Chassis)

Syntax

non-revertive;

Hierarchy Level

[edit chassis aggregated-devices ethernet lacp link-protection]

Release Information

Statement introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

Description

Disable the ability to switch to a better priority link (if one is available) once a link is established as active and a collection or distribution is enabled.

BEST PRACTICE: (MX Series) By default, Link Aggregation Control Protocol link protection is revertive. This means that after the current link becomes active, the router switches to a higher-priority link if one becomes operational or is added to the aggregated Ethernet bundle. In a highly scaled configuration over aggregated Ethernet, we recommend that you prevent the router from performing such a switch by including the **non-revertive** statement. Failure to do so may result in some traffic loss if a MIC on which a member interface is located reboots. Using the **non-revertive** statement for this purpose is not effective if both the primary and secondary interfaces are on the MIC that reboots.

Required Privilege Level

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

Related Documentation

- Configuring Junos OS for Supporting Aggregated Devices on page 139
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

non-revertive (Interfaces)

Syntax non-revertive;

Hierarchy Level [edit interfaces ae*X* aggregated-ether-options lacp link-protection]

Release Information Statement introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 11.4 for EX Series switches.
Statement introduced in Junos OS Release 15.1F4 for PTX Series routers.

Description Disable the ability to switch to a better priority link (if one is available) once a link is established as active and collection distribution is enabled.

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

Related Documentation

- link-protection on page 547
- Configuring Aggregated Ethernet Link Protection on page 105
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

on-disk-failure

Syntax

```
on-disk-failure {
  disk-failure-action (halt | reboot);
}
```

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

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

Description Halt or reboot the switch if it detects hard disk errors on the Routing Engine.

Options The remaining statement is explained separately. See CLI Explorer.

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

Related Documentation

- *Configuring the Junos OS to Enable a Routing Engine to Reboot on Hard Disk Errors*

optics-options

Syntax

```
optics-options {
  alarm low-light-alarm {
    (link-down | syslog);
    }
  tca tca-identifier (enable-tca | no-enable-tca) (threshold number | threshold-24hrs number);
  tx-power dbm;
  warning low-light-warning {
    (link-down | syslog);
  }
  wavelength nm;
}
```

Hierarchy Level

[edit interfaces *interface-name*]

Release Information

Statement introduced before Junos OS Release 7.4.
alarm option and **warning** options introduced in Junos OS Release 10.0.
Statement introduced in Junos OS Release 12.1 for EX Series switches.
Statement and **tx-power** option introduced in Junos OS Release 13.2 for PTX Series routers.
tca option introduced in Junos OS Release 14.2 for PTX Series routers.
Statement introduced in Junos OS Release 18.3R1 for PTX10K-LC1104 on the PTX10008 and PTX10016 routers.
Statement introduced in Junos OS Release 18.3R1 for ACX6360 routers.

Description

For 10-Gigabit Ethernet or 100-Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces only, configure full C-band International Telecommunication Union (ITU)-Grid tunable optics.

Options

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Ethernet DWDM Interface Wavelength Overview*
- *100-Gigabit Ethernet OTN Options Configuration Overview*
- *Supported Forward Error Correction Modes on ACX6360 Router*

peer (ICCP)

Syntax

```
peer ip-address {
  authentication-key string;
  backup-liveness-detection {
    backup-peer-ip ip-address;
  }
  liveness-detection {
    detection-time {
      threshold milliseconds;
    }
    minimum-intervalmilliseconds;
    minimum-receive-interval milliseconds;
    multiplier number;
    no-adaptation;
    transmit-interval {
      minimum-interval milliseconds;
      threshold milliseconds;
    }
    version (1 | automatic);
  }
  local-ip-addr ipv4-address;
  session-establishment-hold-time seconds;
}
```

Hierarchy Level [edit protocols iccp]

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure the peers that host a multichassis link aggregation group (MC-LAG). You must configure Inter-Chassis Control Protocol (ICCP) for both peers that host the MC-LAG.

NOTE: Backup liveness detection is not supported on MX Series routers.

The remaining statements are explained separately. See CLI Explorer.

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

periodic

List of Syntax

Syntax (EX Series) on page 569
Syntax (QFX Series) on page 569

Syntax (EX Series)

periodic *interval*;

Syntax (QFX Series)

periodic (fast | slow);

Hierarchy Level (EX Series)

[edit interfaces ae*x* aggregated-ether-options lacp],
[edit interfaces interface-range *name* aggregated-ether-options lacp]

Hierarchy Level (QFX Series)

[edit interfaces ae*x* aggregated-ether-options lacp]

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 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 15.1F4 for PTX Series routers.

Description

For aggregated Ethernet interfaces only, configure the interval for periodic transmission of LACP packets.

Options

interval—Interval for periodic transmission of LACP packets.

- **fast**—Transmit packets every second.
- **slow**—Transmit packets every 30 seconds.

Default: fast

Required Privilege Level

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

Related Documentation

- *Configuring LACP for Aggregated Ethernet Interfaces*
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Example: Configuring Aggregated Ethernet High-Speed Uplinks Between an EX4200 Virtual Chassis Access Switch and an EX4200 Virtual Chassis Distribution Switch on page 162
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- *Junos OS Network Interfaces Library for Routing Devices*

port-priority

Syntax port-priority *priority*;

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

Release Information Statement introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 11.4 for EX Series switches.
Statement introduced in Junos OS Release 15.1F4 for PTX Series routers.

Description Define LACP port priority at the interface level.

Options *priority*—Priority for being elected to be the active port and both collect and distribute traffic. A smaller value indicates a higher priority for being elected.

Range: 0 through 65535

Default: 127

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

Related Documentation

- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98

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*
- *High Availability Feature Guide*

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 535
- tx-buffers on page 575
- *Configuring CoS Asymmetric Ethernet PAUSE Flow Control*
- *Enabling and Disabling CoS Symmetric Ethernet PAUSE Flow Control*
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*

session-establishment-hold-time

Syntax session-establishment-hold-time *seconds*;

Hierarchy Level [edit protocols iccp],
[edit protocols iccp peer]

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Specify the time during which an Inter-Chassis Control Protocol (ICCP) connection must be established between peers.

Options ***seconds***—Time (in seconds) within which a successful ICCP connection must be established.

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

transmit-interval (Liveness Detection)

Syntax

```
transmit-interval {
  minimum-interval milliseconds;
  threshold milliseconds;
}
```

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.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure the Bidirectional Forwarding Detection (BFD) transmit interval. The negotiated transmit interval for a peer is the interval between the sending of BFD liveness detection requests to peers. The receive interval for a peer is the minimum interval between receiving packets sent from its peer; the receive interval is not negotiated between peers. To determine the transmit interval, each peer compares its configured minimum transmit interval with its peer's minimum receive interval. The larger of the two numbers is accepted as the transmit interval for that peer.

The remaining statements are explained separately. See CLI Explorer.

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

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 535
- rx-buffers on page 572
- *Configuring CoS Asymmetric Ethernet PAUSE Flow Control*
- *Enabling and Disabling CoS Symmetric Ethernet PAUSE Flow Control*
- *Understanding CoS Flow Control (Ethernet PAUSE and PFC)*

CHAPTER 26

Configuration Statements: Channelizing Interfaces

- channel-speed on page 578
- fpc on page 579
- fte (Port) on page 580
- pic on page 581
- pic-mode on page 583
- sfpplus on page 584
- short-reach-mode on page 585
- xe (Port) on page 586
- xle (Port) on page 587

channel-speed

Syntax channel-speed (10g | 25g | 50g; | 100g | 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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description —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).

25g—Set the channel speed to 25g (25-Gigabit Ethernet).

50g—Set the channel speed to 50g (50-Gigabit Ethernet).

100g—Set the channel speed to 100g (100-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 Overview on page 190
- Channelizing Interfaces on QFX5200 Switches on page 231

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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, QFX3600, QFX5200, and OCX Series devices, the slot number is always **0**.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *show chassis fpc*

fte (Port)

Syntax

```
fte {
  (port port-number | port-range port-range-low port-range-high);
}
```

Hierarchy Level [edit chassis (QFX Series) fpc *slot* pic *pic-number*]

Release Information Statement introduced in Junos OS Release 13.2X52-D10 for the QFX Series.

Description Configure a specific port or a range of ports to operate as 40-Gigabit Ethernet data plane uplink (*fte*) type ports.

CAUTION: **The Packet Forwarding Engine on the switch is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the switch.**

Options ***port-number***—Port number on which you want to configure the port type. Valid values are 2 through 7.

port-range-low—Lowest-numbered port in the range of ports. The lowest possible value is 2.

port-range-high—Highest-numbered port in the range of ports. The highest possible value is 7.

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

Related Documentation

- Configuring the QSFP+ Port Type on QFX3500 Standalone Switches on page 239
- Configuring the Port Type on QFX3600 Standalone Switches on page 238
- Configuring the QSFP+ Port Type on QFX5100 Devices on page 241

pic

List of Syntax

Syntax (EX4600, OCX1100, QFX Series, QFabric system with ELS) on page 581
Syntax (EX4600, QFX Series, QFabric system) on page 581

Syntax (EX4600, OCX1100, QFX Series, QFabric system with ELS)

```
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) ;
  }
}
```

Syntax (EX4600, QFX Series, QFabric system)

```
pic pic-number {
  fibre-channel {
    port-range {
      port-range-low port-range-high;
    }
  }
  fte{
    port port-number;
    (port-range port-range-low | port-range-high);
  }
  xe {
    (port port-number | port-range port-range-low port-range-high);
  }
  xle {
    (port port-number | port-range port-range-low port-range-high);
  }
```

Hierarchy Level (EX4600, OCX1100, QFX Series, QFabric system with ELS)

[edit chassis (EX Series) fpc *slot*]

Hierarchy Level (EX4600, QFX Series, QFabric system)

[edit chassis (QFX Series) fpc *slot*]

[edit chassis (QFX Series) node-group *name* node-device *name*]

Release Information

Statement introduced in Junos OS Release 11.1 for the QFX Series.
Options **xe** and **xle** introduced in Junos OS 12.2X50-D20 for the QFX Series.
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.

Enable the specified port on the Physical Interface Card (PIC) to perform in the specified operating mode.

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*port-range-low*—Lowest-numbered port in the range of ports.

port-range*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.

NOTE: **This statement is not supported on the OCX Series.**

- On a QFX3500 switch, specify **0** if the port type is **fiber-channel**, and **2** if the port type is **xle**.
- On a QFX3600 switch, specify **0** if the port type is **xe**, and **1** if the port type is **xle**.
- On a QFX5100 switch, specify **0** if the port type is **xe**, and **1** if the port type is **xle** and **fte**.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Channelizing Interfaces Overview on page 190
- Configuring the QSFP+ Port Type on QFX3500 Standalone Switches on page 239
- Configuring the Port Type on QFX3600 Standalone Switches on page 238
- Configuring the QSFP+ Port Type on QFX5100 Devices on page 241

pic-mode

Syntax pic-mode *mode*;

Hierarchy Level [edit chassis (EX Series) fpc *slot* pic *pic-number* sfpplus]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the operating mode for the specified port on the SFP+ uplink module on an EX3200 or EX4200 switch.

On a switch using the SFP+ or SFP+ MACSec uplink module, the **pic-mode** setting defines the speeds of the SFP+ interfaces. When the PIC mode is set to **10g** on the SFP+ or SFP+ MACSec uplink module, uplink ports 0 and 2 support MACSec at 10-Gbps speeds while ports 1 and 3 cannot be used to send any traffic. When the PIC mode is set to **1g**, all four SFP+ ports on the uplink module support MACSec at 1-Gbps speeds.

Options *mode*—Operating mode of the SFP+ uplink module:

- **1G**—1-gigabit operating mode
- **10G**—10-gigabit operating mode

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

Related Documentation

- Setting the Mode on an SFP+ or SFP+ MACSec Uplink Module (CLI Procedure) on page 66

sfpplus

Syntax

```
sfpplus {
  pic-modemode;
}
```

Hierarchy Level [edit chassis (EX Series) fpc *slot* pic *pic-number*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the operating mode for the specified port on the SFP+ uplink module on the EX3200 or EX4200 switch.

The remaining statement is explained separately. See CLI Explorer.

Default By default, the SFP+ uplink module operates in the 10-gigabit mode and supports SFP+ transceivers.

NOTE: The SFP+ uplink module provides two ports for 10-gigabit small form-factor pluggable (SFP+) transceivers when configured to operate in 10-gigabit mode or four ports for 1-gigabit small form-factor pluggable (SFP) transceivers when configured to operate in 1-gigabit mode.

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

Related Documentation

- Setting the Mode on an SFP+ or SFP+ MACSec Uplink Module (CLI Procedure) on page 66

short-reach-mode

Syntax short-reach-mode (enable | disable);

Hierarchy Level [edit chassis fpc *fpc-slot* pic *pic-slot*],
[edit chassis fpc *fpc-slot* pic *pic-slot* port-range *port-range-low port-range-high*]

Release Information Statement introduced in Junos OS Release 14.1X53-D30 for the QFX Series.

Description Configure short-reach mode for individual as well as a range of copper-based 10-Gigabit Ethernet interfaces using short cable lengths (less than 10m) on the QFX5100-48T switch. Short-reach mode reduces power consumption up to 5W on these interfaces.

Default This feature is disabled by default.

Options The following options are available:

- **enable**
- **disable**

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

Related Documentation

- Configuring Short Reach Mode on page 48

xe (Port)

Syntax

```
xe {
  (port port-number | port-range port-range-low port-range-high);
}
```

Hierarchy Level

[edit chassis (QFX Series) fpc *slot* pic *pic-number*]

Release Information

Statement introduced in Junos OS Release 12.2X50-D20 for the QFX Series.

Description

(QFX3600 standalone switch only) Configure a specific port or a range of ports to operate as four 10-Gigabit Ethernet (*xe*) type ports.

CAUTION: The Packet Forwarding Engine on the switch is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the switch.

NOTE: Port Q0 supports only three (not the typical four)10-Gigabit Ethernet ports. Therefore, you can configure up to 63 (not 64) 10-Gigabit Ethernet ports on ports Q0 through Q15.

Options

port-number—Port number on which you want to configure the port type. Valid values are 0 through 15.

port-range-low—Lowest-numbered port in the range of ports. The lowest possible value is 0.

port-range-high—Highest-numbered port in the range of ports. The highest possible value is 15.

Required Privilege Level

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

Related Documentation

- Configuring the Port Type on QFX3600 Standalone Switches on page 238

xle (Port)

Syntax

```
xle {
  (port port-number | port-range port-range-low port-range-high);
}
```

Hierarchy Level [edit chassis (QFX Series) fpc *slot* pic *pic-number*]

Release Information Statement introduced in Junos OS Release 12.2X50-D20 for the QFX Series.

Description (QFX3500 and QFX3600 standalone switches only) Configure a specific QSFP+ port or a range of QSFP+ ports to operate as 40-Gigabit Ethernet (*xle*) type ports.

CAUTION: The Packet Forwarding Engine on the switch is restarted when you commit the port type configuration changes. As a result, you might experience packet loss on the switch.

Options

port-number—Port number on which you want to configure the port type. On a QFX3500 standalone switch, specify a value from 0 through 3. On a QFX3600 standalone switch, specify a value from 0 through 15.

port-range-low—Lowest-numbered port in the range of ports. The lowest possible value is 0.

port-range-high—Highest-numbered port in the range of ports. The highest possible value is 3 on QFX3500 standalone switches, and 15 on QFX3600 standalone switches.

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

Related Documentation

- Configuring the QSFP+ Port Type on QFX3500 Standalone Switches on page 239
- Configuring the Port Type on QFX3600 Standalone Switches on page 238

CHAPTER 27

Configuration Statements: Energy Efficient Interfaces

- ieee-802-3az-eee on page 589

ieee-802-3az-eee

Syntax ieee-802-3az-eee;

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

Release Information Statement introduced in Junos OS Release 12.2 for EX Series switches.

Description Configure Energy Efficient Ethernet (EEE) on an EEE-capable Base-T copper interface.

Default EEE is disabled on EEE-capable interfaces.

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

Related Documentation

- Configuring Energy Efficient Ethernet on Interfaces (CLI Procedure) on page 245

CHAPTER 28

Configuration Statements: VLANs

- ethernet-switch-profile on page 592
- l2-domain-id-for-l3 on page 594
- layer2 (enhanced-hash-key) on page 595
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- members on page 597
- native-vlan-id on page 599
- no-local-switching on page 601
- port-mode on page 602
- tag-protocol-id (TPIDs Expected to Be Sent or Received) on page 604
- vlan-id on page 605
- vlan-tagging on page 606

ethernet-switch-profile

Syntax

```
ethernet-switch-profile {
  ethernet-policer-profile {
    input-priority-map {
      ieee802.1p premium [values];
    }
    output-priority-map {
      classifier {
        premium {
          forwarding-class class-name {
            loss-priority (high | low);
          }
        }
      }
    }
    policer cos-policer-name {
      aggregate {
        bandwidth-limit bps;
        burst-size-limit bytes;
      }
      premium {
        bandwidth-limit bps;
        burst-size-limit bytes;
      }
    }
    storm-control storm-control-profile;
    tag-protocol-id tpid;
  }
  mac-learn-enable;
}
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.
Statement introduced in Junos OS Release 13.2 for the QFX Series.
Statement introduced in Junos OS Release 13.2X50-D15 for the EX Series switches.

Description

NOTE: On QFX Series standalone switches, the **ethernet-policer-profile** CLI hierarchy and the **mac-learn-enable** statement are supported only on the Enhanced Layer 2 Switching CLI.

For Gigabit Ethernet IQ, 10-Gigabit Ethernet IQ2 and IQ2-E, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, aggregated Ethernet with Gigabit Ethernet IQ interfaces, the built-in Gigabit Ethernet port on the M7i router); 100-Gigabit

Ethernet Type 5 PIC with CFP; and Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces on EX Series switches, configure VLAN tag and MAC address accounting and filtering properties.

The remaining statements are explained separately. See CLI Explorer.

NOTE: When you gather interfaces into a bridge domain, the **no-mac-learn-enable** statement at the **[edit interfaces *interface-name* gigether-options ethernet-switch-profile]** hierarchy level is not supported. You must use the **no-mac-learning** statement at the **[edit bridge-domains *bridge-domain-name* bridge-options interface *interface-name*]** hierarchy level to disable MAC learning on an interface in a bridge domain. For information on disabling MAC learning for a bridge domain, see the *MX Series Layer 2 Configuration Guide*.

Default If the **ethernet-switch-profile** statement is not configured, Gigabit Ethernet IQ and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router) behave like Gigabit Ethernet interfaces.

Required Privilege Level

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

Related Documentation

- *Configuring Gigabit Ethernet Policers*
- *Configuring MAC Address Filtering*
- *Stacking and Rewriting Gigabit Ethernet VLAN Tags Overview*
- *Configuring Q-in-Q Tunneling on EX Series Switches with ELS Support (CLI Procedure)*

l2-domain-id-for-l3

Syntax l2-domain-id-for-l3 *id*;

Hierarchy Level [edit routing-instances *instance-name*]

Release Information Statement introduced in Junos OS Release 12.3R2.

Description Specify a Layer 2 domain ID within a routing instance.

Options **id**—Layer 2 identification number.

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

Related Documentation
- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252

layer2 (enhanced-hash-key)

List of Syntax

Syntax (EX Series and QFX5100 Switch) on page 595
Syntax (QFX10002 Switch) on page 595

Syntax (EX Series and QFX5100 Switch)

```
layer2 {
  no-destination-mac-address;
  no-ether-type;
  no-source-mac-address;
  vlan-id;
}
```

Syntax (QFX10002 Switch)

```
layer2 {
  no-incoming-port;
  no-destination-mac-address;
  no-ether-type;
  no-source-mac-address;
  source-mac-address;
  vlan-id;
  no-vlan-id;
  inner-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 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- **enhanced-hash-key on page 662**
- **hash-mode on page 667**

layer3-domain-identifier

Syntax

layer3-domain-identifier *identifier*;

Hierarchy Level

[edit routing-instances *instance-name*]

Release Information

Statement introduced in Junos OS Release 12.3R2.

Description

Specify a Layer 3 domain ID within a routing instance.

Options

id—Layer 3 identification number.

Required Privilege Level

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

Related Documentation

- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252

members

Syntax members [(all | *names* | *vlan-ids*)];

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* family ethernet-switching vlan]

Release Information Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement updated with enhanced **?** (CLI completion feature) functionality in Junos OS Release 9.5 for EX Series switches.

Description For trunk interfaces, configure the VLANs that can carry traffic.

TIP: To display a list of all configured VLANs on the system, including VLANs that are configured but not committed, type ? after **vlan** or **vlans** in your configuration mode command line. Note that only one VLAN is displayed for a VLAN range.

NOTE: The number of VLANs supported per switch varies for each model. Use the configuration-mode command **set vlans id vlan-id ?** to determine the maximum number of VLANs allowed on a switch. You cannot exceed this VLAN limit because each VLAN is assigned an ID number when it is created. You can, however, exceed the recommended VLAN member maximum.

On an EX Series switch that runs Junos OS that does not support the Enhanced Layer 2 Software (ELS) configuration style, the maximum number of VLAN members allowed on the switch is 8 times the maximum number of VLANs the switch supports (vmember limit = vlan max * 8). If the switch configuration exceeds the recommended VLAN member maximum, you see a warning message when you commit the configuration. If you ignore the warning and commit such a configuration, the configuration succeeds but you run the risk of crashing the Ethernet switching process (**eswd**) due to memory allocation failure.

On an EX Series switch that runs Junos OS that supports ELS, the maximum number of VLAN members allowed on the switch is 24 times the maximum number of VLANs the switch supports (vmember limit = vlan max * 24). If the configuration of one of these switches exceeds the recommended VLAN member maximum, a warning message appears in the system log (syslog).

Options **all**—Specifies that this trunk interface is a member of all the VLANs that are configured on this switch. When a new VLAN is configured on the switch, this trunk interface automatically becomes a member of the VLAN.

NOTE: **Since VLAN members are limited, specifying all could cause the number of VLAN members to exceed the limit at some point.**

names—Name of one or more VLANs. VLAN IDs are applied automatically in this case.

NOTE: **all cannot be a VLAN name.**

vlan-ids—Numeric identifier of one or more VLANs. For a series of tagged VLANs, specify a range; for example, **10–20** or **10–20 23 27–30**.

NOTE: **Each configured VLAN must have a specified VLAN ID to successfully commit the configuration; otherwise, the configuration commit fails.**

Required Privilege Level

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

Related Documentation

- *show ethernet-switching interfaces*
- *show ethernet-switching interface*
- *show vlans*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- Configuring Gigabit Ethernet Interfaces (CLI Procedure) for EX Series Switches with ELS support on page 75
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Configuring VLANs for EX Series Switches (CLI Procedure)*
- *Configuring VLANs for EX Series Switches with ELS Support (CLI Procedure)*

native-vlan-id

Syntax native-vlan-id *vlan-id*;

Hierarchy Level (QFX Series and EX4600)

For platforms without ELS:

[edit interfaces (QFX Series) *interface-name* unit 0 family ethernet-switching]

For platforms with ELS:

[edit interfaces (QFX Series) *interface-name*]

Hierarchy Level (ACX Series, EX Series, SRX Series, M Series, MX Series, and T Series)

[edit interfaces ge-*fpc/pic/port*],
[edit interfaces *interface-name*]

Hierarchy Level (SRX Series)

[edit interfaces*interface-name*]

Release Information

Statement introduced in Junos OS Release 8.3.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 9.5 for SRX Series.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.

Description

Configure the VLAN identifier to associate with untagged packets received on the physical interface of a trunk mode interface for the following:

- QFX Series and EX4600
- M Series routers with Gigabit Ethernet IQ PICs with SFP and Gigabit Ethernet IQ2 PICs with SFP configured for 802.1Q flexible VLAN tagging
- MX Series routers with Gigabit Ethernet DPCs and MICs, Tri-Rate Ethernet DPCs and MICs, and 10-Gigabit Ethernet DPCs and MICs and MPCs configured for 802.1Q flexible VLAN tagging
- T4000 routers with 100-Gigabit Ethernet Type 5 PIC with CFP
- EX Series switches with Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces

The logical interface on which untagged packets are received must be configured with the same VLAN ID as the native VLAN ID configured on the physical interface, otherwise the untagged packets are dropped. To configure the logical interface, include the **vlan-id** statement (matching the **native-vlan-id** statement on the physical interface) at the **[edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level**.

When the **native-vlan-id** statement is included with the **flexible-vlan-tagging** statement, untagged packets are accepted on the same mixed VLAN-tagged port and on the interfaces that are configured for Q-in-Q tunneling.

When the **native-vlan-id** statement is combined with the **interface-mode** statement, untagged packets are accepted and forwarded within the bridge domain or VLAN that is configured with the matching VLAN ID.

To configure the logical interface, include the **vlan-id** statement (matching the **native-vlan-id** statement on the physical interface) at the **[edit interfaces *interface-name* unit *logical-unit-number*] hierarchy level**.

NOTE: **Starting in Junos OS Release 17.1R1, you can send untagged traffic without a native VLAN ID to the remote end of the network. To do this, remove the native VLAN ID from the untagged traffic configuration by setting the no-native-vlan-insert statement. If you do not configure this statement, the native VLAN ID is added to the untagged traffic.**

Default By default, the untagged packets are dropped. That is, if you do not configure the **native-vlan-id** option, the untagged packets are dropped.

Options *vlan-id*—Numeric identifier of the VLAN.

Range: 1 through 4094

number—VLAN ID number.

Range: (ACX Series routers, SRX Series devices and EX Series switches) 0 through 4094.

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

Related Documentation

- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring Gigabit Ethernet Interfaces (J-Web Procedure)*
- *Understanding Bridging and VLANs on Switches*
- *Enabling VLAN Tagging*
- *Configuring Access Mode on a Logical Interface*
- *Configuring the Native VLAN Identifier on Switches With ELS Support (CLI Procedure)*
- *Understanding Interfaces*
- *Understanding Q-in-Q Tunneling and VLAN Translation*
- *no-native-vlan-insert*
- *Sending Untagged Traffic Without VLAN ID to Remote End*
- *show ethernet-switching interfaces*
- *show vlans*
- flexible-vlan-tagging on page 703
- *Junos OS Network Interfaces Configuration Guide*

no-local-switching

Syntax no-local-switching;

Hierarchy Level [edit routing-instances *instance-name*]

Release Information Statement introduced in Junos OS Release 12.3R2.

Description Specify that access ports in this routing instance do not forward packets to each other.

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

Related Documentation

- Configuring a Layer 2 Virtual Switch on an EX Series Switch on page 252

port-mode

Syntax port-mode (access | tagged-access | trunk);

Hierarchy Level [edit interfaces (QFX Series) *interface-name* unit *logical-unit-number* family ethernet-switching]

Release Information 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

NOTE: This statement does not support the Enhanced Layer 2 Software (ELS) configuration style. If your switch runs software that supports ELS, see interface-mode. For ELS details, see *Using the Enhanced Layer 2 Software CLI*.

Configure whether an interface on the switch operates in access, tagged access, or trunk mode.

Default All switch interfaces are in access mode.

Options

access—Have the interface operate in access mode. In this mode, the interface can be in a single VLAN only. Access interfaces typically connect to network devices, such as PCs, printers, IP telephones, and IP cameras.

tagged-access—Have the interface operate in tagged-access mode. In this mode, the interface can be in multiple VLANs. Tagged access interfaces typically connect to network devices, such as PCs, printers, IP telephones, and IP cameras.

trunk—Have the interface operate in trunk mode. In this mode, the interface can be in multiple VLANs and can multiplex traffic between different VLANs. Trunk interfaces typically connect to other switches and to routers on the LAN.

NOTE: The number of VLANs supported per switch varies for each model. Use the configuration-mode command **set vlans id vlan-id ?** to determine the maximum number of VLANs allowed on a switch. You cannot exceed this VLAN limit because each VLAN is assigned an ID number when it is created. You can, however, exceed the recommended VLAN member maximum. To determine the maximum number of VLAN members allowed on a switch, multiply the VLAN maximum for the switch times 8 (vmember limit = vlan max * 8).

If a switch configuration exceeds the recommended VLAN member maximum, you see a warning message when you commit the configuration. If you ignore the warning and commit such a configuration, the configuration succeeds but you run the risk of crashing the Ethernet switching process (eswd) due to memory allocation failure.

Required Privilege Level

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

Related Documentation

- *Example: Connecting an EX Series Access Switch to a Distribution Switch*
- *Configuring Gigabit Ethernet Interfaces (CLI Procedure)*
- *Configuring VLANs for EX Series Switches (CLI Procedure)*
- *Junos OS Ethernet Interfaces Configuration Guide*

tag-protocol-id (TPIDs Expected to Be Sent or Received)

Syntax tag-protocol-id [*tpids*];

Hierarchy Level [edit interfaces *interface-name* gigether-options ethernet-switch-profile],
[edit interfaces *interface-name* aggregated-ether-options ethernet-switch-profile],
[edit interfaces *interface-name* aggregated-ether-options ethernet-switch-profile],
[edit interfaces *interface-name* ether-options ethernet-switch-profile]

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.
Statement introduced in Junos OS Release 13.2X50-D15 for EX Series switches.
Statement introduced in Junos OS Release 14.1X53-D15 for the QFX Series.

Description For Gigabit Ethernet IQ and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces, aggregated Ethernet with Gigabit Ethernet IQ interfaces, and Gigabit Ethernet PICs with SFPs (except the 10-port Gigabit Ethernet PIC, and the built-in Gigabit Ethernet port on the M7i router), define the TPIDs expected to be sent or received on a particular VLAN. For each Gigabit Ethernet port, you can configure up to eight TPIDs using the **tag-protocol-id** statement; but only the first four TPIDs are supported on IQ2 and IQ2-E interfaces.

For 10-Gigabit Ethernet LAN/WAN PIC interfaces on T Series routers only the default TPID value (**0x8100**) is supported.

For Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces on EX Series switches, define the TPIDs expected to be sent or received on a particular VLAN. The default TPID value is **0x8100**. Other supported values are **0x88a8**, **0x9100**, and **0x9200**.

Options *tpids*—TPIDs to be accepted on the VLAN. Specify TPIDs in hexadecimal.

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

Related Documentation

- *Configuring Frames with Particular TPIDs to Be Processed as Tagged Frames*
- *Configuring Q-in-Q Tunneling on EX Series Switches with ELS Support (CLI Procedure)*

vlan-id

Syntax vlan-id *vlan-id-number*;

Hierarchy Level [edit interfaces (QFX Series) *interface-name* unit *logical-unit-number*]

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 For 10-Gigabit Ethernet and aggregated Ethernet interfaces only, bind an 802.1Q VLAN tag ID to a logical interface. Statement introduced in Junos OS Release 9.2 for EX Series switches.

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 606
- Configuring Gigabit and 10-Gigabit Ethernet Interfaces for EX4600 and QFX Series Switches on page 69
- Configuring a Layer 3 Logical Interface on page 270
- *Junos OS Network Interfaces Library for Routing Devices*

vlan-tagging

Syntax vlan-tagging;

Syntax (QFX Series, NFX Series, and EX4600) vlan-tagging;

Syntax (SRX Series Interfaces) vlan-tagging native-vlan-id *vlan-id*;

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

QFX Series, NFX Series, and EX4600 Interfaces [edit interfaces (QFX Series) *interface-name*]
[edit interfaces (QFX Series) interface-range *interface-range-name*]

SRX Series Interfaces [edit interfaces *interface*]

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 9.5.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.
Statement introduced in Junos OS Release 13.2 for PTX Series Routers.
Statement introduced in Junos OS Release 14.1X53-D10 for the QFX Series.

Description For Fast Ethernet and Gigabit Ethernet interfaces, aggregated Ethernet interfaces configured for VPLS, and pseudowire subscriber interfaces, enable the reception and transmission of 802.1Q VLAN-tagged frames on the interface.

NOTE: For QFX Series configure VLAN identifier for untagged packets received on the physical interface of a trunk mode interface. Enable VLAN tagging. The platform receives and forwards single-tag frames with 802.1Q VLAN tags.

On EX Series switches except for EX4300 and EX9200 switches, the **vlan-tagging** and **family ethernet-switching** statements cannot be configured on the same interface. Interfaces on EX2200, EX3200, EX3300, EX4200, and EX4500 switches are set to **family ethernet-switching** by the default factory configuration. EX6200 and EX8200 switch interfaces do not have a default **family** setting.

Default VLAN tagging is disabled by default.

Options **native-vlan-id**— (SRX Series)Configures a VLAN identifier for untagged packets. Enter a number from 0 through 4094.

NOTE: The **native-vlan-id** can be configured only when either **flexible-vlan-tagging** mode or **interface-mode** trunk is configured.

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

Related Documentation

- 802.1Q VLANs Overview on page 265
- Configuring a Layer 3 Subinterface (CLI Procedure) on page 266
- Configuring Tagged Aggregated Ethernet Interfaces on page 111
- *Example: Configuring Layer 3 Subinterfaces for a Distribution Switch and an Access Switch*
- **vlan-id on page 605**
- Configuring a Layer 3 Logical Interface on page 270
- *Configuring VLAN Tagging*

CHAPTER 29

Configuration Statements: Link Fault Management and Uplink Failure Detection for Interfaces

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- ethernet (Protocols OAM) on page 611
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allow-remote-loopback

Syntax allow-remote-loopback;

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Advertise that the interface is capable of getting into loopback mode. Enable remote loopback in Ethernet OAM link fault management (LFM) on all Ethernet interfaces or the specified interface on the EX Series switch.

WARNING: **If you disable this statement on a peer interface, LFM loopback enable and disable commands will not work. Before disabling this configuration, please make sure the remote-loopback interface is disabled.**

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

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

ethernet (Protocols OAM)

List of Syntax

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Syntax: EX Series Switches and NFX Series Devices on page 614

Syntax: MX, T, ACX Series Routers, SRX Firewalls, M320 and EX Series Switches

```
ethernet {
  connectivity-fault-management {
    action-profile profile-name {
      default-actions {
        interface-down;
      }
    }
    performance-monitoring {
      delegate-server-processing;
      hardware-assisted-timestamping;
      hardware-assisted-keepalives;
      sla-iterator-profiles {
        profile-name {
          avg-fd-twoway-threshold;
          avg-ifdv-twoway-threshold;
          avg-flr-forward-threshold;
          avg-flr-backward-threshold;
          disable;
          calculation-weight {
            delay delay-weight;
            delay-variation delay-variation-weight;
          }
          cycle-time milliseconds;
          iteration-period connections;
          measurement-type (loss | statistical-frame-loss | two-way-delay);
        }
      }
    }
    linktrace {
      age (30m | 10m | 1m | 30s | 10s);
      path-database-size path-database-size;
    }
    maintenance-domain domain-name {
      level number;
      name-format (character-string | none | dns | mac+2octet);
      maintenance-association ma-name {
        short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
        protect-maintenance-association protect-ma-name;
        remote-maintenance-association remote-ma-name;
        continuity-check {
          convey-loss-threshold;
          hold-interval minutes;
          interface-status-tlv;
          interval (10m | 10s | 1m | 1s| 100ms);
          loss-threshold number;
          port-status-tlv;
        }
        mep mep-id {
```

```
                auto-discovery;
                direction (up | down);
                interface interface-name (protect | working);
                lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
                  rem-err-xcon | xcon );
                priority number;
                remote-mep mep-id {
                  action-profile profile-name;
                  sla-iterator-profile profile-name {
                    data-tlv-size size;
                    iteration-count count-value;
                    priority priority-value;
                  }
                }
              }
            }
          }
        }
        evcs evc-id {
          evc-protocol cfm management-domain domain-id (management-association
            association-id | vpls (routing-instance instance-id);
          remote-uni-count count;
          multipoint-to-multipoint;
        }
        link-fault-management {
          action-profile profile-name {
            action {
              link-down;
              send-critical-event;
              syslog;
            }
            event {
              link-adjacency-loss;
              link-event-rate {
                frame-error count;
                frame-period count;
                frame-period-summary count;
                symbol-period count;
              }
              protocol-down;
            }
          }
          interface interface-name {
            apply-action-profile;
            link-discovery (active | passive);
            loopback-tracking;
            pdu-interval interval;
            pdu-threshold threshold-value;
            remote-loopback;
            event-thresholds {
              frame-error count;
              frame-period count;
              frame-period-summary count;
              symbol-period count;
            }
            negotiation-options {
```



```
            allow-remote-loopback;
            no-allow-link-events;
          }
        }
      }
      lmi {
        status-counter count;
        polling-verification-timer value;
        interface name {
          uni-id uni-name;
          status-counter number;
          polling-verification-timer value;
          evc-map-type (all-to-one-bundling | bundling | service-multiplexing);
          evc evc-name {
            default-evc;
            vlan-list vlan-id-list;
          }
        }
      }
    }
```

Syntax: EX Series Switches and NFX Series Devices

```
ethernet {
  connectivity-fault-management {
    action-profile profile-name {
      action {
        interface-down;
      }
      default-actions {
        interface-down;
      }
      event {
        adjacency-loss;
      }
    }
    esp-traceoptions {
      file filename <files number> <no-stamp> <replace> <size size> <world-readable |
        no-world-readable>;
      flag (all |error | esp | interface | krt | lib |normal |task |timer);
    }
    linktrace {
      age (30m | 10m | 1m | 30s | 10s);
      path-database-size path-database-size;
    }
    maintenance-domain domain-name {
      level number;
      mip-half-function (none | default |explicit);
      name-format (character-string | none | dns | mac+2oct);
      maintenance-association ma-name {
        continuity-check {
          hold-interval minutes;
          interface-status-tlv;
          interval (10m | 10s | 1m | 1s| 100ms);
          loss-threshold number;
          port-status-tlv;
        }
        mep mep-id {
          auto-discovery;
          direction down;
          interface interface-name;
          priority
          remote-mep mep-id {
            action-profile profile-name;
            sla-iterator-profile profile-name {
              data-tlv-size size;
              iteration-count count-value;
              priority priority-value;
            }
          }
        }
        short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
      }
    }
    performance-monitoring {
      sla-iterator-profiles {
        profile-name {
          calculation-weight {
            delay delay-value;
```

```
                delay-variation delay-variation-value;
              }
              cycle-time cycle-time-value;
              iteration-period iteration-period-value;
              measurement-type two-way-delay;
              passive;
            }
          }
        }
        traceoptions {
          file filename <files number> <match regex> <size size> <world-readable |
            no-world-readable>;
          flag flag ;
          no-remote-trace;
        }
      }
      link-fault-management {
        action-profile profile-name;
          action {
            syslog;
            link-down;
          }
          event {
            link-adjacency-loss;
            link-event-rate {
              frame-error count;
              frame-period count;
              frame-period-summary count;
              symbol-period count;
            }
          }
        interface interface-name {
          link-discovery (active | passive);
          pdu-interval interval;
          pdu-threshold threshold-value;
          remote-loopback;
          event-thresholds {
            frame-errorcount;
            frame-period count;
            frame-period-summary count;
            symbol-period count;
          }
          negotiation-options {
            allow-remote-loopback;
            no-allow-link-events;
          }
        }
        traceoptions {
          file filename <files number> <match regex> <size size> <world-readable |
            no-world-readable>;
          flag flag ;
          no-remote-trace;
        }
      }
    }
```

Hierarchy Level [edit protocols oam]

Release Information Statement introduced in Junos OS Release 8.2 for MX, T, ACX Series routers, SRX firewalls, M320 and EX Series switches.
Statement introduced in Junos OS Release 9.4 for EX Series switches and NFX Series devices.
connectivity-fault-management introduced in Junos OS Release 10.2 for EX Series switches.

Description Provide IEEE 802.3ah Operation, Administration, and Maintenance (OAM) support for Ethernet interfaces or configure connectivity fault management (CFM) for IEEE 802.1ag Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *Enabling IEEE 802.3ah OAM Support*
- Example: Configuring Ethernet OAM Link Fault Management on page 285

event-thresholds

Syntax

```
event-thresholds {
  frame-error count;
  frame-period count;
  frame-period-summary count;
  symbol-period count;
}
```

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure threshold limit values for link events in periodic OAM PDUs.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

event (OAM LFM)

Syntax

```
event {
  link-adjacency-loss;
  link-event-rate {
    frame-error count;
    frame-period count;
    frame-period-summary count;
    symbol-period count;
  }
}
```

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile *profile-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure link events in an action profile for Ethernet OAM link fault management (LFM).

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

frame-error

Syntax frame-error *count*;

Hierarchy Level [edit protocols oam ethernet link-fault-management event link-event-rate],
[edit protocols oam ethernet link-fault-management interface *interface-name*
event-thresholds]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the threshold value for sending frame error events or taking the action specified in the action profile.

Frame errors occur on the underlying physical layer. The threshold is reached when the number of frame errors reaches the configured value.

Options *count*—Threshold count in seconds for frame error events.

Range: 1 through 100 seconds

Default: 1 second

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

frame-period

Syntax frame-period *count*;

Hierarchy Level [edit protocols oam ethernet link-fault-management event link-event-rate],
[edit protocols oam ethernet link-fault-management interface *interface-name*
event-thresholds]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the number of frame errors within the last N frames that has exceeded a threshold.

Frame errors occur on the underlying physical layer. The threshold is reached when the number of frame errors reaches the configured value.

Options *count*—Threshold count in seconds for frame error events.

Range: 1 through 100 seconds

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

frame-period-summary

Syntax frame-period-summary *count*;

Hierarchy Level [edit protocols oam ethernet link-fault-management event link-event-rate],
[edit protocols oam ethernet link-fault-management interface *interface-name* event-thresholds]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the threshold value for sending frame period summary error events or taking the action specified in the action profile.

An errored frame second is any 1-second period that has at least one errored frame. This event is generated if the number of errored frame seconds is equal to or greater than the specified threshold for that period.

Options *count*—Threshold count in seconds for frame period summary error events.

Range: 1 through 100 seconds

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

interface (OAM Link-Fault Management)

List of Syntax

Syntax: T, M, MX and ACX Series Routers, SRX Series Firewalls and EX Series Switches on page 621
Syntax: EX Series Switches and NFX Series Devices on page 621

Syntax: T, M, MX and ACX Series Routers, SRX Series Firewalls and EX Series Switches

```
interface interface-name {
  apply-action-profile profile-name;
  link-discovery (active | passive);
  pdu-interval interval;
  pdu-threshold threshold-value;
  remote-loopback;
  event-thresholds {
    frame-error count;
    frame-period count;
    frame-period-summary count;
    symbol-period count;
  }
  negotiation-options {
    allow-remote-loopback;
    no-allow-link-events;
  }
}
```

Syntax: EX Series Switches and NFX Series Devices

```
interface interface-name {
  link-discovery (active | passive);
  pdu-interval interval;
  pdu-threshold threshold-value;
  remote-loopback;
  event-thresholds {
    frame-errorcount;
    frame-period count;
    frame-period-summary count;
    symbol-period count;
  }
  negotiation-options {
    allow-remote-loopback;
    no-allow-link-events;
  }
}
```

Hierarchy Level

[edit protocols oam ethernet link-fault-management]

Release Information

Statement introduced in Junos OS Release 8.2 for T, M, MX and ACX Series Routers, SRX Series firewalls and EX Series switches.
Statement introduced in Junos OS Release 9.4 for EX Series switches and NFX Series devices.

Description

Configure Ethernet OAM link fault management (LFM) for all interfaces or for specific interfaces.

For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.3ah Operation, Administration, and Management (OAM) support.

Options **interface** ***interface-name***—Interface to be enabled for IEEE 802.3ah link fault management OAM support.

The remaining statements are described separately.

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

Related Documentation

- *Enabling IEEE 802.3ah OAM Support*
- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

negotiation-options

Syntax

```
negotiation-options {
  allow-remote-loopback;
  no-allow-link-events;
}
```

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Enable and disable IEEE 802.3ah Operation, Administration, and Maintenance (OAM) link fault management (LFM) features for Ethernet interfaces.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

no-allow-link-events

Syntax no-allow-link-events;

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name* negotiation-options]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Disable the sending of link event TLVs.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

pdu-threshold

Syntax pdu-threshold *threshold-value*;

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure how many protocol data units (PDUs) are missed before declaring the peer lost in Ethernet OAM link fault management (LFM) for all interfaces or for specific interfaces.

Options ***threshold-value*** —Number of PDUs missed before declaring the peer lost.

Range: 3 through 10 PDUs

Default: 3 PDUs

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

remote-loopback

Syntax remote-loopback;

Hierarchy Level [edit protocols oam ethernet link-fault-management interface *interface-name*]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Set the data terminal equipment (DTE) in loopback mode. Remove the statement from the configuration to take the DTE out of loopback mode. It is used for IEEE 802.3ah Operation, Administration, and Maintenance (OAM) link fault management (LFM) support.

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

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

symbol-period

Syntax symbol-period *count*;

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile; event link-event-rate]
,
[edit protocols oam ethernet link-fault-management interface *interface-name* event-thresholds]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure the threshold for sending symbol period events or taking the action specified in the action profile.

Symbol code errors occur on the underlying physical layer. The symbol period threshold is reached when the number of symbol errors reaches the configured value within the period. You cannot configure the default value to a different value.

Options *count*—Threshold count in seconds for symbol period events.

Range: 1 through 100 seconds

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

syslog (OAM LFM)

Syntax syslog;

Hierarchy Level [edit protocols oam ethernet link-fault-management action-profile *profile-name*; action]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Generate a system log message for the Ethernet Operation, Administration, and Maintenance (OAM) link fault management (LFM) event.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

oam

Syntax

```
oam {
  ethernet{
    connectivity-fault-management {
      action-profile profile-name {
        action {
          interface-down;
        }
        default-actions {
          interface-down;
        }
        event {
          adjacency-loss;
        }
      }
      linktrace {
        age (30m | 10m | 1m | 30s | 10s);
        path-database-size path-database-size;
      }
      maintenance-domain domain-name {
        level number;
        mip-half-function (none | default |explicit);
        name-format (character-string | none | dns | mac+2oct);
        maintenance-association ma-name {
          continuity-check {
            hold-interval minutes;
            interface-status-tlv;
            interval (10m | 10s | 1m | 1s| 100ms);
            loss-threshold number;
            port-status-tlv;
          }
          mep mep-id {
            auto-discovery;
            direction down;
            interface interface-name;
            remote-mep mep-id {
              action-profile profile-name;
            }
          }
        }
      }
      performance-monitoring {
        sla-iterator-profiles {
          profile-name {
            calculation-weight {
              delay delay-value;
              delay-variation delay-variation-value;
            }
            cycle-time cycle-time-value;
            iteration-period iteration-period-value;
            measurement-type two-way-delay;
            passive;
          }
```



```
          }
        }
      }
      link-fault-management {
        action-profile profile-name;
          action {
            syslog;
            link-down;
          }
          event {
            link-adjacency-loss;
            link-event-rate {
              frame-error count;
              frame-period count;
              frame-period-summary count;
              symbol-period count;
            }
          }
        interface interface-name {
          link-discovery (active | passive);
          pdu-interval interval;
          pdu-threshold threshold-value;
          remote-loopback;
          event-thresholds {
            frame-errorcount;
            frame-period count;
            frame-period-summary count;
            symbol-period count;
          }
          negotiation-options {
            allow-remote-loopback;
            no-allow-link-events;
          }
        }
      }
    }
```

Hierarchy Level [edit protocols]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.
connectivity-fault-management introduced in Junos OS Release 10.2 for EX Series switches.

Description Provide IEEE 802.3ah Operation, Administration, and Maintenance (OAM) link fault management (LFM) support for Ethernet interfaces on EX Series switches or configure connectivity fault management (CFM) for IEEE 802.1ag Operation, Administration, and Management (OAM) support on the switches.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- *Example: Configuring Ethernet OAM Connectivity Fault Management on EX Series Switches*
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282
- *Configuring Ethernet OAM Connectivity Fault Management (CLI Procedure)*

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. See CLI Explorer.

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

Related Documentation

- Overview of Uplink Failure Detection on page 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

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 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

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 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

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. See CLI Explorer.

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

Related Documentation

- Overview of Uplink Failure Detection on page 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

action (OAM LFM)

Syntax

```
action {
   syslog;
   link-down;
}
```

Hierarchy Level [edit protocols oam ethernet link-fault-management]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Define the action or actions to be taken when the OAM link fault management (LFM) fault event occurs.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

action-profile

Syntax

```
action-profile profile-name;
  action {
    syslog;
    link-down;
  }
  event {
    link-adjacency-loss;
    link-event-rate {
      frame-error count;
      frame-period count;
      frame-period-summary count;
      symbol-period count;
    }
  }
```

Hierarchy Level [edit protocols oam ethernet link-fault-management]

Release Information Statement introduced in Junos OS Release 9.4 for EX Series switches.

Description Configure an Ethernet OAM link fault management (LFM) action profile by specifying a profile name.

The remaining statements are explained separately. See CLI Explorer.

Options *profile-name*—Name of the action profile.

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

Related Documentation

- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

CHAPTER 30

Configuration Statements: Unicast Reverse Path Forwarding (uRPF)

- group (RPF Selection) on page 634
- multicast-rpf-routes on page 635
- next-hop (PIM RPF Selection) on page 636
- prefix-list (PIM RPF Selection) on page 637
- rpf-check (Dynamic Profiles) on page 638
- rpf-check on page 639
- rpf-check-policy (Routing Options RPF) on page 640
- rpf-loose-mode-discard on page 641
- rpf-selection on page 642
- source (PIM RPF Selection) on page 643
- unicast-reverse-path on page 644
- wildcard-source (PIM RPF Selection) on page 645

group (RPF Selection)

Syntax

```
group group-address{
  sourcesource-address{
    next-hop next-hop-address;
  }
  wildcard-source {
    next-hop next-hop-address;
  }
}
```

Hierarchy Level [edit routing-instances *routing-instance-name* edit protocols pim rpf-selection]

Release Information Statement introduced in JUNOS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Configure the PIM group address for which you configure RPF selectiongroup (RPF Selection).

Default By default, PIM RPF selection is not configured.

Options ***group-address***—PIM group address for which you configure RPF selection.

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

multicast-rpf-routes

Syntax multicast-rpf-routes;

Hierarchy Level [edit logical-systems *logical-system-name* protocols isis traffic-engineering family inet shortcuts],
[edit logical-systems *logical-system-name* routing-instances traffic-engineering family inet shortcuts],
[edit protocols isis traffic-engineering family inet shortcuts],
[edit routing-instances *routing-instance-name* protocols isis traffic-engineering family inet shortcuts]

Release Information Statement introduced in Junos OS Release 9.3.

Description Install unicast IPv4 routes into the multicast routing table (inet.2) for multicast reverse-path-forwarding (RPF) checks.

Traffic engineering shortcuts must be enabled. IPv4 multicast topology must not be enabled. Label-switched paths (LSPs) must not be advertised into IS-IS.

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

Related Documentation

- *Example: Enabling IS-IS Traffic Engineering Support*
- *Using Labeled-Switched Paths to Augment SPF to Compute IGP Shortcuts*

next-hop (PIM RPF Selection)

Syntax next-hop *next-hop-address*;

Hierarchy Level [edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address* source *source-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address* wildcard-source],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses* source *source-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses* wildcard-source]

Release Information Statement introduced in JUNOS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Configure the specific next-hop address for the PIM group source.

Options ***next-hop-address***—Specific next-hop address for the PIM group source.

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

prefix-list (PIM RPF Selection)

Syntax

```
prefix-list prefix-list-addresses {
  source source-address {
    next-hop next-hop-address;
  }
  wildcard-source {
    next-hop next-hop-address;
  }
}
```

Hierarchy Level

[edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address* source *source-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address* wildcard-source],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses* source *source-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses* wildcard-source]

Release Information

Statement introduced in Junos OS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

(Optional) Configure a list of prefixes (addresses) for multiple PIM groups.

Options

prefix-list-addresses—List of prefixes (addresses) for multiple PIM groups.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

rpf-check (Dynamic Profiles)

Syntax

```
rpf-check {
   fail-filter filter-name;
   mode loose;
}
```

Hierarchy Level [edit dynamic-profiles *profile-name* interfaces *interface-name* unit *logical-unit-number* family *family*]

Release Information Statement introduced in Junos OS Release 9.6.

Description Check whether traffic is arriving on an expected path. You can include this statement with the **inet** protocol family only.

The remaining statements are explained separately. Search for a statement in CLI Explorer or click a linked statement in the Syntax section for details.

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

Related Documentation

- Configuring Unicast RPF Strict Mode on page 307
- *Configuring Unicast RPF and Fail Filters in Dynamic Profiles for Subscriber Interfaces*

rpf-check

List of Syntax

Syntax (MX Series, SRX Series, M Series, T Series, PTX Series) on page 639
Syntax (EX Series) on page 639

Syntax (MX Series, SRX Series, M Series, T Series, PTX Series)

```
rpf-check {
  fail-filter filter-name;
  mode loose;
}
```

Syntax (EX Series)

```
rpf-check;
```

Hierarchy Level (MX Series, SRX Series, M Series, T Series, PTX Series)

[edit interfaces *interface-name* unit *logical-unit-number* family *inet*],
[edit interfaces *interface-name* unit *logical-unit-number* family *inet6*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *inet*]
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* family *inet6*]

Hierarchy Level (EX Series)

[edit interfaces *interface-name* unit *logical-unit-number* family inet],
[edit interfaces *interface-name* unit *logical-unit-number* family inet6]

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 13.2 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Support for interface **ps0** (pseudowire subscriber logical interface device) added in Junos OS Release 15.1.

Description

Enable a reverse-path forwarding (RPF) check on unicast traffic.

On EX3200 and EX4200 switches, enable a reverse-path forwarding (RPF) check on unicast traffic (except ECMP packets) on all ingress interfaces.

On EX4300 switches, enable a reverse-path forwarding (RPF) check on unicast traffic, including ECMP packets, on all ingress interfaces.

On EX8200 and EX6200 switches, enable an RPF check on unicast traffic, including ECMP packets, on the selected ingress interfaces.

On QFX Series switches, enable an RPF check on unicast traffic (except ECMP packets) on the selected ingress interfaces.

The mode statement is explained separately.

Default

Unicast RPF is disabled on all interfaces.

Options

fail-filter—A filter to evaluate when packets are received on the interface. If the RPF check fails, this optional filter is evaluated. If the fail filter is not configured, the default action is to silently discard the packet.

Required Privilege Level

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

Related Documentation

- Configuring Unicast RPF Strict Mode on page 307
- Configuring Unicast RPF Loose Mode on page 309
- *Example: Configuring Unicast Reverse-Path-Forwarding Check*
- *Configuring a Pseudowire Subscriber Logical Interface Device*
- Example: Configuring Unicast RPF on an EX Series Switch on page 318
- Configuring Unicast RPF (CLI Procedure) on page 313
- Disabling Unicast RPF (CLI Procedure) on page 315
- Understanding Unicast RPF on page 300

rpf-check-policy (Routing Options RPF)

Syntax

rpf-check-policy [*policy-names*];

Hierarchy Level

[edit logical-systems *logical-system-name* routing-instances *routing-instance-name* routing-options multicast],
[edit logical-systems *logical-system-name* routing-options multicast],
[edit routing-instances *routing-instance-name* routing-options multicast],
[edit routing-options multicast]

Release Information

Statement introduced in Junos OS Release 8.1.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 12.3 for ACX Series routers.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Apply policies for disabling RPF checks on arriving multicast packets. The policies must be correctly configured.

Options

policy-names—Name of one or more multicast RPF check policies.

Required Privilege Level

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

Related Documentation

- *Example: Configuring RPF Policies*

rpf-loose-mode-discard

Syntax

```
rpf-loose-mode-discard {
  family {
    inet;
    inet6;
  }
}
```

Hierarchy Level [edit forwarding-options]

Release Information Statement introduced in Junos OS Release 12.1.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description Configure unicast reverse path forwarding (unicast RPF) loose mode with the ability to discard packets with the source address pointing to the discard next hop.

Options **inet**—IPv4 address family.

inet6—IPv6 address family.

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

Related Documentation

- Configuring Unicast RPF on page 304

rpf-selection

Syntax

```
rpf-selection {
  group group-address {
    sourcesource-address {
      next-hop next-hop-address;
    }
    wildcard-source {
      next-hop next-hop-address;
    }
  }
  prefix-list prefix-list-addresses {
    source source-address {
      next-hop next-hop-address;
    }
    wildcard-source {
      next-hop next-hop-address;
    }
  }
```

Hierarchy Level

[edit routing-instances *routing-instance-name* protocols pim]
[edit protocols pim]

Release Information

Statement introduced in JUNOS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure the PIM RPF next-hop neighbor for a specific group and source for a VRF routing instance.

NOTE: Starting in Junos OS 17.4R1, you can configure **rpf-selection** statement at the **[edit protocols pim]** hierarchy level.

The remaining statements are explained separately. See CLI Explorer.

Default

If you omit the **rpf-selection** statement, PIM RPF checks typically choose the best path determined by the unicast protocol for all multicast flows.

Options

source-address—Specific source address for the PIM group.

Required Privilege Level

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

source (PIM RPF Selection)

Syntax

source *source-address* {
  next-hop *next-hop-address*;
}

Hierarchy Level

[edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses*]

Release Information

Statement introduced in JUNOS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Configure the source address for the PIM group.

Options

source-address—Specific source address for the PIM group.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

unicast-reverse-path

Syntax unicast-reverse-path (active-paths | feasible-paths);

Hierarchy Level [edit logical-systems *logical-system-name* routing-options forwarding-table],
[edit routing-instances *routing-instance-name* instance-type *name* routing-options forwarding-table],
[edit routing-options forwarding-table]

Release Information Statement introduced before Junos OS Release 7.4.
Support for routing instances added in Junos OS Release 8.3.
Statement introduced in Junos OS Release 12.3 for ACX Series routers.
Statement introduced in Junos OS Release 11.3 for QFX Series switches.

NOTE: **On EX4300 switches, unicast reverse path with active path is supported, but feasible path is not supported.**

Description Control the operation of unicast reverse-path-forwarding check. This statement enables the RPF check to be used when routing is asymmetrical.

Options **active-paths**—Consider only active paths during the unicast reverse-path check.

feasible-paths—Consider all feasible paths during the unicast reverse-path check.

Default: If you omit the **unicast-reverse-path** statement, only the active paths to a particular destination are considered.

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

Related Documentation

- *Example: Configuring Unicast Reverse-Path-Forwarding Checking to Prevent DoS and DDoS Attacks*
- *Enabling Unicast Reverse-Path Forwarding Check for VPNs*

wildcard-source (PIM RPF Selection)

Syntax

```
wildcard-source {
  next-hop next-hop-address;
}
```

Hierarchy Level

[edit routing-instances *routing-instance-name* protocols pim rpf-selection group *group-address*],
[edit routing-instances *routing-instance-name* protocols pim rpf-selection prefix-list *prefix-list-addresses*]

Release Information

Statement introduced in Junos OS Release 10.4.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Use a wildcard for the multicast source instead of (or in addition to) a specific multicast source.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Example: Configuring PIM RPF Selection*

CHAPTER 31

Configuration Statements: IP Directed and Targeted Broadcast

- targeted-broadcast on page 648
- policy-statement on page 649

targeted-broadcast

Syntax (EX Series, MX Series, ACX Series)

```
targeted-broadcast {
  forward-and-send-to-re;
  forward-only;
}
```

Syntax (QFX Series, OCX1100, EX4600, NFX Series)

```
targeted-broadcast;
```

Hierarchy Level (EX Series, MX Series, ACX Series)

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

Hierarchy Level (QFX Series, OCX1100, EX4600, NFX Series)

[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 9.4 for EX Series switches.
Statement introduced in Junos OS Release 10.2.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Specify the IP packets destined for a Layer 3 broadcast address 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.

The remaining statements are explained separately. See CLI Explorer.

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

- Configuring Targeted Broadcast on page 328
- Understanding Targeted Broadcast on page 327

policy-statement

Syntax

```
policy-statement policy-name {
  term term-name {
    from {
      as-path-unique-count count (equal | orhigher | orlower);
      family family-name;
      match-conditions;
      policy subroutine-policy-name;
      prefix-list prefix-list-name;
      prefix-list-filter prefix-list-name match-type <actions>;
      protocol protocol-name;
      route-filter destination-prefix match-type <actions>;
      source-address-filter source-prefix match-type <actions>;
      tag value;
      traffic-engineering;
    }
    to {
      match-conditions;
      policy subroutine-policy-name;
    }
    then actions;
  }
  then {
    aggregate-bandwidth;
    dynamic-tunnel-attributes dynamic-tunnel-attributes;
    limit-bandwidth limit-bandwidth;
    multipath-resolve multipath-resolve;
    no-entropy-label-capability;
    prefix-segment {
      index index;
      node-segment;
    }
    priority (high | medium | low);
  }
}
```

Hierarchy Level

[edit dynamic-profiles *profile-name* policy-options],
[edit logical-systems *logical-system-name* policy-options],
[edit policy-options]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Support for configuration in the dynamic database introduced in Junos OS Release 9.5.
Support for configuration in the dynamic database introduced in Junos OS Release 9.5 for EX Series switches.
inet-mdt option introduced in Junos OS Release 10.0R2.
Statement introduced in Junos OS Release 11.3 for the QFX Series.
route-target option introduced in Junos OS Release 12.2.
Statement introduced in Junos OS 14.1X53-D20 for the OCX Series.
protocol and **traffic-engineering** options introduced in Junos OS Release 14.2.
no-entropy-label-capability option introduced in Junos OS Release 15.1.

priority and **tag** ***value*** options introduced in Junos OS Release 17.1.
as-path-unique-count option introduced in Junos OS Release 17.2R1.
prefix-segment option introduced in Junos OS Release 17.2R1 for MX Series routers, PTX Series routers, QFX5100 switches, and QFX10000 switches.
multipath-resolve and **dynamic-tunnel-attributes** options introduced in Junos OS Release 17.3R1.
aggregate-bandwidth and **limit-bandwidth** ***limit-bandwidth*** options introduced in Junos OS Release 17.4R1 for MX Series, PTX Series, and QFX Series.

Description Define a routing policy, including subroutine policies.

A *term* is a named structure in which match conditions and actions are defined. Routing policies are made up of one or more terms. Each routing policy term is identified by a term name. The name can contain letters, numbers, and hyphens (-) and can be up to 255 characters long. To include spaces in the name, enclose the entire name in double quotation marks.

Each term contains a set of match conditions and a set of actions:

- Match conditions are criteria that a route must match before the actions can be applied. If a route matches all criteria, one or more actions are applied to the route.
- Actions specify whether to accept or reject the route, control how a series of policies are evaluated, and manipulate the characteristics associated with a route.

Generally, a router compares a route against the match conditions of each term in a routing policy, starting with the first and moving through the terms in the order in which they are defined, until a match is made and an explicitly configured or default action of **accept** or **reject** is taken. If none of the terms in the policy match the route, the router compares the route against the next policy, and so on, until either an action is taken or the default policy is evaluated.

If none of the match conditions of each term evaluates to true, the final action is executed. The final action is defined in an unnamed term. Additionally, you can define a default action (either **accept** or **reject**) that overrides any action intrinsic to the protocol.

The order of match conditions in a term is not relevant, because a route must match all match conditions in a term for an action to be taken.

To list the routing policies under the **[edit policy-options]** hierarchy level by **policy-statement** ***policy-name*** in alphabetical order, enter the **show policy-options** configuration command.

The statements are explained separately.

Options

actions—(Optional) One or more actions to take if the conditions match. The actions are described in "Configuring Flow Control Actions" on page 127.

family ***family-name***—(Optional) Specify an address family protocol. Specify **inet** for IPv4. Specify **inet6** for 128-bit IPv6, and to enable interpretation of IPv6 router filter addresses. For IS-IS traffic, specify **iso**. For IPv4 multicast VPN traffic, specify **inet-mvpn**. For IPv6 multicast VPN traffic, specify **inet6-mvpn**. For multicast-distribution-tree (MDT) IPv4 traffic, specify **inet-mdt**. For BGP route target VPN traffic, specify **route-target**. For traffic engineering, specify **traffic-engineering**.

NOTE: When family is not specified, the routing device or routing instance uses the address family or families carried by BGP. If multiprotocol BGP (MP-BGP) is enabled, the policy defaults to the protocol family or families carried in the network layer reachability information (NLRI) as configured in the *family* statement for BGP. If MP-BGP is not enabled, the policy uses the default BGP address family unicast IPv4.

from—(Optional) Match a route based on its source address.

as-path-unique-count ***count*** **(equal | orhigher | orlower)**—(Optional) Specify a number from 0 through 1024 to filter routes based on the number of unique autonomous systems (ASs) in the AS path. Specify the match condition for the unique AS path count.

aggregate-bandwidth—(Optional) Enable BGP to advertise aggregate outbound link bandwidth for load balancing.

dynamic-tunnel-attributes ***dynamic-tunnel-attributes***—(Optional) Choose a set of defined dynamic tunnel attributes for forwarding traffic over V4oV6 tunnels.

match-conditions—(Optional in **from** statement; required in **to** statement) One or more conditions to use to make a match. The qualifiers are described in *Routing Policy Match Conditions*.

multipath-resolve ***multipath-resolve***–(Optional) Enable the use of all paths for resolution over the specified prefix.

limit-bandwidth ***limit-bandwidth***—(Optional) Specify the limit for advertised aggregate outbound link bandwidth for load balancing.

Range: 0 through 4,294,967,295 bytes

no-entropy-label-capability—(Optional) Disable the entropy label capability advertisement at egress or transit routes specified in the policy.

priority (high | medium | low)—(Optional) Configure the priority for an IS-IS route to change the default order in which the routes are installed in the routing table, in the event of a network topology change.

policy ***subroutine-policy-name***—Use another policy as a match condition within this policy. The name identifying the subroutine policy can contain letters, numbers, and hyphens (-) and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (“ ”). Policy names cannot take the form **__.*-internal__**, as this form is reserved. For information about how to configure subroutines, see *Understanding Policy Subroutines in Routing Policy Match Conditions*.

policy-name—Name that identifies the policy. The name can contain letters, numbers, and hyphens (-) and can be up to 255 characters long. To include spaces in the name, enclose it in quotation marks (“ ”).

prefix-list ***prefix-list-name***—Name of a list of IPv4 or IPv6 prefixes.

prefix-list-filter ***prefix-list-name***—Name of a prefix list to evaluate using qualifiers; ***match-type*** is the type of match, and ***actions*** is the action to take if the prefixes match.

protocol ***protocol-name***—Name of the protocol used to control traffic engineering database import at the originating point.

route-filter ***destination-prefix match-type <actions>***—(Optional) List of routes on which to perform an immediate match; ***destination-prefix*** is the IPv4 or IPv6 route prefix to match, ***match-type*** is the type of match (see *Configuring Route Lists*), and ***actions*** is the action to take if the ***destination-prefix*** matches.

source-address-filter ***source-prefix match-type <actions>***—(Optional) Unicast source addresses in multiprotocol BGP (MBGP) and Multicast Source Discovery Protocol (MSDP) environments on which to perform an immediate match. ***source-prefix*** is the IPv4 or IPv6 route prefix to match, ***match-type*** is the type of match (see *Configuring Route Lists*), and ***actions*** is the action to take if the ***source-prefix*** matches.

tag ***value***—(Optional) A numeric value that identifies a route. You can tag certain routes to prioritize them over other routes. In the event of a network topology change, Junos OS updates these routes in the routing table before updating other routes with lower priority. You can also tag some routes to identify and reject them based on your requirement.

term ***term-name***—Name that identifies the term. The term name must be unique in the policy. It can contain letters, numbers, and hyphens (-) and can be up to 64 characters long. To include spaces in the name, enclose the entire name in quotation marks (“ ”). A policy statement can include multiple terms. We recommend that you name all terms. However, you do have the option to include an unnamed term which must be the final term in the policy. To configure an unnamed term, omit the **term** statement when defining match conditions and actions.

to—(Optional) Match a route based on its destination address or the protocols into which the route is being advertised.

then—(Optional) Actions to take on matching routes. The actions are described in “Configuring Flow Control Actions” on page 127 and “Configuring Actions That Manipulate Route Characteristics” on page 127.

Required Privilege Level

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

Related Documentation

- *dynamic-db*
- *Understanding Source Packet Routing in Networking (SPRING)*

CHAPTER 32

Configuration Statements: ARP

- arp (Interfaces) on page 656
- gratuitous-arp-reply on page 658
- no-gratuitous-arp-request on page 659
- proxy-arp on page 660

arp (Interfaces)

Syntax

arp *ip-address* (mac | multicast-mac) *mac-address* publish;

```
arp {
  aging-timer minutes;
  gratuitous-arp-delayseconds;
  gratuitous-arp-on-ifup;
  interfaces {
    interface-name {
      aging-timer minutes;
    }
  }
  passive-learning;
  purging;
}
```

Syntax (EX Series)

```
arp {
  aging-timer minutes;
}
```

Hierarchy Level

[edit system]

[edit 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 address *address*]

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

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 14.1X53-D20 for the OCX Series.

Description

For Ethernet, Fast Ethernet, and Gigabit Ethernet interfaces only, configure Address Resolution Protocol (ARP) table entries, mapping IP addresses to MAC addresses. You can enable backup VRRP routers to learn ARP requests for VRRP-IP to VRRP-MAC address translation. You can also set the time interval between ARP updates.

NOTE: By default, an ARP policer is installed that is shared among all the Ethernet interfaces on which you have configured the **family inet** statement. By including the **arp** statement at the **[edit interfaces *interface-name* unit *logical-unit-number* family inet policer]** hierarchy level, you can apply a specific ARP-packet policer to an interface. This feature is not available on EX Series switches.

When you need to conserve IP addresses, you can configure an Ethernet interface to be unnumbered by including the **unnumbered-address** statement at the **[edit interfaces *interface-name* unit *logical-unit-number* family inet]** hierarchy level.

NOTE: For EX-Series switches, set only the time interval between ARP updates.

Options **ip-address**—IP address to map to the MAC address. The IP address specified must be part of the subnet defined in the enclosing **address** statement.

mac *mac-address*—MAC address to map to the IP address. Specify the MAC address as six hexadecimal bytes in one of the following formats: ***nnnn*.*nnnn*.*nnnn*** or ***nn*:*nn*:*nn*:*nn*:*nn*:*nn***. For example, **0000.5e00.5355** or **00:00:5e:00:53:55**.

multicast-mac *mac-address*—Multicast MAC address to map to the IP address. Specify the multicast MAC address as six hexadecimal bytes in one of the following formats: ***nnnn*.*nnnn*.*nnnn*** or ***nn*:*nn*:*nn*:*nn*:*nn*:*nn***. For example, **0000.5e00.5355** or **00:00:5e:00:53:55**.

publish—(Optional) Have the router or switch reply to ARP requests for the specified IP address. If you omit this option, the router or switch uses the entry to reach the destination but does not reply to ARP requests.

NOTE: For unicast MAC addresses only, if you include the **publish** option, the router or switch replies to proxy ARP requests.

aging-timer—Time interval in minutes between ARP updates. In environments where the number of ARP entries to update is high (for example, on routers only, metro Ethernet environments), increasing the time between updates can improve system performance.

passive-learning (QFX-Series only)—Configure backup VRRP routers or switches to learn the ARP mappings (IP-to-MAC address) for hosts sending the requests. By default, the backup VRRP router drops these requests; therefore, if the master router fails, the backup router must learn all entries present in the ARP cache of the master router. Configuring passive learning reduces transition delay when the backup router is activated.

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

Related Documentation

- Configuring Static ARP Table Entries For Mapping IP Addresses to MAC Addresses on page 345
- *Configuring Junos OS ARP Learning and Aging Options for Mapping IPv4 Network Addresses to MAC Addresses*
- *Junos OS Network Interfaces Library for Routing Devices*
- *Junos OS System Basics Configuration Guide* .

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.

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 Switches*

proxy-arp

Syntax proxy-arp (restricted | unrestricted);

Hierarchy Level [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 9.6 for EX Series switches.
restricted added in Junos OS Release 10.0 for EX Series switches.
Statement introduced in Junos OS Release 12.2 for the QFX Series.

Description For Ethernet interfaces only, configure the router or switch to respond to any ARP request, as long as the router or switch has an active route to the ARP request's target address.

NOTE: You must configure the IP address and the **inet** family for the interface when you enable proxy ARP.

Default Proxy ARP is not enabled. The router or switch responds to an ARP request only if the destination IP address is its own.

Options

- **none**—The router or switch responds to any ARP request for a local or remote address if the router or switch has a route to the target IP address.
- **restricted**—(Optional) The router or switch responds to ARP requests in which the physical networks of the source and target are different and does not respond if the source and target IP addresses are in the same subnet. The router or switch must also have a route to the target IP address.
- **unrestricted**—(Optional) The router or switch responds to any ARP request for a local or remote address if the router or switch has a route to the target IP address.

Default: unrestricted

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

Related Documentation

- Configuring Restricted and Unrestricted Proxy ARP on page 346
- *Configuring Proxy ARP on Switches (CLI Procedure)*
- *Example: Configuring Proxy ARP on an EX Series Switch*
- Configuring Gratuitous ARP on page 343

CHAPTER 33

Configuration Statements: Resilient Hashing

- ecmp-resilient-hash on page 661
- enhanced-hash-key on page 662
- hash-key (Forwarding Options) on page 665
- hash-mode on page 667
- hash-seed on page 669
- inet (enhanced-hash-key) on page 670
- inet6 (enhanced-hash-key) on page 672
- ipv6-flow-label on page 674
- resilient-hash on page 674

ecmp-resilient-hash

Syntax ecmp-resilient-hash;

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 14.1X53-D10 for the QFX Series.

Description Enable resilient hashing for ECMP groups, to minimize remapping of destination paths.

NOTE:

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

Related Documentation
- Configuring Resilient Hashing for Trunk/ECMP Groups on page 351

enhanced-hash-key

List of Syntax

Syntax (EX Series and QFX5100 Switches) on page 662
Syntax (QFX10002 and QFX10008 Switches) on page 662

Syntax (EX Series and QFX5100 Switches)

```
enhanced-hash-key {
  ecmp-resilient-hash;
  fabric-load-balance {
    flowlet {
      inactivity-interval interval;
    }
    per-packet;
  }
  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;
  }
}
```

Syntax (QFX10002 and QFX10008 Switches)

```
enhanced-hash-key {
  hash-seed seed-value;
  inet {
    no-ipv4-destination-address;
    no-ipv4-source-address;
    no-l4-destination-port;
    no-l4-source-port;
  }
  inet6 {
    ipv6-flow-label;
    no-ipv6-destination-address;
    no-ipv6-source-address;
```

```
    no-l4-destination-port;
    no-l4-source-port;
  }
  layer2 {
    destination-mac-address
    inner-vlan-id;
    no-ether-type;
    no-vlan-id;
    source-mac-address;
  }
  no-mpls;
  gre {
    key;
    protocol;
  }
  vxlan-vnid
  }
}
```

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.
The **fabric-load-balance** statement introduced in Junos OS Release 14.1X53-D10.
The **fabric-load-balance** statement deprecated starting in Junos OS Releases 14.1X53-D46, 15.1R7, 16.1R6, 17.2R2, 17.3R2, and 17.4R1.
The **hash-seed** statement introduced in Junos OS Release 15.1X53-D30.

Description Configure the hashing key used to hash link aggregation group (LAG) and equal-cost multipath (ECMP) traffic, or enable adaptive load balancing (ALB) in a Virtual Chassis Fabric (VCF).

NOTE: **Starting in Junos OS Release 14.1X53-D46, 15.1R7, 16.1R6, 17.2R2, 17.3R2, and 17.4R1, the ALB feature is deprecated. If fabric-load-balance is enabled in the configuration for a VCF, delete the configuration item upon upgrading Junos OS.**

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.

On QFX10002 and QFX10008 switches, you can configure the hash seed for load balancing.

By default, the QFX10002 and QFX10008 switches use the system MAC address to generate a hash seed value. You can configure the hash seed value using the **hash-seed** statement at the [**edit forwarding-options enhanced-hash-key**] hierarchy level. Set a value between 0 and 4294967295. If you do not configure a hash seed value, the system will by generate a hash seed value based on the system MAC address.

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352

hash-key (Forwarding Options)

Syntax

```
hash-key {
  family {
    inet {
      layer-3;
      layer-4;
      inner-vlan-id;
      outer-vlan-id;
    }
  }
  multiservice {
    source-mac;
    destination-mac;
    payload {
      ip {
        layer3-only;
        layer-3 (source-ip-only | destination-ip-only);
        layer-4;
        inner-vlan-id;
        outer-vlan-id;
      }
    }
  }
}
```

Hierarchy Level

[edit forwarding-options]
[edit chassis fpc *slot-number* pic *pic-number*]

Release Information

Statement introduced in Junos OS Release 15.1X53-D10 for QFX10000 switches.

Description

(QFX10000 switches only) Select which packet header data to use for per-flow load balancing.

NOTE: You can configure either Layer 3 or Layer 4 load balancing, or both at the same time.

NOTE: On I chip platforms, an unknown Layer 4 header is excluded from load-balance hashing to avoid undesired packet reordering.

Options

- **inet**—IPv4 address family.
- **layer-3**—Incorporate Layer 3 data into the hash key.
- **layer-4**—Incorporate Layer 4 data into the hash key.

- **outer-vlan-id**—Include outer VLAN ID information in the hash key.
- **inner-vlan-id**—Include inner VLAN ID information in the hash key.
- **payload**—Incorporate payload data into the hash key.
- **ip**—Include the IP address of the IPv4 or IPv6 payload into the hash key.
- **layer-3–only**—Include only Layer 3 IP information.

Required Privilege Level

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

Related Documentation

-

hash-mode

Syntax

```
hash-mode {
  layer2-header;
  layer2-payload;
  gtp-header-offset offset-value;
}
```

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.
Statement is not supported on QFX10002 and QFX 10008 switches.
Hash mode option *gtp-header-offset* introduced in Junos OS Release 17.3R3 for QFX5000 line of switches.

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.

gtp-header-offset—Set proper offset value for the header based on the different patterns.

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 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- **enhanced-hash-key on page 662**
- **inet on page 670**
- **inet6 on page 672**
- **layer2 on page 595**
- **gtp-header-offset on page 676**

hash-seed

Syntax hash-seed *seed-value*;

Hierarchy Level [edit forwarding-options enhanced-hash-key]

Release Information Statement introduced in Junos OS Release 15.1X53-D30 on QFX Series devices.

Description Configure a hash seed for load-balancing functions.

By default, the QFX10002 and QFX10008 switches use the system MAC address to generate a hash seed value. You can configure the hash seed value using the **hash-seed** statement at the [**edit forwarding-options enhanced-hash-key**] hierarchy. Set a value between 0 and 4294967295. If you do not configure a hash seed value, the system will generate a hash seed value based on the system MAC address.

NOTE: The **fabric-load-balance** and **user-defined-fields** statements are not supported at the [**edit forwarding-options enhanced-hash-key**] hierarchy level.

Options **hash-seed*seed-value***—A hash seed value, in the range from 0 to 4294967295.

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

Related Documentation

- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- Configuring the Fields in the Algorithm Used To Hash LAG Bundle and ECMP Traffic (CLI Procedure) on page 362
- **show forwarding-options enhanced-hash-key on page 735**

inet (enhanced-hash-key)

List of Syntax

Syntax (EX Series and QFX5100 Switch) on page 670
Syntax (QFX10002 and QFX10008 Switches) on page 670

Syntax (EX Series and QFX5100 Switch)

```
inet {
  no-ipv4-destination-address;
  no-ipv4-source-address;
  no-l4-destination-port;
  no-l4-source-port;
  no-protocol;
  vlan-id;
}
```

Syntax (QFX10002 and QFX10008 Switches)

```
inet {
  no-ipv4-destination-address;
  no-ipv4-source-address;
  no-l4-destination-port;
  no-l4-source-port;
}
```

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.
Statement introduced in Junos OS Release 15.1X53-D30 on QFX10002 and QFX10008 Switches.

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.

NOTE: The **vlan-id** option is not supported and should not be configured on a Virtual Chassis or Virtual Chassis Fabric (VCF) that contains any of the following switches as members: EX4300, EX4600, QFX3500, QFX3600, QFX5100, or QFX5110 switches.

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 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- **hash-seed on page 669**
- **enhanced-hash-key on page 662**
- **hash-mode on page 667**
- **inet6 on page 672**

inet6 (enhanced-hash-key)

List of Syntax

Syntax (EX Series and QFX5100 Switch) on page 672
Syntax (QFX10002 and QFX10008 Switches) on page 672

Syntax (EX Series and QFX5100 Switch)

```
inet6 {
  no-ipv6-destination-address;
  no-ipv6-source-address;
  no-l4-destination-port;
  no-l4-source-port;
  no-next-header;
  vlan-id;
}
```

Syntax (QFX10002 and QFX10008 Switches)

```
inet6 {
  ipv6-flow-label;
  no-ipv6-destination-address;
  no-ipv6-source-address;
  no-l4-destination-port;
  no-l4-source-port;
}
```

Hierarchy Level

[edit forwarding-options enhanced-hash-key]

Release Information

Statement introduced in Junos OS Release 13.2X51-D15 on EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 on QFX Series devices.
Statement introduced in Junos OS Release 15.1X53-D30 on QFX10002 and QFX 10008 switches.

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 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- **hash-seed on page 669**
- **enhanced-hash-key on page 662**
- **hash-mode on page 667**
- **inet on page 670**

ipv6-flow-label

Syntax ipv6-flow-label;

Hierarchy Level For QFX Series:

[edit forwarding-options enhanced-hash-key inet6]

Hierarchy Level For PTX Series:

[edit forwarding-options hash-key family inet6 layer-3]

Release Information Statement introduced in Junos OS Release 15.1X53-D30 on QFX10002 and 10008 switches..
Statement introduced in Junos OS Release 18.3R1 for PTX series routers.

Description Enable IPv6 packet flow labels for hash calculations and load balancing based on the flow label of the IPv6 header.

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

Related Documentation

- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic (QFX 10002 and QFX 10008 Switches) on page 358
- **show forwarding-options enhanced-hash-key on page 735**

resilient-hash

Syntax resilient-hash;

Hierarchy Level [edit interfaces ae*x* aggregated-ether-options]]

Release Information Statement introduced in Junos OS Release 14.1X53-D10 for the QFX Series.

Description Enable resilient hashing for a LAG to minimize remapping of destination paths.

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

Related Documentation

- Configuring Resilient Hashing for Trunk/ECMP Groups on page 351
- *Configuring Resilient Hashing for LAGs and ECMP Groups*

CHAPTER 34

Configuration Statements: Generic Routing Encapsulation (GRE)

- gtp-header-offset on page 676
- gtp-tunnel-endpoint-identifier on page 678
- source on page 679
- ttl on page 680
- tunnel on page 681
- allow-fragmentation on page 682
- copy-tos-to-outer-ip-header on page 683
- do-not-fragment on page 684
- destination (Tunnels) on page 685
- family on page 686
- routing-instance on page 687
- source on page 688
- tunnel on page 689
- tunnel-port on page 689
- unit (Interfaces) on page 690

gtp-header-offset

Syntax gtp-header-offset *offset-value*

Hierarchy Level (QFX5000 line of switches) [edit forwarding-options enhanced-hash-key hash-mode]

Release Information Statement introduced in Junos OS Release 17.3R3 for QFX5000 line of switches.

Description You must only provide a decimal value for *gtp-header-offset* command. As per standards, 0x32 is the default header offset value. But, due to some special patterns in the header, offset may vary like, 0x30, 0x28, and so on. In this case, you need to convert it to a proper offset value as follows:

For Example:

- If the offset value is 0x32, the equivalent decimal value is calculated as (16*3+2) which is equal to 50.
- If the offset value is 0x30, the equivalent decimal value is calculated as (16*3+0) which is equal to 48.

After setting *gtp-header-offset* to a proper offset value, run *gtp-tunnel-endpoint-identifier* command to enable GTP hashing. Refer gtp-tunnel-endpoint-identifier for more details. For example:

- If the IPv6 traffic has *0x32* as offset value, then use **set forwarding-options enhanced-hash-key family inet *gtp-tunnel-endpoint-identifier*** command directly.
- If the IPv6 traffic has *0x30* as offset value, then you must set proper offset value after enabling GTP hashing as follows:

  set forwarding-options enhanced-hash-key family inet *gtp-tunnel-endpoint-identifier*

  set forwarding-options enhanced-hash-key hash-mode *gtp-header-offset* 48
- If the IPv4 traffic has *0x32* as offset value, then use **set forwarding-options enhanced-hash-key family inet gtp-tunnel-endpoint-identifier** command directly.
- If the IPv4 traffic has *0x30* as offset value, then you must set proper offset value after enabling GTP hashing as follows:

  set forwarding-options enhanced-hash-key family inet gtp-tunnel-endpoint-identifier

  set forwarding-options enhanced-hash-key hash-mode gtp-header-offset 48

NOTE: Both IPv4 and IPv6 share same GTP header offset value. If there are two different traffic streams, that is, if IPv4 has value X as offset value and IPv6 has Y as offset value, then hashing will be successful only for one of the traffic stream.

Required Privilege Level

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

Related Documentation

- gtp-tunnel-endpoint-identifier on page 678

gtp-tunnel-endpoint-identifier

Syntax gtp-tunnel-endpoint-identifier

Hierarchy Level [edit forwarding-options hash-key family inet layer-4],

[edit forwarding-options hash-key family inet6 layer-4]

Hierarchy Level (QFX5000 line of switches) [edit forwarding-options enhanced-hash-key family inet],

Release Information Statement introduced in Junos OS Release 15.1F3 and 16.1R2 for PTX5000 routers with third-generation FPCs.
Statement introduced in Junos OS Release 15.1F6 and 16.1R2 for PTX3000 routers with third-generation FPCs.
Statement introduced in Junos OS Release 17.3R3 for QFX5000 line of switches.

Description When you configure **gtp-tunnel-endpoint-identifier**, the hash calculation of IPv4 or IPv6 packets are included in the GPRS tunneling protocol–tunnel endpoint ID (GTP-TEID) field hash calculations.

NOTE: The **gtp-tunnel-endpoint-identifier** configuration statement is supported on PTX Series routers only when network services is set to **enhanced-mode**. For more information, see **enhanced-mode**.

In QFX5000 line of switches, if this statement is configured, the default L4 ports 2152 and 2123 is set to use along with the default first byte 0x32.

(QFX5000 line of switches) In most of the cases, configuring **gtp-tunnel-endpoint-identifier** statement is sufficient for enabling GTP hashing. After enabling, if GTP hashing does not work, it is recommended to capture the packets using relevant tools and identify the offset value. As per standards, 0x32 is the default header offset value. But, due to some special patterns in the header, offset may vary to say 0x30, 0x28, and so on. In this cases, use **gtp-header-offset** statement to set a proper offset value. Once the header offset value is resolved, run **gtp-tunnel-endpoint-identifier** command for enabling GTP hashing successfully. Refer **gtp-header-offset** for more details.

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

Related Documentation

- *hash-key*
- *Understanding Per-Packet Load Balancing*
- *Configuring Per-Packet Load Balancing*

- gtp-header-offset on page 676

source

Syntax source *source-address*;

Hierarchy Level (EX, NFX, OCX1100 and QFX Series) [edit interfaces *interface-name* unit *logical-unit-number* tunnel]

Hierarchy Level (M-series and T-series) [edit interfaces *interface-name* unit *logical-unit-number* tunnel *address*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* tunnel *address*]

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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

- *Tunnel Services Overview*
- *multicast-only*
- primary (Address on Interface) on page 463
- *Junos OS Services Interfaces Library for Routing Devices*

ttl

Syntax ttl *value*;

Hierarchy Level [edit interfaces *interface-name* 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 17.1 for ACX Series routers.

Description Set the time-to-live value bit in the header of the outer IP packet.

Options ***value***—Time-to-live value.

Range: 0 through 255

Default: 64

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

Related Documentation

- *Tunnel Services Overview*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- Configuring Generic Routing Encapsulation Tunneling (CLI Procedure) on page 377

allow-fragmentation

Syntax
allow-fragmentation;

Hierarchy Level
[edit interfaces gr-*fpc/pic/port* unit *logical-unit-number* tunnel],
[edit logical-systems *logical-system-name* interfaces gr-*fpc/pic/port* unit *logical-unit-number* tunnel]

Release Information
Statement introduced in Junos OS Release 9.2.
Statement introduced in Junos OS Release 15.1X53-D10 for QFX10000 switches.

Description
For a generic routing encapsulation (GRE) tunnel, enable fragmentation of GRE-encapsulated packets whose size exceeds the maximum transmission unit (MTU) value of a link that the packet passes through. The don't-fragment (DF) bit is not set in the outer IP header of GRE-encapsulated packets.

To enable the reassembly of fragmented GRE-encapsulated packets on GRE tunnel interfaces at the endpoint of the GRE tunnel, include the *reassemble-packets* statement for the interface.

Default
If you do not include the **allow-fragmentation** statement, fragmentation of GRE-encapsulated packets is disabled.

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

Related Documentation
- *reassemble-packets*
- *Enabling Fragmentation and Reassembly on Packets After GRE-Encapsulation*
- *Junos OS Services Interfaces Library for Routing Devices*

copy-tos-to-outer-ip-header

Syntax copy-tos-to-outer-ip-header;

Hierarchy Level [edit interfaces gr-*fpc/pic/port* unit *logical-unit-number*],
[edit interfaces gre unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces gr-*fpc/pic/port* unit *logical-unit-number*],
[edit logical-systems *logical-system-name* interfaces gre unit *logical-unit-number*]

Release Information Statement introduced in Junos OS Release 8.2.
Support for GRE interfaces for Generalized MPLS (GMPLS) introduced in Junos OS Release 12.3R7.

Description For GRE tunnel interfaces and GRE interfaces for GMPLS control channels only, enable the inner IP header's ToS bits to be copied to the outer IP packet header for traffic originating in the Routing Engine.

To verify that this option is enabled at the interface level, use the **show interfaces *interface-name* detail** command.

Default If you omit this statement, the ToS bits in the outer IP header are set to 0.

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

Related Documentation

- *Configuring a GRE Tunnel to Copy ToS Bits to the Outer IP Header*
- *copy-tos-to-outer-ip-header-transit*

do-not-fragment

Syntax do-not-fragment;

Hierarchy Level [edit interfaces gr-*fpc/pic/port* unit *logical-unit-number* tunnel],
[edit logical-systems *logical-system-name* interfaces gr-*fpc/pic/port* unit *logical-unit-number* tunnel]

Release Information Statement introduced in Junos OS Release 9.2.
Statement introduced in Junos OS Release 15.1X53-D10 for QFX10000 switches.

Description For a generic routing encapsulation (GRE) tunnel, disable fragmentation of GRE-encapsulated packets. This sets the do-not-fragment (DF) bit in the outer IP header of the GRE-encapsulated packets so that they do not get fragmented anywhere in the path. When the size of a GRE-encapsulated packet is greater than the MTU of a link that the packet passes through, the GRE-encapsulated packet is dropped.

Default By default, fragmentation of GRE-encapsulated packets is disabled.

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

Related Documentation

- allow-fragmentation on page 682
- *reassemble-packets*
- *Enabling Fragmentation and Reassembly on Packets After GRE-Encapsulation*
- *Junos OS Services Interfaces Library for Routing Devices*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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 on page 43
- Configuring Generic Routing Encapsulation Tunneling (CLI Procedure) on page 377
- *Junos OS Services Interfaces Library for Routing Devices*

family

Syntax

```
family family {
  address address {
    destination address;
  }
}
```

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

Release Information Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 15.1X53-D10 for QFX10000 switches.

Description Configure protocol family information for the logical interface.

Options *family*—Protocol family:

- **ccc**—Circuit cross-connect protocol suite
- **inet**—IP version 4 (IPv4)
- **inet6**—IP version 6 (IPv6)
- **iso**—Open Systems Interconnection (OSI) International Organization for Standardization (ISO) protocol suite
- **mlfr-end-to-end**—Multilink Frame Relay FRF.15
- **mlfr-uni-nni**—Multilink Frame Relay FRF.16
- **multilink-ppp**—Multilink Point-to-Point Protocol
- **mpls**—MPLS
- **tcc**—Translational cross-connect protocol suite
- **tnp**—Trivial Network Protocol
- **vpls**—Virtual private LAN service

The remaining statements are explained separately. See CLI Explorer.

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

Related Documentation

- *Link and Multilink Services Interfaces Feature Guide for Routing Devices*
- *Junos OS Network Interfaces Library for Routing Devices*

routing-instance

Syntax

```
routing-instance {
  destination routing-instance-name;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* tunnel],
[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 15.1X53-D10 for QFX10000 switches.

Description

Specify the destination routing instance that points to the routing table containing the tunnel destination address.

Default

The default Internet routing table **inet.0**.

Required Privilege Level

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

Related Documentation

- *Configuring Tunnel Interfaces for Routing Table Lookup*

source

Syntax source *source-address*;

Hierarchy Level (EX, NFX, OCX1100 and QFX Series) [edit interfaces *interface-name* unit *logical-unit-number* tunnel]

Hierarchy Level (M-series and T-series) [edit interfaces *interface-name* unit *logical-unit-number* tunnel *address*],
[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number* tunnel *address*]

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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

- *Tunnel Services Overview*
- *multicast-only*
- primary (Address on Interface) on page 463
- *Junos OS Services Interfaces Library for Routing Devices*

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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. See CLI Explorer.

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

Related Documentation

- Configuring Generic Routing Encapsulation Tunneling (CLI Procedure) on page 377

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.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX 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) on page 377

unit (Interfaces)

Syntax

```
unit logical-unit-number {
  peer-unit unit-number;
  reassemble-packets;
  tunnel {
    allow-fragmentation;
    backup-destination address;
    destination destination-address;
    do-not-fragment;
    key number;
    routing-instance {
      destination routing-instance-name;
    }
    source source-address;
    ttl number;
  }
}
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 15.1X53-D10 for QFX10000 switches.

Description

Configure a logical interface on the physical device. 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. See CLI Explorer.

Required Privilege Level

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

Related Documentation

- *Junos OS Network Interfaces Library for Routing Devices* for other statements that do not affect services interfaces.

CHAPTER 35

Configuration Statements: Flexible Ethernet Services Encapsulation

- encapsulation on page 692
- encapsulation (Logical Interface) on page 699
- flexible-vlan-tagging on page 703

encapsulation

List of Syntax

Syntax for Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series on page 692
Syntax for Logical Interfaces: SRX Series on page 692

Syntax for Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series

```
encapsulation (atm-ccc-cell-relay | atm-pvc | cisco-hdlc | cisco-hdlc-ccc | cisco-hdlc-tcc |
  ethernet-bridge | ethernet-ccc | ethernet-over-atm | ethernet-tcc | ethernet-vpls |
  ethernet-vpls-fr | ether-vpls-over-atm-llc | ethernet-vpls-ppp | extended-frame-relay-ccc
  | extended-frame-relay-ether-type-tcc | extended-frame-relay-tcc | extended-vlan-bridge
  | extended-vlan-ccc | extended-vlan-tcc | extended-vlan-vpls | flexible-ethernet-services
  | flexible-frame-relay | frame-relay | frame-relay-ccc | frame-relay-ether-type |
  frame-relay-ether-type-tcc | frame-relay-port-ccc | frame-relay-tcc | generic-services |
  multilink-frame-relay-uni-nni | ppp | ppp-ccc | ppp-tcc | vlan-ccc | vlan-vci-ccc | vlan-vpls);
```

Syntax for Logical Interfaces: SRX Series

```
encapsulation (ether-vpls-ppp | ethernet-bridge | ethernet-ccc | ethernet-tcc | ethernet-vpls
  | extended-frame-relay-ccc | extended-frame-relay-tcc | extended-vlan-bridge |
  extended-vlan-ccc | extended-vlan-tcc | extended-vlan-vpls | frame-relay-port-ccc |
  vlan-ccc | vlan-vpls);
```

Physical Interfaces: M Series, MX Series, QFX Series, T Series, PTX Series

[edit interfaces *interface-name*],
[edit interfaces rlsq *number:number*]

Logical Interfaces: SRX Series

[edit interfaces *interface-name* unit *logical-unit-number*]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.5.
Statement introduced in Junos OS Release 11.1 for EX Series switches.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers (**flexible-ethernet-services**, **ethernet-ccc**, and **ethernet-tcc** options only).

Description

For M Series, MX Series, QFX Series, T Series, PTX Series, specify the physical link-layer encapsulation type.

For SRX Series, specify logical link layer encapsulation.

NOTE: Not all encapsulation types are supported on the switches. See the switch CLI.

Default

ppp—Use serial PPP encapsulation.

Physical Interface Options and Logical Interface Options

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Physical Interface Options and Logical Interface Options

For physical interfaces:

NOTE: Frame Relay, ATM, PPP, SONET, and SATSOP options are not supported on EX Series switches.

- **atm-ccc-cell-relay**—Use ATM cell-relay encapsulation.
- **atm-pvc**—Defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*. When you configure physical ATM interfaces with ATM PVC encapsulation, an RFC 2684-compliant ATM Adaptation Layer 5 (AAL5) tunnel is set up to route the ATM cells over a Multiprotocol Label Switching (MPLS) path that is typically established between two MPLS-capable routers using the Label Distribution Protocol (LDP).
- **cisco-hdlc**—Use Cisco-compatible High-Level Data Link Control (HDLC) framing. E1, E3, SONET/SDH, T1, and T3 interfaces can use Cisco HDLC encapsulation. Two related versions are supported:
  - CCC version (**cisco-hdlc-ccc**)—The logical interface does not require an encapsulation statement. When you use this encapsulation type, you can configure the **ccc** family only.
  - TCC version (**cisco-hdlc-tcc**)—Similar to CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- **cisco-hdlc-ccc**—Use Cisco-compatible HDLC framing on CCC circuits.
- **cisco-hdlc-tcc**—Use Cisco-compatible HDLC framing on TCC circuits for connecting different media.
- **ethernet-bridge**—Use Ethernet bridge encapsulation on Ethernet interfaces that have bridging enabled and that must accept all packets.
- **ethernet-over-atm**—For interfaces that carry IPv4 traffic, use Ethernet over ATM encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces. As defined in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*, this encapsulation type allows ATM interfaces to connect to devices that support only bridge protocol data units (BPDUs). Junos OS does not completely support bridging, but accepts BPDU packets as a default gateway. If you use the router as an edge device, then the router acts as a default gateway. It accepts Ethernet LLC/SNAP frames with IP or ARP in the payload, and drops the rest. For packets destined to the Ethernet LAN, a route lookup is done using the destination IP address. If the route lookup yields a full address match, the packet is encapsulated with an LLC/SNAP and MAC header, and the packet is forwarded to the ATM interface.
- **ethernet-tcc**—For interfaces that carry IPv4 traffic, use Ethernet TCC encapsulation on interfaces that must accept packets carrying standard TPID values. For 8-port, 12-port, and 48-port Fast Ethernet PICs, TCC is not supported.

- **ethernet-vpls**—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard TPID values. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.
- **ethernet-vpls-fr**—Use in a VPLS setup when a CE device is connected to a PE device over a time division multiplexing (TDM) link. This encapsulation type enables the PE device to terminate the outer Layer 2 Frame Relay connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use the MAC address to forward the packet into a given VPLS instance.
- **ethernet-vpls-ppp**—Use in a VPLS setup when a CE device is connected to a PE device over a time division multiplexing (TDM) link. This encapsulation type enables the PE device to terminate the outer Layer 2 PPP connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use it to forward the packet into a given VPLS instance.
- **ether-vpls-over-atm-llc**—For ATM intelligent queuing (IQ) interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.
- **extended-frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to CCC. When you use this encapsulation type, you can configure the **ccc** family only.
- **extended-frame-relay-ether-type-tcc**—Use extended Frame Relay ether type TCC for Cisco-compatible Frame Relay for DLCIs 1 through 1022. This encapsulation type is used for circuits with different media on either side of the connection.
- **extended-frame-relay-tcc**—Use Frame Relay encapsulation on TCC circuits to connect different media. This encapsulation type allows you to dedicate DLCIs 1 through 1022 to TCC.
- **extended-vlan-bridge**—Use extended VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q VLAN tagging and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.
- **extended-vlan-ccc**—Use extended VLAN encapsulation on CCC circuits with Gigabit Ethernet and 4-port Fast Ethernet interfaces that must accept packets carrying 802.1Q values. Extended VLAN CCC encapsulation supports TPIDs 0x8100, 0x9100, and 0x9901. When you use this encapsulation type, you can configure the **ccc** family only. For 8-port, 12-port, and 48-port Fast Ethernet PICs, extended VLAN CCC is not supported. For 4-port Gigabit Ethernet PICs, extended VLAN CCC is not supported.
- **extended-vlan-tcc**—For interfaces that carry IPv4 traffic, use extended VLAN encapsulation on TCC circuits with Gigabit Ethernet interfaces on which you want to use 802.1Q tagging. For 4-port Gigabit Ethernet PICs, extended VLAN TCC is not supported.

- **extended-vlan-vpls**—Use extended VLAN VPLS encapsulation on Ethernet interfaces that have VLAN 802.1Q tagging and VPLS enabled and that must accept packets carrying TPIDs 0x8100, 0x9100, and 0x9901. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

NOTE: **The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.**

- **flexible-ethernet-services**—For Gigabit Ethernet IQ interfaces and Gigabit Ethernet PICs with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router), and for Gigabit Ethernet interfaces, use flexible Ethernet services encapsulation when you want to configure multiple per-unit Ethernet encapsulations. Aggregated Ethernet bundles can use this encapsulation type. This encapsulation type allows you to configure any combination of route, TCC, CCC, Layer 2 virtual private networks (VPNs), and VPLS encapsulations on a single physical port. If you configure flexible Ethernet services encapsulation on the physical interface, VLAN IDs from 1 through 511 are no longer reserved for normal VLANs.
- **flexible-frame-relay**—For IQ interfaces only, use flexible Frame Relay encapsulation when you want to configure multiple per-unit Frame Relay encapsulations. This encapsulation type allows you to configure any combination of TCC, CCC, and standard Frame Relay encapsulations on a single physical port. Also, each logical interface can have any DLCI value from 1 through 1022.
- **frame-relay**—Use Frame Relay encapsulation is defined in RFC 1490, *Multiprotocol Interconnect over Frame Relay*. E1, E3, link services, SONET/SDH, T1, T3, and voice services interfaces can use Frame Relay encapsulation.
- **frame-relay-ccc**—Use Frame Relay encapsulation on CCC circuits. This encapsulation is same as standard Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to CCC. The logical interface must also have **frame-relay-ccc** encapsulation. When you use this encapsulation type, you can configure the **ccc** family only.
- **frame-relay-ether-type**—Use Frame Relay ether type encapsulation for compatibility with the Cisco Frame Relay. IETF frame relay encapsulation identifies the payload format using NLPID and SNAP formats. Cisco-compatible Frame Relay encapsulation uses the Ethernet type to identify the type of payload.

NOTE: **When the encapsulation type is set to Cisco-compatible Frame Relay encapsulation, ensure that the LMI type is set to ANSI or Q933-A.**

- **frame-relay-ether-type-tcc**—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media. This encapsulation is Cisco-compatible Frame Relay for DLCIs 0 through 511. DLCIs 512 through 1022 are dedicated to TCC.

- **frame-relay-port-ccc**—Use Frame Relay port CCC encapsulation to transparently carry all the DLCIs between two customer edge (CE) routers without explicitly configuring each DLCI on the two provider edge (PE) routers with Frame Relay transport. The connection between the two CE routers can be either user-to-network interface (UNI) or network-to-network interface (NNI); this is completely transparent to the PE routers. When you use this encapsulation type, you can configure the **ccc** family only.
- **frame-relay-tcc**—This encapsulation is similar to Frame Relay CCC and has the same configuration restrictions, but used for circuits with different media on either side of the connection.
- **generic-services**—Use generic services encapsulation for services with a hierarchical scheduler.
- **multilink-frame-relay-uni-nni**—Use MLFR UNI NNI encapsulation. This encapsulation is used on link services, voice services interfaces functioning as FRF.16 bundles, and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.
-
- **ppp**—Use serial PPP encapsulation. This encapsulation is defined in RFC 1661, *The Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links*. PPP is the default encapsulation type for physical interfaces. E1, E3, SONET/SDH, T1, and T3 interfaces can use PPP encapsulation.
- **ppp-ccc**—Use serial PPP encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.
- **ppp-tcc**—Use serial PPP encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.
- **vlan-ccc**—Use Ethernet VLAN encapsulation on CCC circuits. VLAN CCC encapsulation supports TPID 0x8100 only. When you use this encapsulation type, you can configure the **ccc** family only.

- **vlan-vci-ccc**—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only. All logical interfaces configured on the Ethernet interface must also have the encapsulation type set to **vlan-vci-ccc**.
- **vlan-vpls**—Use VLAN VPLS encapsulation on Ethernet interfaces with VLAN tagging and VPLS enabled. Interfaces with VLAN VPLS encapsulation accept packets carrying standard TPID values only. On M Series routers, except the M320 router, the 4-port Fast Ethernet TX PIC and the 1-port, 2-port, and 4-port, 4-slot Gigabit Ethernet PICs can use the Ethernet VPLS encapsulation type.

NOTE:
- Label-switched interfaces (LSIs) do not support VLAN VPLS encapsulation. Therefore, you can only use VLAN VPLS encapsulation on a PE-router-to-CE-router interface and not a core-facing interface.
- Starting with Junos OS release 13.3, a commit error occurs when you configure **vlan-vpls** encapsulation on a physical interface and configure **family inet** on one of the logical units. Previously, it was possible to commit this invalid configuration.

For logical interfaces:

- **frame-relay**—Configure a Frame Relay encapsulation when the physical interface has multiple logical units, and the units are either point to point or multipoint.
- **multilink-frame-relay-uni-nni**—Link services interfaces functioning as FRF.16 bundles can use Multilink Frame Relay UNI NNI encapsulation.
- **ppp**—For normal mode (when the device is using only one ISDN B-channel per call). Point-to-Point Protocol is for communication between two computers using a serial interface.
- **ppp-over-ether**—This encapsulation is used for underlying interfaces of pp0 interfaces.

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

Related Documentation

- *Understanding Physical Encapsulation on an Interface*
- *Configuring Interface Encapsulation on Physical Interfaces*
- *Configuring CCC Encapsulation for Layer 2 VPNs*
- *Configuring Layer 2 Switching Cross-Connects Using CCC*
- *Configuring TCC Encapsulation for Layer 2 VPNs and Layer 2 Circuits*
- *Configuring ATM Interface Encapsulation*
- *Configuring ATM-to-Ethernet Interworking*
- *Configuring VLAN and Extended VLAN Encapsulation*
- *Configuring VLAN and Extended VLAN Encapsulation*
- *Configuring Encapsulation for Layer 2 Wholesale VLAN Interfaces*
- *Configuring Interfaces for Layer 2 Circuits*
- *Configuring Interface Encapsulation on PTX Series Packet Transport Routers*
- *Configuring MPLS LSP Tunnel Cross-Connects Using CCC*
- *Configuring TCC*
- *Configuring VPLS Interface Encapsulation*
- *Configuring Interfaces for VPLS Routing*
- *Defining the Encapsulation for Switching Cross-Connects*
- *Configuring an MPLS-Based Layer 2 VPN (CLI Procedure)*

encapsulation (Logical Interface)

Syntax

encapsulation (atm-ccc-cell-relay | atm-ccc-vc-mux | atm-cisco-nlpid | atm-mlppp-llc | atm-nlpid | atm-ppp-llc | atm-ppp-vc-mux | atm-snap | atm-tcc-snap | atm-tcc-vc-mux | atm-vc-mux | ether-over-atm-llc | ether-vpls-over-atm-llc | ether-vpls-over-fr | ether-vpls-over-ppp | ethernet | ethernet-ccc | ethernet-vpls | ethernet-vpls-fr | frame-relay-ccc | frame-relay-ether-type | frame-relay-ether-type-tcc | frame-relay-ppp | frame-relay-tcc | gre-fragmentation | multilink-frame-relay-end-to-end | multilink-ppp | ppp-over-ether | ppp-over-ether-over-atm-llc | vlan-bridge | vlan-ccc | vlan-vci-ccc | vlan-tcc | vlan-vpls | vxlan);

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers (**ethernet**,**vlan-ccc**, and **vlan-tcc** options only).
Statement introduced in Junos OS Release 12.2 for the ACX Series Universal Metro Routers. Only the **atm-ccc-cell-relay** and **atm-ccc-vc-mux** options are supported on ACX Series routers.
Statement introduced in Junos OS Release 17.3R1 for QFX10000 Series switches (**ethernet-ccc** and **vlan-ccc** options only).

Description

Configure a logical link-layer encapsulation type. Not all encapsulation types are supported on the switches. See the switch CLI.

Options

atm-ccc-cell-relay—Use ATM cell-relay encapsulation.

atm-ccc-vc-mux—Use ATM virtual circuit (VC) multiplex encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

atm-cisco-nlpid—Use Cisco ATM network layer protocol identifier (NLPID) encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

atm-mlppp-llc—For ATM2 IQ interfaces only, use Multilink Point-to-Point (MLPPP) over AAL5 LLC. For this encapsulation type, your router must be equipped with a Link Services or Voice Services PIC. MLPPP over ATM encapsulation is not supported on ATM2 IQ OC48 interfaces.

atm-nlpid—Use ATM NLPID encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

atm-ppp-llc—(ATM2 IQ interfaces and MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP only) Use PPP over AAL5 LLC encapsulation.

atm-ppp-vc-mux—(ATM2 IQ interfaces and MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP only) Use PPP over ATM AAL5 multiplex encapsulation.

atm-snap—(All interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) Use ATM subnetwork attachment point (SNAP) encapsulation.

atm-tcc-snap—Use ATM SNAP encapsulation on translational cross-connect (TCC) circuits.

atm-tcc-vc-mux—Use ATM VC multiplex encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

atm-vc-mux—(All interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) Use ATM VC multiplex encapsulation. When you use this encapsulation type, you can configure the **inet** family only.

ether-over-atm-llc—(All IP interfaces including MX Series routers with MPC/MIC interfaces using the ATM MIC with SFP) For interfaces that carry IP traffic, use Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure multipoint interfaces.

ether-vpls-over-atm-llc—For ATM2 IQ interfaces only, use the Ethernet virtual private LAN service (VPLS) over ATM LLC encapsulation to bridge Ethernet interfaces and ATM interfaces over a VPLS routing instance (as described in RFC 2684, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*). Packets from the ATM interfaces are converted to standard ENET2/802.3 encapsulated Ethernet frames with the frame check sequence (FCS) field removed.

ether-vpls-over-fr—For E1, T1, E3, T3, and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over Frame Relay encapsulation to support Bridged Ethernet over Frame Relay encapsulated TDM interfaces for VPLS applications, per RFC 2427, *Multiprotocol Interconnect over Frame Relay*.

NOTE: **The SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, and the DS3/E3 MIC do not support Ethernet over Frame Relay encapsulation.**

ether-vpls-over-ppp—For E1, T1, E3, T3, and SONET interfaces only, use the Ethernet virtual private LAN service (VPLS) over Point-to-Point Protocol (PPP) encapsulation to support Bridged Ethernet over PPP-encapsulated TDM interfaces for VPLS applications.

ethernet—Use Ethernet II encapsulation (as described in RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*).

ethernet-ccc—Use Ethernet CCC encapsulation on Ethernet interfaces.

ethernet-vpls—Use Ethernet VPLS encapsulation on Ethernet interfaces that have VPLS enabled and that must accept packets carrying standard Tag Protocol ID (TPID) values.

NOTE: The built-in Gigabit Ethernet PIC on an M7i router does not support extended VLAN VPLS encapsulation.

ethernet-vpls-fr—Use in a VPLS setup when a CE device is connected to a PE router over a time-division multiplexing (TDM) link. This encapsulation type enables the PE router to terminate the outer layer 2 Frame Relay connection, use the 802.1p bits inside the inner Ethernet header to classify the packets, look at the MAC address from the Ethernet header, and use the MAC address to forward the packet into a given VPLS instance.

frame-relay-ccc—Use Frame Relay encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

frame-relay-ether-type—Use Frame Relay ether type encapsulation for compatibility with Cisco Frame Relay. The physical interface must be configured with flexible-frame-relay encapsulation.

frame-relay-ether-type-tcc—Use Frame Relay ether type TCC for Cisco-compatible Frame Relay on TCC circuits to connect different media. The physical interface must be configured with flexible-frame-relay encapsulation.

frame-relay-ppp—Use PPP over Frame Relay circuits. When you use this encapsulation type, you can configure the **ppp** family only.

frame-relay-tcc—Use Frame Relay encapsulation on TCC circuits for connecting different media. When you use this encapsulation type, you can configure the **tcc** family only.

gre-fragmentation—For adaptive services interfaces only, use GRE fragmentation encapsulation to enable fragmentation of IPv4 packets in GRE tunnels. This encapsulation clears the do not fragment (DF) bit in the packet header. If the packet’ s size exceeds the tunnel’ s maximum transmission unit (MTU) value, the packet is fragmented before encapsulation.

multilink-frame-relay-end-to-end—Use MLFR FRF.15 encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces, and is supported on LSQ and redundant LSQ interfaces.

multilink-ppp—Use MLPPP encapsulation. This encapsulation is used only on multilink, link services, and voice services interfaces and their constituent T1 or E1 interfaces.

ppp-over-ether—Use PPP over Ethernet encapsulation to configure an underlying Ethernet interface for a dynamic PPPoE logical interface on M120 and M320 routers with Intelligent Queuing 2 (IQ2) PICs, and on MX Series routers with MPCs.

ppp-over-ether-over-atm-llc—(MX Series routers with MPCs using the ATM MIC with SFP only) For underlying ATM interfaces, use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead, configure the interface address on the PPP interface.

vlan-bridge—Use Ethernet VLAN bridge encapsulation on Ethernet interfaces that have IEEE 802.1Q tagging, flexible-ethernet-services, and bridging enabled and that must accept packets carrying TPID 0x8100 or a user-defined TPID.

vlan-ccc—Use Ethernet virtual LAN (VLAN) encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

vlan-vci-ccc—Use ATM-to-Ethernet interworking encapsulation on CCC circuits. When you use this encapsulation type, you can configure the **ccc** family only.

vlan-tcc—Use Ethernet VLAN encapsulation on TCC circuits. When you use this encapsulation type, you can configure the **tcc** family only.

vlan-vpls—Use Ethernet VLAN encapsulation on VPLS circuits.

vxlan—Use VXLAN data plane encapsulation for EVPN.

Required Privilege Level

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

Related Documentation

- *Configuring Layer 2 Switching Cross-Connects Using CCC*
- *Configuring the Encapsulation for Layer 2 Switching TCCs*
- *Configuring Interface Encapsulation on Logical Interfaces*
- *Configuring the CCC Encapsulation for LSP Tunnel Cross-Connects*
- *Circuit and Translational Cross-Connects Overview*
- *Identifying the Access Concentrator*
- *Configuring ATM Interface Encapsulation*
- *Configuring VLAN and Extended VLAN Encapsulation*
- *Configuring ATM-to-Ethernet Interworking*
- *Configuring Interface Encapsulation on PTX Series Packet Transport Routers*
- *Configuring CCC Encapsulation for Layer 2 VPNs*
- *Configuring TCC Encapsulation for Layer 2 VPNs and Layer 2 Circuits*
- *Configuring ATM for Subscriber Access*
- *Understanding CoS on ATM IMA Pseudowire Interfaces Overview*
- *Configuring Policing on an ATM IMA Pseudowire*

flexible-vlan-tagging

Syntax flexible-vlan-tagging;

Hierarchy Level [edit interfaces ae*x*],
[edit interfaces ge-*fpc/pic/port*],
[edit interfaces et-*fpc/pic/port*],
[edit interfaces ps0],
[edit interfaces xe-*fpc/pic/port*]

Release Information Statement introduced in Junos OS Release 8.1.
Support for aggregated Ethernet added in Junos OS Release 9.0.
Statement introduced in Junos OS Release 12.1x48 for PTX Series Packet Transport Routers.
Statement introduced in Junos OS Release 13.2X50-D15 for EX Series switches.
Statement introduced in Junos OS Release 13.2X51-D20 for the QFX Series.

Description Support simultaneous transmission of 802.1Q VLAN single-tag and dual-tag frames on logical interfaces on the same Ethernet port, and on pseudowire logical interfaces.

This statement is supported on M Series and T Series routers, for Fast Ethernet and Gigabit Ethernet interfaces only on Gigabit Ethernet IQ2 and IQ2-E, IQ, and IQE PICs, and for aggregated Ethernet interfaces with member links in IQ2, IQ2-E, and IQ PICs or in MX Series DPCs, or on Ethernet interfaces for PTX Series Packet Transport Routers or 100-Gigabit Ethernet Type 5 PIC with CFP.

This statement is supported on Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and aggregated Ethernet interfaces on EX Series and QFX Series switches.

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

Related Documentation

- *Enabling VLAN Tagging*
- *Configuring Flexible VLAN Tagging on PTX Series Packet Transport Routers*
- *Configuring Double-Tagged VLANs on Layer 3 Logical Interfaces*

CHAPTER 36

Operational Commands

- Common Output Fields Description on page 706
- clear interfaces statistics
- monitor interface
- request diagnostics tdr
- show diagnostics tdr
- show forwarding-options enhanced-hash-key
- show interfaces (10-Gigabit Ethernet)
- show interfaces (Discard)
- show interfaces
- show interfaces (Serial)
- show interfaces diagnostics optics
- show interfaces extensive
- show interfaces fabric
- show interfaces ge
- show interfaces (GRE)
- show interfaces irb
- show interfaces mc-ae
- show interfaces me0
- show interfaces queue
- show interfaces queue fabric
- show interfaces xe
- show interfaces xle
- show interfaces statistics fabric
- show interfaces vlan
- show lacp interfaces
- show lacp statistics interfaces (View)
- show oam ethernet link-fault-management
- show redundant-trunk-group

- show uplink-failure-detection
- show virtual-chassis vc-port diagnostics optics
- test interface restart-auto-negotiation

Common Output Fields Description

This chapter explains the content of the output fields, which appear in the output of most **show interfaces** commands.

Damping Field

For the physical interface, the Damping field shows the setting of the following damping parameters:

- **half-life**—Decay half-life. The number of seconds after which the accumulated interface penalty counter is reduced by half if the interface remains stable.
- **max-suppress**—Maximum hold-down time. The maximum number of seconds that an interface can be suppressed irrespective of how unstable the interface has been.
- **reuse**—Reuse threshold. When the accumulated interface penalty counter falls below this number, the interface is no longer suppressed.
- **suppress**—Cutoff (suppression) threshold. When the accumulated interface penalty counter exceeds this number, the interface is suppressed.
- **state**—Interface damping state. If damping is enabled on an interface, it is suppressed during interface flaps that match the configured damping parameters.

Destination Class Field

For the logical interface, the **Destination class** field provides the names of destination class usage (DCU) counters per family and per class for a particular interface. The counters display packets and bytes arriving from designated user-selected prefixes. For example:

```
                                          Packets                        Bytes
Destination class                  (packet-per-second)          (bits-per-second)

            gold                          1928095                   161959980
                                   (                889)        (    597762)
           bronze                                     0                        0
                                   (                  0)        (            0)
           silver                                     0                        0
                                   (                  0)        (            0)
```

Enabled Field

For the physical interface, the **Enabled** field provides information about the state of the interface, displaying one or more of the following values:

- **Administratively down, Physical link is Down**—The interface is turned off, and the physical link is inoperable and cannot pass packets even when it is enabled.To change the interface state to **Enabled**, use the following command:

user@host# set interfaces *interface* enable

Manually verify the connections to bring the physical link up.

- **Administratively down, Physical link is Up**—The interface is turned off, but the physical link is operational and can pass packets when it is enabled.To change the interface state to **Enabled**, use the following command:

  user@host# set interfaces *interface* enable

- **Enabled, Physical link is Down**—The interface is turned on, but the physical link is inoperable and cannot pass packets. Manually verify the connections to bring the physical link up.
- **Enabled, Physical link is Up**—The interface is turned on, and the physical link is operational and can pass packets.

Filters Field

For the logical interface, the **Filters** field provides the name of the firewall filters to be evaluated when packets are received or transmitted on the interface. The format is **Filters: Input:** ***filter-name*** and **Filters: Output:** ***filter-name***. For example:

```
Filters: Input: sample-all
Filters: Output: cp-ftp
```

Flags Fields

The following sections provide information about flags that are specific to interfaces:

- Addresses, Flags Field on page 707
- Device Flags Field on page 708
- Family Flags Field on page 708
- Interface Flags Field on page 709
- Link Flags Field on page 710
- Logical Interface Flags Field on page 710

Addresses, Flags Field

The **Addresses, Flags** field provides information about the addresses configured for the protocol family on the logical interface and displays one or more of the following values:

- **Dest-route-down**—The routing process detected that the link was not operational and changed the interface routes to nonforwarding status
- **Is-Default**—The default address of the router used as the source address by SNMP, ping, traceroute, and other network utilities.
- **Is-Preferred**—The default local address for packets originating from the local router and sent to destinations on the subnet.
- **Is-Primary**—The default local address for broadcast and multicast packets originated locally and sent out the interface.
- **Preferred**—This address is a candidate to become the preferred address.

- **Primary**—This address is a candidate to become the primary address.
- **Trunk**—Interface is a trunk.
- **Trunk, Inter-Switch-Link**—Interface is a trunk, and InterSwitch Link protocol (ISL) is configured on the trunk port of the primary VLAN in order to connect the routers composing the PVLAN to each other.

Device Flags Field

The **Device flags** field provides information about the physical device and displays one or more of the following values:

- **ASIC Error**—Device is down because of ASIC wedging and due to which PFE is disabled.
- **Down**—Device has been administratively disabled.
- **Hear-Own-Xmit**—Device receives its own transmissions.
- **Link-Layer-Down**—The link-layer protocol has failed to connect with the remote endpoint.
- **Loopback**—Device is in physical loopback.
- **Loop-Detected**—The link layer has received frames that it sent, thereby detecting a physical loopback.
- **No-Carrier**—On media that support carrier recognition, no carrier is currently detected.
- **No-Multicast**—Device does not support multicast traffic.
- **Present**—Device is physically present and recognized.
- **Promiscuous**—Device is in promiscuous mode and recognizes frames addressed to all physical addresses on the media.
- **Quench**—Transmission on the device is quenched because the output buffer is overflowing
- **Recv-All-Multicasts**—Device is in multicast promiscuous mode and therefore provides no multicast filtering.
- **Running**—Device is active and enabled.

Family Flags Field

The **Family flags** field provides information about the protocol family on the logical interface and displays one or more of the following values:

- **DCU**—Destination class usage is enabled.
- **Dest-route-down**—The software detected that the link is down and has stopped forwarding the link's interface routes.
- **Down**—Protocol is inactive.
- **Is-Primary**—Interface is the primary one for the protocol.
- **Mac-Validate-Loose**—Interface is enabled with loose MAC address validation.

- **Mac-Validate-Strict**—Interface is enabled with strict MAC address validation.
- **Maximum labels**—Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.
- **MTU-Protocol-Adjusted**—The effective MTU is not the configured value in the software.
- **No-Redirects**—Protocol redirects are disabled.
- **Primary**—Interface can be considered for selection as the primary family address.
- **Protocol-Down**—Protocol failed to negotiate correctly.
- **SCU-in**—Interface is configured for source class usage input.
- **SCU-out**—Interface is configured for source class usage output.
- **send-bcast-packet-to-re**—Interface is configured to forward IPv4 broadcast packets to the Routing Engine.
- **targeted-broadcast**—Interface is configured to forward IPv4 broadcast packets to the LAN interface and the Routing Engine.
- **Unnumbered**—Protocol family is configured for unnumbered Ethernet. An unnumbered Ethernet interface borrows an IPv4 address from another interface, which is referred to as the donor interface.
- **Up**–Protocol is configured and operational.
- **uRPF**—Unicast Reverse Path Forwarding is enabled.

Interface Flags Field

The **Interface flags** field provides information about the physical interface and displays one or more of the following values:

- **Admin-Test**—Interface is in test mode and some sanity checking, such as loop detection, is disabled.
- **Disabled**—Interface is administratively disabled.
- **Down**—A hardware failure has occurred.
- **Hardware-Down**—Interface is nonfunctional or incorrectly connected.
- **Link-Layer-Down**—Interface keepalives have indicated that the link is incomplete.
- **No-Multicast**—Interface does not support multicast traffic.
- **No-receive No-transmit**—Passive monitor mode is configured on the interface.
- **OAM-On-SVLAN**—(MX Series routers with MPC/MIC interfaces only) Interface is configured to propagate the Ethernet OAM state of a static, single-tagged service VLAN (S-VLAN) on a Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet interface to a dynamic or static double-tagged customer VLAN (C-VLAN) that has the same S-VLAN (outer) tag as the S-VLAN.
- **Point-To-Point**—Interface is point-to-point.

- **Pop all MPLS labels from packets of depth**—MPLS labels are removed as packets arrive on an interface that has the **pop-all-labels** statement configured. The depth value can be one of the following:
  - **1**—Takes effect for incoming packets with one label only.
  - **2**—Takes effect for incoming packets with two labels only.
  - **[1 2]**—Takes effect for incoming packets with either one or two labels.
- **Promiscuous**—Interface is in promiscuous mode and recognizes frames addressed to all physical addresses.
- **Recv-All-Multicasts**—Interface is in multicast promiscuous mode and provides no multicast filtering.
- **SNMP-Traps**—SNMP trap notifications are enabled.
- **Up**—Interface is enabled and operational.

Link Flags Field

The **Link flags** field provides information about the physical link and displays one or more of the following values:

- **ACFC**—Address control field compression is configured. The Point-to-Point Protocol (PPP) session negotiates the ACFC option.
- **Give-Up**—Link protocol does not continue connection attempts after repeated failures.
- **Loose-LCP**—PPP does not use the Link Control Protocol (LCP) to indicate whether the link protocol is operational.
- **Loose-LMI**—Frame Relay does not use the Local Management Interface (LMI) to indicate whether the link protocol is operational.
- **Loose-NCP**—PPP does not use the Network Control Protocol (NCP) to indicate whether the device is operational.
- **No-Keepalives**—Link protocol keepalives are disabled.
- **PFC**—Protocol field compression is configured. The PPP session negotiates the PFC option.

Logical Interface Flags Field

The **Logical interface flags** field provides information about the logical interface and displays one or more of the following values:

- **ACFC Encapsulation**—Address control field Compression (ACFC) encapsulation is enabled (negotiated successfully with a peer).
- **Device-down**—Device has been administratively disabled.
- **Disabled**—Interface is administratively disabled.
- **Down**—A hardware failure has occurred.

- **Clear-DF-Bit**—GRE tunnel or IPsec tunnel is configured to clear the Don't Fragment (DF) bit.
- **Hardware-Down**—Interface protocol initialization failed to complete successfully.
- **PFC**—Protocol field compression is enabled for the PPP session.
- **Point-To-Point**—Interface is point-to-point.
- **SNMP-Traps**—SNMP trap notifications are enabled.
- **Up**—Interface is enabled and operational.

Label-Switched Interface Traffic Statistics Field

When you use the **vrf-table-label** statement to configure a VRF routing table, a label-switched interface (LSI) logical interface label is created and mapped to the VRF routing table.

Any routes present in a VRF routing table and configured with the **vrf-table-label** statement are advertised with the LSI logical interface label allocated for the VRF routing table. When packets for this VPN arrive on a core-facing interface, they are treated as if the enclosed IP packet arrived on the LSI interface and are then forwarded and filtered based on the correct table. For more information on the **vrf-table-label** statement, including a list of supported interfaces, see the *Junos VPNs Configuration Guide*.

If you configure the **family mpls** statement at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level and you also configure the **vrf-table-label** statement at the **[edit routing-instances *routing-instance-name*]** hierarchy level, the output for the **show interface *interface-name* extensive** command includes the following output fields about the LSI traffic statistics:

- **Input bytes**—Number of bytes entering the LSI and the current throughput rate in bits per second (bps).
- **Input packets**—Number of packets entering the LSI and the current throughput rate in packets per second (pps).

NOTE: If LSI interfaces are used with VPLS when **no-tunnel-services** is configured or L3VPN when **vrf-table-label** configuration is applied inside the routing-instance, the **Input packets** field associated with the core-facing interfaces may not display the correct value. Only the Input counter is affected because the LSI is used to receive traffic from the remote PEs. Traffic that arrives on an LSI interface might not be counted at both the Traffic Statistics and the Label-switched interface (LSI) traffic statistics levels.

This note applies to the following platforms:

- M Series routers with -E3 FPC model numbers or configured with an Enhanced CFEB (CFEB-E), and M120 routers
- MX Series routers with DPC or ADPC only

The following example shows the LSI traffic statistics that you might see as part of the output of the **show interface** ***interface-name*** **extensive** command:

```
Label-switched interface (LSI) traffic statistics:
  Input bytes:            0          0 bps
  Input packets:          0          0 pps
```

Policer Field

For the logical interface, the **Policer** field provides the policers that are to be evaluated when packets are received or transmitted on the interface. The format is **Policer: Input:** ***type-fpc/picport*****-in-policer, Output:** ***type-fpc/pic/port*****-out-policer**. For example:

Policer: Input: at-1/2/0-in-policer, Output: at-2/4/0-out-policer

Protocol Field

For the logical interface, the **Protocol** field indicates the protocol family or families that are configured on the interface, displaying one or more of the following values:

- **aenet**—Aggregated Ethernet. Displayed on Fast Ethernet interfaces that are part of an aggregated Ethernet bundle.
- **ccc**—Circuit cross-connect (CCC). Configured on the logical interface of CCC physical interfaces.
- **inet**—IP version 4 (IPv4). Configured on the logical interface for IPv4 protocol traffic, including Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Internet Control Message Protocol (ICMP), and Internet Protocol Control Protocol (IPCP).
- **inet6**—IP version 6 (IPv6). Configured on the logical interface for IPv6 protocol traffic, including Routing Information Protocol for IPv6 (RIPng), Intermediate System-to-Intermediate System (IS-IS), and BGP.
- **iso**—International Organization for Standardization (ISO). Configured on the logical interface for IS-IS traffic.
- **mlfr-uni-nni**—Multilink Frame Relay (MLFR) FRF.16 user-to-network network-to-network (UNI NNI). Configured on the logical interface for link services bundling.
- **mlfr-end-to-end**—Multilink Frame Relay end-to-end. Configured on the logical interface for multilink bundling.
- **mlppp**—Multilink Point-to-Point Protocol (MLPPP). Configured on the logical interface for multilink bundling.
- **mpls**—Multiprotocol Label Switching (MPLS). Configured on the logical interface for participation in an MPLS path.
- **pppoe**— Point-to-Point Protocol over Ethernet (PPPoE). Configured on Ethernet interfaces enabled to support multiple protocol families.
- **tcc**—Translational cross-connect (TCC). Configured on the logical interface of TCC physical interfaces.

- **tnp**—Trivial Network Protocol (TNP). Used to communicate between the Routing Engine and the router's packet forwarding components. The Junos OS automatically configures this protocol family on the router's internal interfaces only.
- **vpls**—Virtual private LAN service (VPLS). Configured on the logical interface on which you configure VPLS.

RPF Failures Field

For the logical interface, the **RPF Failures** field provides information about the amount of incoming traffic (in packets and bytes) that failed a unicast reverse path forwarding (RPF) check on a particular interface. The format is **RPF Failures: Packets: xx,Bytes: yy**. For example:

RPF Failures: Packets: 0, Bytes:0

Source Class Field

For the logical interface, the **Source class** field provides the names of source class usage (SCU) counters per family and per class for a particular interface. The counters display packets and bytes arriving from designated user-selected prefixes. For example:

```
                          Packets                 Bytes
Source class        (packet-per-second)       (bits-per-second)

          gold        1928095               161959980
             (            889)      (       597762)
        bronze              0                     0
             (              0)      (             0)
        silver              0                     0
             (              0)      (             0)
```

clear interfaces statistics

Syntax clear interfaces statistics (all | *interface-name*)

Release Information Command introduced before Junos OS Release 7.4.

Description Set interface statistics to zero. If you issue the **clear interfaces statistics** ***interface-name*** command and then perform a graceful Routing Engine switchover, the interface statistics are not cleared on the new master. Reissue the command to clear the interface statistics again.

Starting in Junos OS Release 17.3R1, this command supports the clearing of Packet Forwarding Engine accounting statistics on logical interfaces configured with accounting options. On these interfaces, the current statistics values are stored as the new current baseline values and then the counters are reset to zero. If the **allow-clear** statement is included in the interface profile, then the cleared statistics values are reported to the accounting options flat file associated with the interface. Reporting is disabled by default; if **allow-clear** is not configured, then the CLI displays cleared statistics counters, but they are not reported to the flat file.

Options **all**—Set statistics on all interfaces to zero.

interface-name—Set statistics on a particular interface to zero.

Required Privilege Level clear

List of Sample Output clear interfaces statistics on page 714

Output Fields When you enter this command, you are provided no feedback on the status of your request.

Sample Output

clear interfaces statistics

```
user@host> clear interfaces statistics
```


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.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Command introduced in Junos OS Release 18.1 for Gigabit interfaces.

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 switch.

Display the IPv6 interface traffic statistics about the specified Gigabit Ethernet interface for MX series routers. The input and output bytes (bps) and packets (pps) rates are not displayed for IFD and local traffic.

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 55 on page 715. The keys are not case-sensitive.

Table 55: Output Control Keys for the monitor interface interface-name 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.

Table 55: Output Control Keys for the monitor interface interface-name Command (continued)

Key	Action
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.
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 56 on page 716. The keys are not case-sensitive.

Table 56: Output Control Keys for the monitor interface traffic Command

Key	Action
b	Displays the statistics in units of bytes and bits 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 718
monitor interface (OTN Interface) on page 719
monitor interface (MX480 Router with MPC5E and 10-Gigabit Ethernet OTN Interface) on page 720
monitor interface (MX480 Router with MPC5E and 100-Gigabit Ethernet Interface) on page 721
monitor interface (MX2010 Router with MPC6E and 10-Gigabit Ethernet OTN Interface) on page 722

monitor interface (MX2010 Router with MPC6E and 100-Gigabit Ethernet OTN Interface) on page 722
monitor interface (MX2020 Router with MPC6E and 10-Gigabit Ethernet OTN Interface) on page 723
monitor interface (IPv6 Gigabit Ethernet interface traffic statistics for MX series routers) on page 724
monitor interface (Logical) on page 724
monitor interface (QFX3500 Switch) on page 725
monitor interface traffic on page 725
monitor interface traffic (QFX3500 Switch) on page 726
monitor interface traffic detail (QFX3500 Switch) on page 726

Output Fields Table 57 on page 717 describes the output fields for the **monitor interface** command. Output fields are listed in the approximate order in which they appear.

Table 57: 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

Table 57: monitor interface Output Fields (continued)

Field Name	Field Description	Level of Output
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
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 (MX480 Router with MPC5E and 10-Gigabit Ethernet OTN Interface)

```
user@host> monitor interface xe-0/0/3
Interface: xe-0/0/3, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
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:                 5                              [0]
  Output errors:                       0                              [0]
  Output drops:                        0                              [0]
  Aged packets:                        0                              [0]
Active alarms : None
Active defects: None
PCS statistics:                     Seconds
  Bit Errors                           0                              [0]
  Errored blocks                       4                              [0]
Input MAC/Filter statistics:
  Unicast packets                      0                              [0]
  Broadcast packets                    0                              [0]
  Multicast packets                    0                              [0]
```

```
  Oversized frames                     0                                 [0]
  Packet reject count                  0                                 [0]
  DA rejects                           0                                 [0]
  SA rejects                           0                                 [0]
Output MAC/Filter Statistics:
  Unicast packets                      0                                 [0]
  Broadcast packets                    0                                 [0]
  Multicast packets                    0                                 [0]
  Packet pad count                     0                                 [0]
  Packet error count                   0                                 [0]


Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (MX480 Router with MPC5E and 100-Gigabit Ethernet Interface)

```
user@host> monitor interface et-2/1/0
Interface: et-2/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100000mbps
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:               263                                 [0]
  Output errors:                       0                                 [0]
  Output drops:                        0                                 [0]
  Aged packets:                        0                                 [0]
OTN Link 0
  OTN Alarms:
  OTN Defects:
  OTN OC - Seconds
    LOS                              129                                 [0]
    LOF                                2                                 [0]
  OTN OTU - FEC Statistics
    Corr err ratio                 <8E-5
    Corr bytes              169828399453                                 [0]
    Uncorr words             28939961456                                 [0]
  OTN OTU - Counters                                                     [0]
    BIP                                0
    BBE                                0                                 [0]
    ES                                24                                 [0]
    SES                                0                                 [0]
    UAS                             1255                                 [0]
  OTN ODU - Counters                                                     [0]
    BIP                                0
    BBE                                0                                 [0]
    ES                                24                                 [0]
    SES                                0                                 [0]
    UAS                             1256                                 [0]
  OTN ODU - Received Overhead                                            [0]
    APSPCC 0-3:              00 00 00 00
```

```
Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (MX2010 Router with MPC6E and 10-Gigabit Ethernet OTN Interface)

```
user@host> monitor interface xe-6/1/0
Interface: xe-6/1/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
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:              1                                  [0]
  Output errors:                    0                                  [0]
  Output drops:                     0                                  [0]
  Aged packets:                     0                                  [0]
Active alarms : None
Active defects: None
PCS statistics:                 Seconds
  Bit Errors                        0                                  [0]
  Errored blocks                    1                                  [0]
Input MAC/Filter statistics:
  Unicast packets                   0                                  [0]
  Broadcast packets                 0                                  [0]
  Multicast packets                 0                                  [0]
  Oversized frames                  0                                  [0]
  Packet reject count               0                                  [0]
  DA rejects                        0                                  [0]
  SA rejects                        0                                  [0]
Output MAC/Filter Statistics:
  Unicast packets                   0                                  [0]
  Broadcast packets                 0                                  [0]
  Multicast packets                 0                                  [0]
  Packet pad count                  0                                  [0]
  Packet error count                0                                  [0]


Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (MX2010 Router with MPC6E and 100-Gigabit Ethernet OTN Interface)

```
user@host> monitor interface et-9/0/0
Interface: et-9/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 100000mbps
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:            1                                  [0]
  Output errors:                  0                                  [0]
  Output drops:                   0                                  [0]
  Aged packets:                   0                                  [0]



Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (MX2020 Router with MPC6E and 10-Gigabit Ethernet OTN Interface)

```
user@host> monitor interface xe-3/0/0
host name                      Seconds: 67                 Time: 23:46:46
                                                       Delay: 0/0/13
Interface: xe-3/0/0, Enabled, Link is Up
Encapsulation: Ethernet, Speed: 10000mbps
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:            3                                  [0]
  Output errors:                  0                                  [0]
  Output drops:                   0                                  [0]
  Aged packets:                   0                                  [0]
OTN Link 0
  OTN Alarms:
  OTN Defects:
  OTN OC - Seconds
    LOS                           0                                  [0]
    LOF                           0                                  [0]
  OTN OTU - FEC Statistics
    Corr err ratio              N/A
    Corr bytes                    0                                  [0]
    Uncorr words                  0                                  [0]
  OTN OTU - Counters                                                 [0]
    BIP                           0
    BBE                           0                                  [0]
    ES                            0                                  [0]
    SES                           0                                  [0]
    UAS                           0                                  [0]
  OTN ODU - Counters                                                 [0]
    BIP                           0
    BBE                           0                                  [0]
```



```
    ES                                0                                   [0]
    SES                               0                                   [0]
    UAS                               0                                   [0]
  OTN ODU - Received Overhead                                             [0]
    APSPCC 0-3:             00 00 00 00

Next='n', Quit='q' or ESC, Freeze='f', Thaw='t', Clear='c', Interface='i'
```

monitor interface (IPv6 Gigabit Ethernet interface traffic statistics for MX series routers)

```
user@host> monitor interface ge-5/2/0.0
host                     Seconds: 2                  Time: 09:57:57
                                                       Delay: 16/16/29
Interface: ge-2/0/0.1002, Enabled, Link is Up
Flags: SNMP-Traps 0x4000
Encapsulation: VLAN-CCC
VLAN-Tag [ 0x8100.1 0x8100.102 ]
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]
IPv6 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:
  Input bytes:                      0                                      [0]
  Output bytes:                     0                                      [0]
  Input packets:                    0                                      [0]
  Output packets:                   0                                      [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
```

request diagnostics tdr

Syntax request diagnostics tdr (abort | start) interface *interface-name*

Release Information Command introduced in Junos OS Release 9.0 for EX Series switches.

Description Start a time domain reflectometry (TDR) diagnostic test on the specified interface. This test characterizes and locates faults on twisted-pair Ethernet cables. For example, it can detect a broken twisted pair and provide the approximate distance to the break. It can also detect polarity swaps, pair swaps, and excessive skew.

The TDR test is supported on the following switches and interfaces:

- EX2200, EX3200, EX3300, and EX4200 switches—RJ-45 network interfaces. The TDR test is not supported on management interfaces and SFP interfaces.
- EX6200 and EX8200 switches—RJ-45 interfaces on line cards.

NOTE: We recommend running the TDR test when there is no traffic on the interface under test.

You view the results of the TDR test with the show diagnostics tdr command.

Options **abort**—Stop the TDR test currently in progress on the specified interface. No results are reported, and previous results, if any, are cleared.

interface-name—The name of the interface.

start—Start a TDR test on the specified interface.

Required Privilege Level maintenance

Related Documentation

- show diagnostics tdr on page 730
- Diagnosing a Faulty Twisted-Pair Cable (CLI Procedure) on page 390

List of Sample Output request diagnostics tdr start interface ge-0/0/19 on page 729

Output Fields Table 58 on page 729 lists the output fields for the **request diagnostics tdr** command. Output fields are listed in the approximate order in which they appear.

Table 58: request diagnostics tdr Output Fields

Field Name	Field Description
Test Status	Information about the status of the TDR test request: • **Admin Down** ***interface-name***—The interface is administratively down. The TDR test cannot run on interfaces that are administratively down. • **Interface** ***interface-name*** **not found**—The interface does not exist. • **Test successfully executed** ***interface-name***—The test has successfully started on the interface. You can view the test results with the **show diagnostics tdr** command. • **VCT not supported on** ***interface-name***—The TDR test is not supported on the interface.

Sample Output

request diagnostics tdr start interface ge-0/0/19

```
user@switch> request diagnostics tdr start interface ge-0/0/19

Interface TDR detail:
Test status                     : Test successfully executed  ge-0/0/19
```

show diagnostics tdr

Syntax

show diagnostics tdr
<interface *interface-name*>

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.

Description

Display the results of a time domain reflectometry (TDR) diagnostic test run on an interface. A TDR test characterizes and locates faults on twisted-pair Ethernet cables. For example, it can detect a broken twisted pair and provide the approximate distance to the break. It can also detect polarity swaps, pair swaps, and excessive skew.

The TDR test is supported on the following switches and interfaces:

- EX2200, EX3200, EX3300, and EX4200 switches—RJ-45 network interfaces. The TDR test is not supported on management interfaces and SFP interfaces.
- EX6200 and EX8200 switches— RJ-45 interfaces on line cards.

Use the request diagnostics tdr command to request a TDR test on a specified interface. Use the **show diagnostic tdr** command to display the last TDR test results for a specified interface or the last TDR test results for all network interfaces on the switch that support the TDR test.

Options

none—Show summarized last results for all interfaces on the switch that support the TDR test.

interface ***interface-name***—(Optional) Show detailed last results for the specified interface or a range of interfaces. Specify a range of interfaces by entering the beginning and ending interface in the range, separated by a dash—for example, **ge-0/0/15-ge-0/0/20**.

Required Privilege Level

view

Related Documentation

- **request diagnostics tdr on page 728**
- Diagnosing a Faulty Twisted-Pair Cable (CLI Procedure) on page 390

List of Sample Output

show diagnostics tdr interface ge-0/0/19 (Normal Cable) on page 732
show diagnostics tdr interface ge-2/0/2 (Faulty Cable) on page 733
show diagnostics tdr (All Supported Interfaces) on page 733

Output Fields

Table 59 on page 731 lists the output fields for the **show diagnostics tdr** command. Output fields are listed in the approximate order in which they appear.

Table 59: show diagnostics tdr Output Fields

<table>
<tr><th>Field Name</th><th>Field Description</th></tr>
<tr><td>Interface name or

Interface</td><td>Name of interface for which TDR test results are being reported.</td></tr>
<tr><td>Test status</td><td>Status of TDR test:
Aborted—Test was terminated by operator before it was complete.
Failed—Test was not completed successfully.
Interface interface-name not found—Specified interface does not exist.
Not Started—No TDR test results are available for the interface.
Passed—Test completed successfully. The cable, however, might still have a fault—see the Cable status field for information on the cable.
Started—Test is currently running and not yet complete.
VCT not supported on interface-name—TDR test is not supported on the interface.</td></tr>
<tr><td>Link status</td><td>Operating status of link: UP or Down.</td></tr>
<tr><td>MDI pair</td><td>Twisted pair for which test results are being reported, identified by pin numbers. (Displayed only when the interface option is used.)</td></tr>
<tr><td>Cable status</td><td>When detailed information is displayed, status for a twisted pair:
Failed—TDR test failed on the cable pair.
Impedance Mismatch—Impedance on the twisted pair is not correct. Possible reasons for an impedance mismatch include:
The twisted pair is not connected properly.
The twisted pair is damaged.
The connector is faulty.
Normal—No cable fault detected for the twisted pair.
Open—Lack of continuity between the pins at each end of the twisted-pair.
Short on Pair-n—A short-circuit was detected on the twisted pair.
When summary information for all interfaces is displayed, status for the cable as a whole:
Fault—A fault was detected on one or more of the twisted-pairs.
OK—No fault was detected on any of the twisted pairs.</td></tr>
<tr><td>Distance fault or

Max distance fault</td><td>Distance to the fault in whole meters. If there is no fault, this value is 0.

When summary information for all interfaces is displayed, this value is the distance to the most distant fault if there is more than one twisted pair with a fault.</td></tr>
</table>

Table 59: show diagnostics tdr Output Fields (continued)

Field Name	Field Description
Polarity swap	Indicates the polarity status of the twisted pair: • **Normal**—Polarity is normal. Each conductor in the twisted pair has been connected the same pins at the both ends of the connection. For example, a conductor connected to pin 1 at the near end of the connection is connected to pin 1 at the far end. • **Reversed**—Polarity has been reversed. For the twisted pair, the conductors have switched which pins they are connected to at the near and far ends of the connection. For example, the conductor connected to pin 1 at the near end is connected to pin 2 at the far end. (Not available on EX8200 switches.) (Displayed only when the **interface** option is used)
Skew time	Difference in nanoseconds between the propagation delay on this twisted pair and the twisted pair with the shortest propagation delay. (Not available on EX8200 switches.) (Displayed only when the **interface** option is used.)
Channel Pair	Number of the 10/100BASE-T transmit/receive pair being reported on.
Pair Swap	Indicates whether or not the twisted pairs are swapped: • **MDI**—The pairs are not swapped (straight-through cable). • **MDIX**—The pairs are swapped (cross-over cable). (Displayed only when the **interface** option is used.)
Downshift	Indicates whether the connection speed is being downshifted: • **No Downshift**—No downshifting of connection speed. • **Downshift occurs**—Connection speed is downshifted to 10 or 100 Mbs. This occurs if the cable is a two-pair cable rather than the four-pair cable required by Gigabit Ethernet. (Displayed only when the **interface** option is used.)

Sample Output

show diagnostics tdr interface ge-0/0/19 (Normal Cable)

```
user@switch> show diagnostics tdr interface ge-0/0/19
Interface TDR detail:
Interface name                 : ge-0/0/19
Test status                    : Passed
Link status                    :  UP
MDI pair                       : 1-2
  Cable status                 : Normal
  Distance fault               : 0 Meters
  Polartiy swap                : Normal
  Skew time                    : 0 ns
```



```
MDI pair                          : 3-6
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : Normal
  Skew time                       : 8 ns
MDI pair                          : 4-5
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : Normal
  Skew time                       : 8 ns
MDI pair                          : 7-8
  Cable status                    : Normal
  Distance fault                  : 0 Meters
  Polartiy swap                   : Normal
  Skew time                       : 8 ns
Channel pair                      : 1
  Pair swap                       : MDI
Channel pair                      : 2
  Pair swap                       : MDI
Downshift                         : No Downshift
```

show diagnostics tdr interface ge-2/0/2 (Faulty Cable)

```
user@switch> show diagnostics tdr interface ge-2/0/2
Interface TDR detail:
Interface name                    : ge-2/0/2
Test status                       : Passed
Link status                       : Down
MDI Pair                          : 1-2
   Cable status                   : 1-2
   Distance fault                 : 2 Meters
   Polartiy swap                  : N/A
   Skew time                      : N/A
MDI Pair                          : 3-6
   Cable status                   : Impedance Mismatch
   Distance fault                 : 3 Meters
   Polartiy swap                  : N/A
   Skew time                      : N/A
MDI Pair                          : 4-5
   Cable status                   : Impedance Mismatch
   Distance fault                 : 3 Meters
   Polartiy swap                  : N/A
   Skew time                      : N/A
MDI Pair                          : 7-8
   Cable status                   : Short on Pair-2
   Distance fault                 : 3 Meters
   Polartiy swap                  : N/A
   Skew time                      : N/A
Channel pair                      : 1
   Pair swap                      : N/A
Channel pair                      : 2
   Pair swap                      : N/A
Downshift                         : N/A
```

show diagnostics tdr (All Supported Interfaces)

```
user@switch> show diagnostics tdr
Interface    Test status    Link status  Cable status  Max distance fault
 ge-0/0/0    Not Started    N/A          N/A           N/A
 ge-0/0/1    Not Started    N/A          N/A           N/A
```

```
  ge-0/0/2       Started    N/A          N/A          N/A
  ge-0/0/3       Started    N/A          N/A          N/A
  ge-0/0/4        Passed     UP           OK            0
  ge-0/0/5        Passed     UP          Fault        173
  ge-0/0/6        Passed     UP           OK            0
  ge-0/0/7        Passed     UP           OK            0
  ge-0/0/8        Passed     UP           OK            0
  ge-0/0/9        Passed     UP           OK            0
 ge-0/0/10        Passed     UP           OK            0
 ge-0/0/11        Passed     UP           OK            0
 ge-0/0/12        Passed     UP           OK            0
 ge-0/0/13        Passed     UP           OK            0
 ge-0/0/14        Passed     UP           OK            0
 ge-0/0/15        Passed     UP           OK            0
 ge-0/0/16        Passed     UP           OK            0
 ge-0/0/17        Passed     UP           OK            0
 ge-0/0/18        Passed     UP           OK            0
 ge-0/0/19        Passed     UP           OK            0
 ge-0/0/20        Passed    Down         Fault          0
 ge-0/0/21        Passed    Down         Fault          5
 ge-0/0/22        Passed     UP           OK            0
 ge-0/0/23        Passed     UP           OK            0
```


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.
Fabric Load Balancing Options output fields introduced in Junos OS Release 14.1X53-D10.

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 362
- Understanding the Algorithm Used to Hash LAG Bundle and Egress Next-Hop ECMP Traffic on page 352
- **enhanced-hash-key on page 662**

List of Sample Output
show forwarding-options enhanced-hash-key (Layer 2 Payload Hash Mode) on page 737
show forwarding-options enhanced-hash-key (Layer 2 Header Hash Mode) on page 737
show forwarding-options enhanced-hash-key (Fabric Load Balancing Options) on page 738
show forwarding-options enhanced-hash-key (QFX10002 and QFX 10008 Switches) on page 738

Output Fields Table 60 on page 735 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. Output fields vary by platform.

Table 60: 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.

Table 60: show forwarding-options enhanced-hash-key Output Fields (continued)

Field Name	Field Description
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.
Vlan id	Indicates whether the Vlan ID field is or is not used by the hashing algorithm: Yes or No.
Inner-Vlan ID	indicates whether the inner Vlan field is or is not used by the hashing algorithnm: 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.
Load Balancing Method	Indicates the load balancing method for adaptive load balancing (ALB): flowlet or per-packet. The load balancing method is flowlet by default, and can be configured using the **fabric-load-balance** statement.
Fabric Link Scale	Indicates the fabric link scale, in mbps.
Inactivity Interval	Indicates the fabric load balance inactivity interval, in microseconds (us). The inactivity interval is 16 microseconds by default, and can be configured using the **inactivity-interval** statement.
Hash Region Size/Trunk	Indicates the hash region size, in buckets per fabric trunk.

Table 60: show forwarding-options enhanced-hash-key Output Fields (continued)

Field Name	Field Description
Seed	A hash seed value, between 0 and 4294967295. If a hash-seed value is not configured it is automatically assigned on the QFX10002 and QFX10008 switches. A hash-seed prevents traffic polarization to same links on the next hop QFX switch when two are connected with LAG/ECMP.
Key	Indicates whether the GRE key field is or is not used by the hashing algorithm: Yes or No.
Protocol	Indicates if a Generic Router Encapsulation (GRE) endpoint over routes was dynamically learned by a routing protocol such as RIP or OSPF.
MPLS Enabled	Indicates if MPLS is enabled under L2 switching.
VXLAN VNID	A 24-bit virtual network identifier (VNID) that uniquely identifies the Virtual Extensible Local Area Networks (VXLAN) segment.

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 forwarding-options enhanced-hash-key (Fabric Load Balancing Options)

```
user@switch> show forwarding-options enhanced-hash-key
<some output removed for brevity>

  Fabric Load Balancing Options
  ------------------------------------------------------------
      Load Balancing Method  : Flowlet
      Fabric Link Scale      : 40960 (mbps)
      Inactivity Interval    : 16 (us)
      Hash Region Size/Trunk : 1024 (buckets)
```

show forwarding-options enhanced-hash-key (QFX10002 and QFX 10008 Switches)

```
user@switch> show forwarding-options enhanced-hash-key
Slot 0


Seed value for Hash function           0: 3626023417
Seed value for Hash function           1: 3626023417
Seed value for Hash function           2: 3626023417
Seed value for Hash function           3: 3626023417

    Inet settings:
    --------------
        IPV4 dest address:    Yes
        IPV4 source address:  Yes
        L4 Dest Port:         Yes
        L4 Source Port:       Yes
    Inet6 settings:
    --------------
        IPV6 dest address:    Yes
        IPV6 source address:  Yes
        L4 Dest Port:         Yes
        L4 Source Port:       Yes
    L2 settings:
    ------------
        Dest Mac address:    No
        Source Mac address:  No
        Vlan Id:             Yes
        Inner-vlan Id:       No
        Incoming port:       Yes
    GRE settings:
    -------------
```



```
    Key:                No
    Protocol:           No
MPLS settings:
--------------
    MPLS Enabled:       Yes
VXLAN settings:
---------------
    VXLAN VNID:         No
```

show interfaces (10-Gigabit Ethernet)

Syntax

show interfaces xe-*fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 8.0.

Description

(M320, M120, MX Series, and T Series routers only) Display status information about the specified 10-Gigabit Ethernet interface.

Options

xe-*fpc/pic/port*—Display standard information about the specified 10-Gigabit Ethernet interface.

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.

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

List of Sample Output

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2) on page 755
show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode) on page 758
show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC) on page 762
show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode) on page 764
show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only) on page 765
show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only) on page 766

Output Fields

See Table 61 on page 741 for the output fields for the **show interfaces** (10–Gigabit Ethernet) command.

Table 61: show interfaces Gigabit Ethernet 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" on page 706.	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
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
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	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**.	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	(Gigabit Ethernet interfaces) 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. Possible values are described in the " Device Flags" section under "Common Output Fields Description" on page 706.	All levels
Interface flags	Information about the interface. Possible values are described in the " Interface Flags" section under "Common Output Fields Description" on page 706.	All levels

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
Link flags	Information about the link. Possible values are described in the " Links Flags" section under "Common Output Fields Description" on page 706.	All levels
Wavelength	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Schedulers	(Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces only) 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: 2002-04-26 10:52:40 PDT (04:33:20 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps). The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Output Rate	Output rate in bps and pps. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Egress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for egress traffic.	**detail extensive**
Ingress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for ingress traffic.	**detail extensive**

Table 61: show interfaces Gigabit Ethernet 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. The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Output bytes**—Number of bytes transmitted on the interface. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface. Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes. For Gigabit Ethernet IQ PICs, the input byte counts vary by interface type. For more information, see Table 61 on page 741.	**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 the Junos OS does not handle. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) 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 by configuring 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 61: show interfaces Gigabit Ethernet 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. NOTE: In DPCs that are not of the enhanced type, such as DPC 40x 1GE R, DPCE 20x 1GE + 2x 10GE R, or DPCE 40x 1GE R, you might notice a discrepancy in the output of the **show interfaces** command because incoming packets might be counted in the Egress queues section of the output. This problem occurs on non-enhanced DPCs because the egress queue statistics are polled from IMQ (Inbound Message Queuing) block of the I-chip. The IMQ block does not differentiate between ingress and egress WAN traffic; as a result, the combined statistics are displayed in the egress queue counters on the Routing Engine. In a simple VPLS scenorio, if there is no MAC entry in DMAC table (by sending unidirectional traffic), traffic is flooded and the input traffic is accounted in IMQ. For bidirectional traffic (MAC entry in DMAC table), if the outgoing interface is on the same I-chip then both ingress and egress statistics are counted in a combined way. If the outgoing interface is on a different I-chip or FPC, then only egress statistics are accounted in IMQ. This behavior is expected with non-enhanced DPCs	**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**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
Ingress queues	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	**extensive**
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.	**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 routing device configuration, an alarm can ring the red or yellow alarm bell on the routing device, 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
OTN alarms	Active OTN alarms identified on the interface.	**detail extensive**
OTN defects	OTN defects received on the interface.	**detail extensive**
OTN FEC Mode	The FECmode configured on the interface. • **efec**—Enhanced forward error correction (EFEC) is configured to defect and correct bit errors. • **gfec**—G.709 Forward error correction (GFEC) mode is configured to detect and correct bit errors. • **none**—FEC mode is not configured.	**detail extensive**
OTN Rate	OTN mode. • **fixed-stuff-bytes**—Fixed stuff bytes 11.0957 Gbps. • **no-fixed-stuff-bytes**—No fixed stuff bytes 11.0491 Gbps. • **pass-through**—Enable OTN passthrough mode. • **no-pass-through**—Do not enable OTN passthrough mode.	**detail extensive**
OTN Line Loopback	Status of the line loopback, if configured for the DWDM OTN PIC. Its value can be: **enabled** or **disabled**.	**detail extensive**
OTN FEC statistics	The forward error correction (FEC) counters for the DWDM OTN PIC. • **Corrected Errors**—The count of corrected errors in the last second. • **Corrected Error Ratio**—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.	**detail extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
OTN FEC alarms	OTN FEC excessive or degraded error alarms triggered on the interface. • **FEC Degrade**—OTU FEC Degrade defect. • **FEC Excessive**—OTU FEC Excessive Error defect.	**detail extensive**
OTN OC	OTN OC defects triggered on the interface. • **LOS**—OC Loss of Signal defect. • **LOF**—OC Loss of Frame defect. • **LOM**—OC Loss of Multiframe defect. • **Wavelength Lock**—OC Wavelength Lock defect.	**detail extensive**
OTN OTU	OTN OTU defects detected on the interface • **AIS**—OTN AIS alarm. • **BDI**—OTN OTU BDI alarm. • **IAE**—OTN OTU IAE alarm. • **TTIM**—OTN OTU TTIM alarm. • **SF**—OTN ODU bit error rate fault alarm. • **SD**—OTN ODU bit error rate defect alarm. • **TCA-ES**—OTN ODU ES threshold alarm. • **TCA-SES**—OTN ODU SES threshold alarm. • **TCA-UAS**—OTN ODU UAS threshold alarm. • **TCA-BBE**—OTN ODU BBE threshold alarm. • **BIP**—OTN ODU BIP threshold alarm. • **BBE**—OTN OTU BBE threshold alarm. • **ES**—OTN OTU ES threshold alarm. • **SES**—OTN OTU SES threshold alarm. • **UAS**—OTN OTU UAS threshold alarm.	**detail extensive**
Received DAPI	Destination Access Port Interface (DAPI) from which the packets were received.	**detail extensive**
Received SAPI	Source Access Port Interface (SAPI) from which the packets were received.	**detail extensive**
Transmitted DAPI	Destination Access Port Interface (DAPI) to which the packets were transmitted.	**detail extensive**
Transmitted SAPI	Source Access Port Interface (SAPI) to which the packets were transmitted.	**detail extensive**
PCS statistics	(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device. • **Bit errors**—The number of seconds during which at least one bit error rate (BER) occurred while the PCS receiver is operating in normal mode. • **Errored blocks**—The number of seconds when at least one errored block occurred while the PCS receiver is operating in normal mode.	**detail extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem, including the following: • **Total octets** and **total packets**— Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 62 on page 755 • **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 or a cable 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 frames that exceed 1518 octets. • **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. • **Code violations**—Number of times an event caused the PHY to indicate “ Data reception error” or “ invalid data symbol error.”	**extensive**
OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	**extensive**
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	**extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet should enter the system or be rejected. • **Input packet count**—Number of packets received from the MAC hardware that the filter processed. • **Input packet rejects**—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • **Input DA rejects**—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting). • **Input SA rejects**—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • **Output packet count**—Number of packets that the filter has given to the MAC hardware. • **Output packet pad count**—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • **Output packet error count**—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • **CAM destination filters, CAM source filters**— Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0.	**extensive**
PMA PHY	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **PHY Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
WIS section	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**
WIS line	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)	**extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
WIS path	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)	**extensive**

Table 61: show interfaces Gigabit Ethernet 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 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**—Information from the link partner:
	  ◦ **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).
	  ◦ **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

Received path trace, Transmitted path trace	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the routing device at the other end of the fiber. The transmitted path trace value is the message that this routing device transmits.	**extensive**
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface. • **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. Possible values are described in the " Logical Interface Flags" section under "Common Output Fields Description" on page 706.	All levels

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
VLAN-Tag	Rewrite profile applied to incoming or outgoing frames on the outer (**Out**) VLAN tag or for both the outer and inner (**In**) VLAN tags. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **pop**—The outer VLAN tag of the incoming frame is removed. • **swap**—The outer VLAN tag of the incoming frame is overwritten with the user specified VLAN tag information. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **push-push**—Two VLAN tags are pushed in from the incoming frame. • **swap-push**—The outer VLAN tag of the incoming frame is replaced by a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame. • **swap-swap**—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user specified VLAN tag value. • **pop-swap**—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame. • **pop-pop**—Both the outer and inner VLAN tags of the incoming frame are removed.	**brief detail extensive** none
Demux:	IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following: • Source Family Inet • Destination Family Inet	**detail extensive** none
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family. Possible values are described in the " Protocol Field" section under "Common Output Fields Description" on page 706.	**detail extensive** none
MTU	Maximum transmission unit size on the logical interface.	**detail extensive** none
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. • **Input bytes, Output bytes**—Number of bytes received and transmitted on the interface set. The value in this field also includes the Layer 2 overhead bytes for ingress or egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets, Output packets**—Number of packets received and transmitted on the interface set.	**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.	**extensive**
Local statistics	Number and rate of bytes and packets destined to the routing device.	**extensive**

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
Transit statistics	Number and rate of bytes and packets transiting the switch. NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the **Output bytes** and **Output packets** interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	**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
Flags	Information about protocol family flags. Possible values are described in the " Family Flags" section under "Common Output Fields Description" on page 706.	**detail extensive**
Donor interface	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	**detail extensive** none
Preferred source address	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	**detail extensive** none
Input Filters	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	**detail extensive**
Output Filters	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	**detail extensive**
Mac-Validate Failures	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the " Addresses Flags" section under "Common Output Fields Description" on page 706.	**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 address flag (possible values are described in the "Addresses Flags" section under "Common Output Fields Description" on page 706.	**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

Table 61: show interfaces Gigabit Ethernet Output Fields (continued)

Field Name	Field Description	Level of Output
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

For Gigabit Ethernet IQ PICs, traffic and MAC statistics output varies. Table 62 on page 755 describes the traffic and MAC statistics for two sample interfaces, each of which is sending traffic in packets of 500 bytes (including 478 bytes for the Layer 3 packet, 18 bytes for the Layer 2 VLAN traffic header, and 4 bytes for cyclic redundancy check [CRC] information). In Table 62 on page 755, the **ge-0/3/0** interface is the inbound physical interface, and the **ge-0/0/0** interface is the outbound physical interface. On both interfaces, traffic is carried on logical unit **.50** (VLAN 50).

Table 62: Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type

Interface Type	Sample Command	Byte and Octet Counts Include	Comments
Inbound physical interface	**show interfaces ge-0/3/0 extensive**	Traffic statistics: Input bytes: 496 bytes per packet, representing the Layer 2 packet MAC statistics: Received octets: 500 bytes per packet, representing the Layer 2 packet + 4 bytes	The additional 4 bytes are for the CRC.
Inbound logical interface	**show interfaces ge-0/3/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	
Outbound physical interface	**show interfaces ge-0/0/0 extensive**	Traffic statistics: Input bytes: 490 bytes per packet, representing the Layer 3 packet + 12 bytes MAC statistics: Received octets: 478 bytes per packet, representing the Layer 3 packet	For input bytes, the additional 12 bytes includes 6 bytes for the destination MAC address + 4 bytes for VLAN + 2 bytes for the Ethernet type.
Outbound logical interface	**show interfaces ge-0/0/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	

Sample Output

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2)

```
user@host> show interfaces xe-5/0/0 extensive
Physical interface: xe-5/0/0, Enabled, Physical link is Up
              Interface index: 177, SNMP ifIndex: 99, Generation: 178
```



```
             Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Speed: 10Gbps,
Loopback: None, Source filtering: Enabled,
             Flow control: Enabled
             Device flags   : Present Running
             Interface flags: SNMP-Traps Internal: 0x4000
             Link flags     : None
             CoS queues     : 8 supported, 4 maximum usable queues
             Schedulers     : 1024
             Hold-times     : Up 0 ms, Down 0 ms
             Current address: 00:00:5e:00:53:f6, Hardware address:
00:00:5e:00:53:f6
             Last flapped   : Never
             Statistics last cleared: Never
             Traffic statistics:
             Input  bytes  :          6970332384                    0 bps
             Output bytes  :                   0                    0 bps
             Input  packets:            81050506                    0 pps
             Output packets:                   0                    0 pps
             IPv6 transit statistics:
             Input  bytes  :                  0
             Output bytes  :                  0
             Input  packets:                  0
             Output packets:                  0
             Ingress traffic statistics at Packet Forwarding Engine:
             Input  bytes  :          6970299398                    0 bps
             Input  packets:            81049992                    0 pps
             Drop   bytes  :                   0                    0 bps
             Drop   packets:                   0                    0 pps
             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
             Ingress queues: 4 supported, 4 in use
            Queue counters:      Queued packets  Transmitted packets     Dropped
 packets
             0 best-effort           81049992             81049992
       0
             1 expedited-fo                 0                    0
       0
             2 assured-forw                 0                    0
       0
             3 network-cont                 0                    0
       0
             Egress queues: 4 supported, 4 in use
            Queue counters:      Queued packets  Transmitted packets     Dropped
 packets
             0 best-effort                  0                    0
       0
             1 expedited-fo                 0                    0
       0
             2 assured-forw                 0                    0
       0
             3 network-cont                 0                    0
       0
             Active alarms  : None
             Active defects : None
             PCS statistics                      Seconds
```



```
             Bit errors                            0
             Errored blocks                        0
             MAC statistics:                     Receive         Transmit
             Total octets                     6970332384                0
             Total packets                      81050506                0
             Unicast packets                    81050000                0
             Broadcast packets                       506                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
             Filter statistics:
             Input packet count                 81050506
             Input packet rejects                    506
             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: 0, CAM source filters: 0
             Packet Forwarding Engine configuration:
             Destination slot: 5
             CoS information:
             Direction : Output
             CoS transmit queue         Bandwidth              Buffer Priority
   Limit
                                  %           bps     %         usec
             0 best-effort       95     950000000    95         0          low
    none
             3 network-control    5      50000000     5         0          low
    none
             Direction : Input
             CoS transmit queue         Bandwidth              Buffer Priority
   Limit
                                 %           bps     %         usec
             0 best-effort       95     950000000    95         0          low
    none
             3 network-control    5      50000000     5         0          low
    none
            Logical interface xe-5/0/0.0 (Index 71) (SNMP ifIndex 95) (Generation
 195)
Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ]  Encapsulation: ENET2
Egress account overhead: 100
Ingress account overhead: 90
Traffic statistics:
Input  bytes  :                 0
Output bytes  :                46
Input  packets:                 0
Output packets:                 1
IPv6 transit statistics:
Input  bytes  :                0
Output bytes  :                0
Input  packets:                0
Output packets:                0
Local statistics:
```

```
Input  bytes  :                  0
Output bytes  :                 46
Input  packets:                  0
Output packets:                  1
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: 253, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.0.2/24, Local: 192.0.2.1, Broadcast: 192.0.2.255, Generation:
265
Protocol multiservice, MTU: Unlimited, Generation: 254, Route table: 0
Flags: None
Policer: Input: __default_arp_policer__
```

show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode)

```
user@host> show interfaces xe-1/0/0 extensive
Physical interface: xe-1/0/0, Enabled, Physical link is Up
Interface index: 141, SNMP ifIndex: 34, Generation: 47
Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Loopback: Disabled
WAN-PHY mode
Source filtering: Disabled, Flow control: Enabled
Device flags   : Present Running
Interface flags: SNMP-Traps 16384
Link flags     : None
CoS queues     : 4 supported
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:00:5e:00:53:9d, Hardware address: 00:00:5e:00:53:9d
Last flapped   : 2005-07-07 11:22:34 PDT (3d 12:28 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
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,
    HS Link CRC errors: 0, HS Link FIFO overflows: 0,
      Resource errors: 0
Output errors:
Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0,
  Aged packets: 0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0,
    Resource errors: 0
Queue counters:       Queued packets  Transmitted packets     Dropped packets
0 best-effort                    0                    0                   0
1 expedited-fo                   0                    0                   0
2 assured-forw                   0                    0                   0
3 network-cont                   0                    0                   0
Active alarms : LOL, LOS, LBL
Active defects: LOL, LOS, LBL, SEF, AIS-L, AIS-P
PCS statistics             Seconds       Count
```



```
Bit errors                    0           0
Errored blocks                0           0
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
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: 0, CAM source filters: 0
PMA PHY:              Seconds        Count  State
PLL lock                    0            0  OK
PHY light               63159            1  Light Missing
WIS section:
BIP-B1                      0            0
SEF                    434430       434438  Defect Active
LOS                    434430            1  Defect Active
LOF                    434430            1  Defect Active
ES-S                   434430
SES-S                  434430
SEFS-S                 434430
WIS line:
BIP-B2                      0            0
REI-L                       0            0
RDI-L                       0            0  OK
AIS-L                  434430            1  Defect Active
BERR-SF                     0            0  OK
BERR-SD                     0            0  OK
ES-L                   434430
SES-L                  434430
UAS-L                  434420
ES-LFE                      0
SES-LFE                     0
UAS-LFE                     0
WIS path:
BIP-B3                      0            0
REI-P                       0            0
LOP-P                       0            0  OK
AIS-P                  434430            1  Defect Active
RDI-P                       0            0  OK
UNEQ-P                      0            0  OK
PLM-P                       0            0  OK
ES-P                   434430
SES-P                  434430
UAS-P                  434420
```

```
ES-PFE                  0
SES-PFE                 0
UAS-PFE                 0
Received path trace:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
Transmitted path trace: orissa so-1/0/0
6f 72 69 73 73 61 20 73 6f 2d 31 2f 30 2f 30 00   orissa so-1/0/0.
Packet Forwarding Engine configuration:
Destination slot: 1
CoS information:
CoS transmit queue
```

```
Bandwidth
```

```
Buffer
```

```
Priority   Limit
```

```
%

bps     %
bytes
0 best-effort

95

950000000

95

0

low

none
3 network-control

5

50000000
```

5

0

low

none

show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC)

```
user@host> show interfaces ge-7/0/0 extensive
Physical interface: ge-7/0/0, Enabled, Physical link is Down
Interface index: 143, SNMP ifIndex: 508, Generation: 208
Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, BPDU Error: None,
  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
    Flow control: Enabled
    Device flags   : Present Running Down
    Interface flags: Hardware-Down SNMP-Traps Internal: 0x4000
Link flags     : None
Wavelength     : 1550.12 nm, Frequency: 193.40 THz
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:00:5e:00:53:72, Hardware address: 00:00:5e:00:53:72
Last flapped   : 2011-04-20 15:48:54 PDT (18:39:49 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: 2, 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, 4 in use
```



```
Queue counters:       Queued packets  Transmitted packets      Dropped packets
0 best-effort                  0                    0                    0
1 expedited-fo                 0                    0                    0
2 assured-forw                 0                    0                    0
3 network-cont
Queue number:         Mapped forwarding classes
0                   best-effort
1                   expedited-forwarding
2                   assured-forwarding
3                   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
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
OTN alarms            :   None
OTN defects           :   None
OTN FEC Mode       : GFEC
OTN Rate              : Fixed Stuff Bytes 11.0957Gbps
OTN Line Loopback : Enabled
OTN FEC statistics :
Corrected Errors                                       0
Corrected Error Ratio (          0 sec average)     0e-0
OTN FEC alarms:          Seconds        Count  State
FEC Degrade                  0            0  OK
FEC Excessive                0            0  OK
OTN OC:                  Seconds        Count  State
LOS                          2            1  OK
LOF                      67164            2  Defect Active
LOM                      67164           71  Defect Active
Wavelength Lock              0            0  OK
OTN OTU:
AIS                          0            0  OK
BDI                      65919         4814  Defect Active
IAE                      67158            1  Defect Active
```



```
TTIM                         7            1  OK
SF                       67164            2  Defect Active
SD                       67164            3  Defect Active
TCA-ES                       0            0  OK
TCA-SES                      0            0  OK
TCA-UAS                     80           40  OK
TCA-BBE                      0            0  OK
BIP                          0            0  OK
BBE                          0            0  OK
ES                           0            0  OK
SES                          0            0  OK
UAS                        587            0  OK
Received DAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
Received SAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
Transmitted DAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
Transmitted SAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
OTN Received Overhead Bytes:
APS/PCC0: 0x02, APS/PCC1: 0x42, APS/PCC2: 0xa2, APS/PCC3: 0x48
Payload Type: 0x03
OTN Transmitted Overhead Bytes:
APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
Payload Type: 0x03
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: 0, CAM source filters: 0
Packet Forwarding Engine configuration:
Destination slot: 7
CoS information:
Direction : Output
CoS transmit queue               Bandwidth               Buffer Priority   Limit

  %             bps      %           usec
0 best-effort           95      9500000000    95              0       low     none
3 network-control        5       500000000     5              0       low     none

  ...
```

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode)

user@host> **show interfaces xe-7/0/0 extensive**

```
Physical interface: xe-7/0/0, Enabled, Physical link is Up
Interface index: 173, SNMP ifIndex: 212, Generation: 174
Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, Unidirectional:
 Enabled,
  Loopback: None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
    ...
```


show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only)

```
user@host> show interfaces xe-7/0/0–tx extensive
Physical interface: xe-7/0/0-tx, Enabled, Physical link is Up
             Interface index: 176, SNMP ifIndex: 137, Generation: 177
             Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
Unidirectional: Tx-Only
             Device flags   : Present Running
             Interface flags: SNMP-Traps Internal: 0x4000
             Link flags     : None
             CoS queues     : 8 supported, 8 maximum usable queues
             Hold-times     : Up 0 ms, Down 0 ms
             Current address: 00:00:5e:00:53:83, Hardware address:
00:00:5e:00:53:83
             Last flapped   : 2007-06-01 09:08:19 PDT (3d 02:31 ago)
Statistics last cleared: Never
Traffic statistics:
Input  bytes  :                  0                    0 bps
Output bytes  :      322891152287160          9627472888 bps
Input  packets:                  0                    0 pps
Output packets:         328809727380             1225492 pps
  ...
  Filter statistics:
Output packet count          328810554250
Output packet pad count                 0
Output packet error count               0
  ...
  Logical interface xe-7/0/0-tx.0 (Index 73) (SNMP ifIndex 138) (Generation 139)
Flags: SNMP-Traps Encapsulation: ENET2
Egress account overhead: 100
Ingress account overhead: 90
Traffic statistics:
Input  bytes  :                  0
Output bytes  :      322891152287160
Input  packets:                  0
Output packets:         328809727380
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  :      322891152287160          9627472888 bps
Input  packets:                  0                    0 pps
Output packets:         328809727380             1225492 pps
IPv6 transit statistics:
Input  bytes  :                 0
Output bytes  :                 0
Input  packets:                 0
Output packets:                 0
Protocol inet, MTU: 1500, Generation: 147, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.11.12/24, Local: 10.11.12.13, Broadcast: 10.11.12.255, Generation:
 141
Protocol multiservice, MTU: Unlimited, Generation: 148, Route table: 0
```

```
Flags: None
Policer: Input: __default_arp_policer__
```

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only)

```
user@host> show interfaces xe-7/0/0– rx extensive
Physical interface: xe-7/0/0-rx, Enabled, Physical link is Up
  Interface index: 174, SNMP ifIndex: 118, Generation: 175
Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, Unidirectional:
 Rx-Only
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : None
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:00:5e:00:53:83, Hardware address: 00:00:5e:00:53:83
Last flapped   : 2007-06-01 09:08:22 PDT (3d 02:31 ago)
Statistics last cleared: Never
Traffic statistics:
Input  bytes  :      322857456303482          9627496104 bps
Output bytes  :                    0                   0 bps
Input  packets:         328775413751             1225495 pps
Output packets:                    0                   0 pps
  ...
  Filter statistics:
Input packet count           328775015056
Input packet rejects                    1
Input DA rejects                        0
  ...
  Logical interface xe-7/0/0-rx.0 (Index 72) (SNMP ifIndex 120) (Generation 138)
Flags: SNMP-Traps Encapsulation: ENET2
Traffic statistics:
Input  bytes  :      322857456303482
Output bytes  :                    0
Input  packets:         328775413751
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  :      322857456303482          9627496104 bps
Output bytes  :                    0                   0 bps
Input  packets:         328775413751             1225495 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: 145, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 192.0.2/24, Local: 192.0.2.1, Broadcast: 192.0.2.255, Generation:
139
```

```
Protocol multiservice, MTU: Unlimited, Generation: 146, Route table: 0
Flags: None
Policer: Input: __default_arp_policer__
```

show interfaces (Discard)

Syntax

show interfaces dsc
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Release Information Command introduced before Junos OS Release 7.4.

Description Display status information about the specified discard interface.

Options

dsc—Display standard information about the specified discard interface.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—This option is not relevant for the discard interface and always shows a value of 0.

snmp-index ***snmp-index***—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) This option is not relevant for the discard interface and always shows a value of 0.

Required Privilege Level view

Related Documentation

- *show interfaces (ATM)*
- *show interfaces routing*

List of Sample Output

show interfaces dsc on page 771
show interfaces dsc brief on page 771
show interfaces dsc detail on page 771
show interfaces dsc extensive on page 772

Output Fields Table 63 on page 768 lists the output fields for the **show interfaces** (discard) command. Output fields are listed in the approximate order in which they appear.

Table 63: Discard show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		

Table 63: Discard show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Physical interface	Name of the physical interface, whether the interface is enabled, and the state of the physical interface: **Up** or **Down**.	All levels
Interface index	Physical interface's index number, which reflects its initialization sequence.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
SNMP ifIndex	SNMP index number for the physical interface.	**detail extensive** none
Type	Type of interface. **Software-Pseudo** indicates a standard software interface with no associated hardware device.	All levels
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source. It can be **Internal** or **External**.	**brief detail extensive**
Speed	Speed at which the interface is running.	**brief detail extensive**
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under “Common Output Fields Description” on page 706.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 706.	All levels
Link type	Encapsulation being used on the physical interface.	**detail extensive**
Link flags	Information about the link. Possible values are described in the “Link Flags” section under “Common Output Fields Description” on page 706.	**detail extensive**
Physical info	Information about the physical interface.	**detail extensive**
Hold-times	Current interface hold-time up and hold-time down. Value is in milliseconds.	**detail extensive**
Current address, Hardware address	Configured MAC address and hardware MAC address.	**detail extensive**
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 hour:minute:second timezone*** **(*hour:minute:second* 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 63: Discard show interfaces 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, Output bytes**—Number of bytes received and transmitted on the interface. • **Input packets, Output packets**—Number of packets received and transmitted on the interface.	**detail extensive**
Input errors	Input errors on the interface: • **Errors**—Sum of 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	(Extensive only) 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 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		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	**detail extensive**
SNMP ifIndex	Logical interface SNMP interface index number.	**detail extensive**
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Table 63: Discard show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Flags	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under “Common Output Fields Description” on page 706.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family configured on the logical interface, such as **iso**, **inet6**, or **mpls**.	**All levels**
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**

Sample Output

show interfaces dsc

```
user@host> show interfaces dsc
Physical interface: dsc, Enabled, Physical link is Up
  Interface index: 5, SNMP ifIndex: 5
  Type: Software-Pseudo, MTU: Unlimited
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : None
  Last flapped   : Never
    Input packets : 0
    Output packets: 0

  Logical interface dsc.0 (Index 66) (SNMP ifIndex 235)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Unspecified
    Protocol inet, MTU: Unlimited
      Flags: None
```

show interfaces dsc brief

```
user@host> show interfaces dsc brief
Physical interface: dsc, Enabled, Physical link is Up
  Type: Software-Pseudo, Link-level type: Unspecified, MTU: Unlimited, Clocking:
 Unspecified, Speed: Unspecified
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps

  Logical interface dsc.0
    Flags: Point-To-Point SNMP-Traps Encapsulation: Unspecified
    inet
```

show interfaces dsc detail

```
user@host> show interfaces dsc detail
```

```
Physical interface: dsc, Enabled, Physical link is Up
  Interface index: 5, SNMP ifIndex: 5, Generation: 9
  Type: Software-Pseudo, Link-level type: Unspecified, MTU: Unlimited, Clocking:
 Unspecified, Speed: Unspecified
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Unspecified
  Link flags     : None
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: Unspecified, Hardware address: Unspecified
  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

  Logical interface dsc.0 (Index 66) (SNMP ifIndex 235) (Generation 6)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Unspecified
    Protocol inet, MTU: Unlimited, Generation: 14, Route table: 0
      Flags: None
```

show interfaces dsc extensive

```
user@host> show interfaces dsc extensive
Physical interface: dsc, Enabled, Physical link is Up
  Interface index: 5, SNMP ifIndex: 5, Generation: 9
  Type: Software-Pseudo, Link-level type: Unspecified, MTU: Unlimited, Clocking:
 Unspecified, Speed: Unspecified
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Unspecified
  Link flags     : None
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: Unspecified, Hardware address: Unspecified
  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
  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 dsc.0 (Index 66) (SNMP ifIndex 235) (Generation 6)
    Flags: Point-To-Point SNMP-Traps Encapsulation: Unspecified
    Protocol inet, MTU: Unlimited, Generation: 14, Route table: 0
```

show interfaces

List of Syntax

Syntax (Gigabit Ethernet) on page 773
Syntax (10 Gigabit Ethernet) on page 773
Syntax (SRX Series Devices) on page 773

Syntax (Gigabit Ethernet)

show interfaces ge-*fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Syntax (10 Gigabit Ethernet)

show interfaces xe-*fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index *snmp-index*>
<statistics>

Syntax (SRX Series Devices)

show interfaces (
<*interface-name*>
<brief | detail | extensive | terse>
<controller *interface-name*>|
<descriptions *interface-name*>|
<destination-class (all | *destination-class-name logical-interface-name*)>|
<diagnostics optics *interface-name*>|
<far-end-interval *interface-fpc/pic/port*>|
<filters *interface-name*>|
<flow-statistics *interface-name*>|
<interval *interface-name*>|
<load-balancing (detail | *interface-name*)>|
<mac-database mac-address *mac-address*>|
<mc-ae id *identifier* unit *number* revertive-info>|
<media *interface-name*>|
<policers *interface-name*>|
<queue both-ingress-egress egress forwarding-class *forwarding-class* ingress l2-statistics>|
<redundancy (detail | *interface-name*)>|
<routing brief detail summary *interface-name*>|
<routing-instance (all | *instance-name*)>|
<snmp-index *snmp-index*>|
<source-class (all | *destination-class-name logical-interface-name*)>|
<statistics *interface-name*>|
<switch-port *switch-port number*>|
<transport pm (all | optics | otn) (all | current | currentday | interval | previousday) (all | *interface-name*)>|
<zone *interface-name*>
)

Release Information

Command introduced before Junos OS Release 7.4 for Gigabit interfaces.
Command introduced in Junos OS Release 8.0 for 10 Gigabit interfaces.
Command modified in Junos OS Release 9.5 for SRX Series devices.

Command introduced in Junos OS Release 18.1 for Gigabit interfaces.

Description Display status information about the specified Gigabit Ethernet interface.

(M320, M120, MX Series, and T Series routers only) Display status information about the specified 10-Gigabit Ethernet interface.

Display the IPv6 interface traffic statistics about the specified Gigabit Ethernet interface for MX series routers. The input and output bytes (bps) and packets (pps) rates are not displayed for IFD and local traffic.

Display status information and statistics about interfaces on SRX Series appliance running Junos OS.

NOTE: On SRX Series appliances, on configuring identical IPs on a single interface, you will not see a warning message; instead, you will see a syslog message.

Options For Gigabit interfaces:

ge-*fpc/pic/port*—Display standard information about the specified Gigabit Ethernet interface.

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.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

For 10 Gigabit interfaces:

xe-*fpc/pic/port*—Display standard information about the specified 10-Gigabit Ethernet interface.

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.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

For SRX interfaces:

- **interface-name**—(Optional) Display standard information about the specified interface. Following is a list of typical interface names. Replace pim with the PIM slot and port with the port number.
  - **at-** ***pim/0/port***—ATM-over-ADSL or ATM-over-SHDSL interface.
  - **ce1-*pim/0/ port***—Channelized E1 interface.
  - **cl-0/0/8**—3G wireless modem interface for SRX320 devices.
  - **ct1-*pim/0/port***—Channelized T1 interface.
  - **dl0**—Dialer Interface for initiating ISDN and USB modem connections.
  - **e1-*pim/0/port***—E1 interface.
  - **e3-*pim/0/port***—E3 interface.
  - **fe-*pim/0/port***—Fast Ethernet interface.
  - **ge-*pim/0/port***—Gigabit Ethernet interface.
  - **se-*pim/0/port***—Serial interface.
  - **t1-*pim/0/port***—T1 (also called DS1) interface.
  - **t3-*pim/0/port***—T3 (also called DS3) interface.
  - **wx-*slot*/0/0**—WAN acceleration interface, for the WXC Integrated Services Module (ISM 200).
  - **interface-name**—(Optional) Display standard information about the specified interface. Following is a list of typical interface names. Replace pim with the PIM slot and port with the port number.
    - **at-** ***pim/0/port***—ATM-over-ADSL or ATM-over-SHDSL interface.
    - **ce1-*pim/0/ port***—Channelized E1 interface.
    - **cl-0/0/8**—3G wireless modem interface for SRX320 devices.
    - **ct1-*pim/0/port***—Channelized T1 interface.
    - **dl0**—Dialer Interface for initiating ISDN and USB modem connections.
    - **e1-*pim/0/port***—E1 interface.
    - **e3-*pim/0/port***—E3 interface.
    - **fe-*pim/0/port***—Fast Ethernet interface.
    - **ge-*pim/0/port***—Gigabit Ethernet interface.
    - **se-*pim/0/port***—Serial interface.
    - **t1-*pim/0/port***—T1 (also called DS1) interface.

- **t3-*pim/0/port***—T3 (also called DS3) interface.
- **wx-*slot*/0/0**—WAN acceleration interface, for the WXC Integrated Services Module (ISM 200).

Additional Information In a logical system, this command displays information only about the logical interfaces and not about the physical interfaces.

Required Privilege Level view

Related Documentation

- *Understanding Layer 2 Interfaces on Security Devices*
- *Verifying and Managing Agent Circuit Identifier-Based Dynamic VLAN Configuration*
- *Verifying and Managing Configurations for Dynamic VLANs Based on Access-Line Identifiers*

List of Sample Output

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Output Fields

Table 64 on page 777 describes the output fields for the **show interfaces** (Gigabit Ethernet) command. Output fields are listed in the approximate order in which they appear. For Gigabit Ethernet IQ and IQE PICs, the traffic and MAC statistics vary by interface type. For more information, see Table 65 on page 806.

Table 64: show interfaces (Gigabit Ethernet) 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” on page 706.	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

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
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
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
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	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**.	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	(Gigabit Ethernet interfaces) 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. Possible values are described in the "Device Flags" section under "Common Output Fields Description" on page 706.	All levels
Interface flags	Information about the interface. Possible values are described in the "Interface Flags" section under "Common Output Fields Description" on page 706.	All levels
Link flags	Information about the link. Possible values are described in the "Links Flags" section under "Common Output Fields Description" on page 706.	All levels
Wavelength	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
Schedulers	(Gigabit Ethernet intelligent queuing 2 [IQ2] interfaces only) Number of CoS schedulers configured.	**extensive**
Hold-times	Current interface hold-time up and hold-time down, in milliseconds (ms).	**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: 2002-04-26 10:52:40 PDT (04:33:20 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps). The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None
Output Rate	Output rate in bps and pps. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Egress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for egress traffic.	**detail extensive**
Ingress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for ingress traffic.	**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. The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Output bytes**—Number of bytes transmitted on the interface. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets**—Number of packets received on the interface. • **Output packets**—Number of packets transmitted on the interface. Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes. For Gigabit Ethernet IQ PICs, the input byte counts vary by interface type. For more information, see Table 31 under the show interfaces command.	**detail extensive**

Table 64: show interfaces (Gigabit Ethernet) 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 (usually IPv4) 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 by configuring 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 64: show interfaces (Gigabit Ethernet) 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. NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), the **Drops** field does not always use the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs. • **Collisions**—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number must always be 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 must 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. NOTE: In DPCs that are not of the enhanced type, such as DPC 40x 1GE R, DPCE 20x 1GE + 2x 10GE R, or DPCE 40x 1GE R, you might notice a discrepancy in the output of the **show interfaces** command because incoming packets might be counted in the Egress queues section of the output. This problem occurs on non-enhanced DPCs because the egress queue statistics are polled from IMQ (Inbound Message Queuing) block of the I-chip. The IMQ block does not differentiate between ingress and egress WAN traffic; as a result, the combined statistics are displayed in the egress queue counters on the Routing Engine. In a simple VPLS scenario, if there is no MAC entry in DMAC table (by sending unidirectional traffic), traffic is flooded and the input traffic is accounted in IMQ. For bidirectional traffic (MAC entry in DMAC table), if the outgoing interface is on the same I-chip then both ingress and egress statistics are counted in a combined way. If the outgoing interface is on a different I-chip or FPC, then only egress statistics are accounted in IMQ. This behavior is expected with non-enhanced DPCs	**detail extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
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. NOTE: Due to accounting space limitations on certain Type 3 FPCs (which are supported in M320 and T640 routers), the **Dropped packets** field does not always display the correct value for queue 6 or queue 7 for interfaces on 10-port 1-Gigabit Ethernet PICs.	**detail extensive**
Ingress queues	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	**extensive**
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.	**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 router configuration, an alarm can ring the red or yellow alarm bell on the router, 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
Interface transmit statistics	(On MX Series devices) Status of the **interface-transmit-statistics** configuration: Enabled or Disabled. • **Enabled**—When the **interface-transmit-statistics** statement is included in the configuration. If this is configured, the interface statistics show the actual transmitted load on the interface. • **Disabled**—When the **interface-transmit-statistics** statement is not included in the configuration. If this is not configured, the interface statistics show the offered load on the interface.	**detail extensive**
OTN FEC statistics	The forward error correction (FEC) counters provide the following statistics: • **Corrected Errors**—Count of corrected errors in the last second. • **Corrected Error Ratio**—Corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.	**detail extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
PCS statistics	(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device. • **Bit errors**—Number of seconds during which at least one bit error rate (BER) occurred while the PCS receiver is operating in normal mode. • **Errored blocks**—Number of seconds when at least one errored block occurred while the PCS receiver is operating in normal mode.	**detail extensive**

Link Degrade	Shows the link degrade status of the physical link and the estimated bit error rates (BERs). This field is available only for the PICs supporting the physical link monitoring feature.
	• **Link Monitoring**—Indicates if physical link degrade monitoring is enabled on the interface.
	  ◦ **Enable**—Indicates that link degrade monitoring has been enabled (using the **link-degrade-monitor** statement) on the interface.
	  ◦ **Disable**—Indicates that link degrade monitoring has not been enabled on the interface. If link degrade monitoring has not been enabled, the output does not show any related information, such as BER values and thresholds.
	• **Link Degrade Set Threshold**—The BER threshold value at which the link is considered degraded and a corrective action is triggered.
	• **Link Degrade Clear Threshold**—The BER threshold value at which the degraded link is considered recovered and the corrective action applied to the interface is reverted.
	• **Estimated BER**—The estimated bit error rate.
	• **Link-degrade event**—Shows link degrade event information.
	  ◦ **Seconds**—Time (in seconds) elapsed after a link degrade event occurred.
	  ◦ **Count**—The number of link degrade events recorded.
	  ◦ **State**—Shows the link degrade status (example: **Defect Active**).
		detail extensive

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output

MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem, including the following:
	• **Total octets** and **total packets**—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 31 under the show interfaces command.
	• **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 or a cable 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**—There are two possible conditions regarding the number of oversized frames:
	  ◦ Packet length exceeds 1518 octets, or
	  ◦ Packet length exceeds MRU
	• **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.
	NOTE: The 20-port Gigabit Ethernet MIC (MIC-3D-20GE-SFP) does not have hardware counters for VLAN frames. Therefore, the **VLAN tagged frames** field displays 0 when the **show interfaces** command is executed on a 20-port Gigabit Ethernet MIC. In other words, the number of VLAN tagged frames cannot be determined for the 20-port Gigabit Ethernet MIC.
	• **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."
		extensive

OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	**extensive**
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	**extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet may enter the system or be rejected. • **Input packet count**—Number of packets received from the MAC hardware that the filter processed. • **Input packet rejects**—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • **Input DA rejects**—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the router from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local router (which the router is rejecting). • **Input SA rejects**—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field must increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • **Output packet count**—Number of packets that the filter has given to the MAC hardware. • **Output packet pad count**—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • **Output packet error count**—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field must not increment. • **CAM destination filters, CAM source filters**—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields must be 0.	**extensive**
PMA PHY	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **PHY Lock**—Phase-locked loop • **PHY Light**—Loss of optical signal	**extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
WIS section	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • **SES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**
WIS line	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)	**extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
WIS path	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload (signal) label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)	**extensive**

Table 64: show interfaces (Gigabit Ethernet) 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 Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.
	• **Link partner**—Information from the remote Ethernet device:
	  ◦ **Link mode**—Depending on the capability of the link partner, either **Full-duplex** or **Half-duplex**.
	  ◦ **Flow control**—Types of flow control supported by the link partner. For Gigabit Ethernet interfaces, types are **Symmetric** (link partner supports **PAUSE** on receive and transmit), **Asymmetric** (link partner supports **PAUSE** on transmit), **Symmetric/Asymmetric** (link partner supports **PAUSE** on receive and transmit or only **PAUSE** on transmit), and **None** (link partner does not support flow control).
	  ◦ **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**—Information from the local Ethernet device:
	  ◦ **Flow control**—Types of flow control supported by the local device. For Gigabit Ethernet interfaces, advertised capabilities are **Symmetric/Asymmetric** (local device supports **PAUSE** on receive and transmit or only **PAUSE** on receive) and **None** (local device does not support flow control). Depending on the result of the negotiation with the link partner, local resolution flow control type will display **Symmetric** (local device supports **PAUSE** on receive and transmit), **Asymmetric** (local device supports **PAUSE** on receive), and **None** (local device does not support flow control).
	  ◦ **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

Received path trace, Transmitted path trace	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the router at the other end of the fiber. The transmitted path trace value is the message that this router transmits.	**extensive**
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface. • **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. Possible values are described in the “Logical Interface Flags” section under “Common Output Fields Description” on page 706.	All levels

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
VLAN-Tag	Rewrite profile applied to incoming or outgoing frames on the outer (**Out**) VLAN tag or for both the outer and inner (**In**) VLAN tags. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **pop**—The outer VLAN tag of the incoming frame is removed. • **swap**—The outer VLAN tag of the incoming frame is overwritten with the user-specified VLAN tag information. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **push-push**—Two VLAN tags are pushed in from the incoming frame. • **swap-push**—The outer VLAN tag of the incoming frame is replaced by a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame. • **swap-swap**—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user-specified VLAN tag value. • **pop-swap**—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame. • **pop-pop**—Both the outer and inner VLAN tags of the incoming frame are removed.	**brief detail extensive** none
Demux	IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following: • Source Family Inet • Destination Family Inet	**detail extensive** none
Encapsulation	Encapsulation on the logical interface.	All levels
ACI VLAN	Information displayed for agent circuit identifier (ACI) interface set configured with the **agent-circuit-id** autoconfiguration stanza. **Dynamic Profile**—Name of the dynamic profile that defines the ACI interface set. If configured, the ACI interface set enables the underlying Ethernet interface to create dynamic VLAN subscriber interfaces based on ACI information. NOTE: The ACI VLAN field is replaced with the Line Identity field when an ALI interface set is configured with the **line-identity** autoconfiguration stanza.	**brief detail extensive** none
Line Identity	Information displayed for access-line-identifier (ALI) interface sets configured with the **line-identity** autoconfiguration stanza. • **Dynamic Profile**—Name of the dynamic profile that defines the ALI interface set. • Trusted option used to create the ALI interface set: **Circuit-id**, **Remote-id**, or **Accept-no-ids**. More than one option can be configured. If configured, the ALI interface set enables the underlying Ethernet interface to create dynamic VLAN subscriber interfaces based on ALI information. NOTE: The Line Identity field is replaced with the ACI VLAN field when an ACI interface set is configured with the **agent-circuit-id** autoconfiguration stanza.	**detail**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
Protocol	Protocol family. Possible values are described in the “Protocol Field” section under “Common Output Fields Description” on page 706.	**detail extensive** none
MTU	Maximum transmission unit size on the logical interface.	**detail extensive** none
Neighbor Discovery Protocol (NDP)Queue Statistics	NDP statistics for protocol **inet6** under logical interface statistics. • **Max nh cache**—Maximum interface neighbor discovery nexthop cache size. • **New hold nh limit**—Maximum number of new unresolved nexthops. • **Curr nh cnt**—Current number of resolved nexthops in the NDP queue. • **Curr new hold cnt**—Current number of unresolved nexthops in the NDP queue. • **NH drop cnt**—Number of NDP requests not serviced.	All levels
Dynamic Profile	Name of the dynamic profile that was used to create this interface configured with a Point-to-Point Protocol over Ethernet (PPPoE) family.	**detail extensive** none
Service Name Table	Name of the service name table for the interface configured with a PPPoE family.	**detail extensive** none
Max Sessions	Maximum number of PPPoE logical interfaces that can be activated on the underlying interface.	**detail extensive** none
Duplicate Protection	State of PPPoE duplicate protection: **On** or **Off**. When duplicate protection is configured for the underlying interface, a dynamic PPPoE logical interface cannot be activated when an existing active logical interface is present for the same PPPoE client.	**detail extensive** none
Direct Connect	State of the configuration to ignore DSL Forum VSAs: **On** or **Off**. When configured, the router ignores any of these VSAs received from a directly connected CPE device on the interface.	**detail extensive** none
AC Name	Name of the access concentrator.	**detail extensive** none
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. • **Input bytes, Output bytes**—Number of bytes received and transmitted on the interface set. The value in this field also includes the Layer 2 overhead bytes for ingress or egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets, Output packets**—Number of packets received and transmitted on the interface set.	**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.	**extensive**
Local statistics	Number and rate of bytes and packets destined to the router.	**extensive**

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
Transit statistics	Number and rate of bytes and packets transiting the switch. NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the **Output bytes** and **Output packets** interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	**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
Flags	Information about protocol family flags. Possible values are described in the "Family Flags" section under "Common Output Fields Description" on page 706.	**detail extensive**
Donor interface	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	**detail extensive** none
Preferred source address	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	**detail extensive** none
Input Filters	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.	**detail extensive**
Output Filters	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.	**detail extensive**
Mac-Validate Failures	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the "Addresses Flags" section under "Common Output Fields Description" on page 706.	**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. Possible values are described in the "Addresses Flags" section under "Common Output Fields Description" on page 706.	**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

Table 64: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
Broadcast	Broadcast address of the logical interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

The following table describes the output fields for the **show interfaces** (10–Gigabit Ethernet) command.

Field Name	Field Description	Level of Output
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” on page 706.	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
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
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	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**.	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: **Enabled** or **Disabled**.	All levels

Remote-fault	(Gigabit Ethernet interfaces) 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. Possible values are described in the “Device Flags” section under “Common Output Fields Description” on page 706.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 706.	All levels
Link flags	Information about the link. Possible values are described in the “Links Flags” section under “Common Output Fields Description” on page 706.	All levels
Wavelength	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Schedulers	(Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces only) 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: 2002-04-26 10:52:40 PDT (04:33:20 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps). The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Output Rate	Output rate in bps and pps. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail extensive**
Egress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for egress traffic.	**detail extensive**
Ingress account overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for ingress traffic.	**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. The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Output bytes**—Number of bytes transmitted on the interface. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **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. • **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. • **L3 incompletes**—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) 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 by configuring 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>
<tr><td>Output errors</td><td>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.</td><td>extensive</td></tr>
<tr><td>Egress queues</td><td>Total number of egress queues supported on the specified interface.

NOTE: In DPCs that are not of the enhanced type, such as DPC 40x 1GE R, DPCE 20x 1GE + 2x 10GE R, or DPCE 40x 1GE R, you might notice a discrepancy in the output of the show interfaces command because incoming packets might be counted in the Egress queues section of the output. This problem occurs on non-enhanced DPCs because the egress queue statistics are polled from IMQ (Inbound Message Queuing) block of the I-chip. The IMQ block does not differentiate between ingress and egress WAN traffic; as a result, the combined statistics are displayed in the egress queue counters on the Routing Engine. In a simple VPLS scenorio, if there is no MAC entry in DMAC table (by sending unidirectional traffic), traffic is flooded and the input traffic is accounted in IMQ. For bidirectional traffic (MAC entry in DMAC table), if the outgoing interface is on the same I-chip then both ingress and egress statistics are counted in a combined way. If the outgoing interface is on a different I-chip or FPC, then only egress statistics are accounted in IMQ. This behavior is expected with non-enhanced DPCs</td><td>detail extensive</td></tr>
<tr><td>Queue counters (Egress)</td><td>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.</td><td>detail extensive</td></tr>
<tr><td>Ingress queues</td><td>Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.</td><td>extensive</td></tr>
</table>

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.	**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 routing device configuration, an alarm can ring the red or yellow alarm bell on the routing device, 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
OTN alarms	Active OTN alarms identified on the interface.	**detail extensive**
OTN defects	OTN defects received on the interface.	**detail extensive**
OTN FEC Mode	The FECmode configured on the interface. • **efec**—Enhanced forward error correction (EFEC) is configured to defect and correct bit errors. • **gfec**—G.709 Forward error correction (GFEC) mode is configured to detect and correct bit errors. • **none**—FEC mode is not configured.	**detail extensive**
OTN Rate	OTN mode. • **fixed-stuff-bytes**—Fixed stuff bytes 11.0957 Gbps. • **no-fixed-stuff-bytes**—No fixed stuff bytes 11.0491 Gbps. • **pass-through**—Enable OTN passthrough mode. • **no-pass-through**—Do not enable OTN passthrough mode.	**detail extensive**
OTN Line Loopback	Status of the line loopback, if configured for the DWDM OTN PIC. Its value can be: **enabled** or **disabled**.	**detail extensive**
OTN FEC statistics	The forward error correction (FEC) counters for the DWDM OTN PIC. • **Corrected Errors**—The count of corrected errors in the last second. • **Corrected Error Ratio**—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.	**detail extensive**
OTN FEC alarms	OTN FEC excessive or degraded error alarms triggered on the interface. • **FEC Degrade**—OTU FEC Degrade defect. • **FEC Excessive**—OTU FEC Excessive Error defect.	**detail extensive**

OTN OC	OTN OC defects triggered on the interface. • **LOS**—OC Loss of Signal defect. • **LOF**—OC Loss of Frame defect. • **LOM**—OC Loss of Multiframe defect. • **Wavelength Lock**—OC Wavelength Lock defect.	**detail extensive**
OTN OTU	OTN OTU defects detected on the interface • **AIS**—OTN AIS alarm. • **BDI**—OTN OTU BDI alarm. • **IAE**—OTN OTU IAE alarm. • **TTIM**—OTN OTU TTIM alarm. • **SF**—OTN ODU bit error rate fault alarm. • **SD**—OTN ODU bit error rate defect alarm. • **TCA-ES**—OTN ODU ES threshold alarm. • **TCA-SES**—OTN ODU SES threshold alarm. • **TCA-UAS**—OTN ODU UAS threshold alarm. • **TCA-BBE**—OTN ODU BBE threshold alarm. • **BIP**—OTN ODU BIP threshold alarm. • **BBE**—OTN OTU BBE threshold alarm. • **ES**—OTN OTU ES threshold alarm. • **SES**—OTN OTU SES threshold alarm. • **UAS**—OTN OTU UAS threshold alarm.	**detail extensive**
Received DAPI	Destination Access Port Interface (DAPI) from which the packets were received.	**detail extensive**
Received SAPI	Source Access Port Interface (SAPI) from which the packets were received.	**detail extensive**
Transmitted DAPI	Destination Access Port Interface (DAPI) to which the packets were transmitted.	**detail extensive**
Transmitted SAPI	Source Access Port Interface (SAPI) to which the packets were transmitted.	**detail extensive**
PCS statistics	(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device. • **Bit errors**—The number of seconds during which at least one bit error rate (BER) occurred while the PCS receiver is operating in normal mode. • **Errored blocks**—The number of seconds when at least one errored block occurred while the PCS receiver is operating in normal mode.	**detail extensive**

MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem, including the following: • **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 or a cable 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 frames that exceed 1518 octets. • **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. • **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."	**extensive**
OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	**extensive**
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	**extensive**

Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet should enter the system or be rejected. • **Input packet count**—Number of packets received from the MAC hardware that the filter processed. • **Input packet rejects**—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • **Input DA rejects**—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting). • **Input SA rejects**—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • **Output packet count**—Number of packets that the filter has given to the MAC hardware. • **Output packet pad count**—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • **Output packet error count**—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • **CAM destination filters, CAM source filters**—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0.	extensive
PMA PHY	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem.	extensive

WIS section	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information: • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B1**—Bit interleaved parity for SONET section overhead • **SEF**—Severely errored framing • **LOL**—Loss of light • **LOF**—Loss of frame • **ES-S**—Errored seconds (section) • S**ES-S**—Severely errored seconds (section) • **SEFS-S**—Severely errored framing seconds (section)	**extensive**
WIS line	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. State other than **OK** indicates a problem. Subfields are: • **BIP-B2**—Bit interleaved parity for SONET line overhead • **REI-L**—Remote error indication (near-end line) • **RDI-L**—Remote defect indication (near-end line) • **AIS-L**—Alarm indication signal (near-end line) • **BERR-SF**—Bit error rate fault (signal failure) • **BERR-SD**—Bit error rate defect (signal degradation) • **ES-L**—Errored seconds (near-end line) • **SES-L**—Severely errored seconds (near-end line) • **UAS-L**—Unavailable seconds (near-end line) • **ES-LFE**—Errored seconds (far-end line) • **SES-LFE**—Severely errored seconds (far-end line) • **UAS-LFE**—Unavailable seconds (far-end line)	**extensive**

WIS path	(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information. • **Seconds**—Number of seconds the defect has been active. • **Count**—Number of times that the defect has gone from inactive to active. • **State**—State of the error. Any state other than **OK** indicates a problem. Subfields are: • **BIP-B3**—Bit interleaved parity for SONET section overhead • **REI-P**—Remote error indication • **LOP-P**—Loss of pointer (path) • **AIS-P**—Path alarm indication signal • **RDI-P**—Path remote defect indication • **UNEQ-P**—Path unequipped • **PLM-P**—Path payload label mismatch • **ES-P**—Errored seconds (near-end STS path) • **SES-P**—Severely errored seconds (near-end STS path) • **UAS-P**—Unavailable seconds (near-end STS path) • **SES-PFE**—Severely errored seconds (far-end STS path) • **UAS-PFE**—Unavailable seconds (far-end STS path)	**extensive**

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 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**—Information from the link partner:
	  ◦ **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).
	  ◦ **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

Received path trace, Transmitted path trace	(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the routing device at the other end of the fiber. The transmitted path trace value is the message that this routing device transmits.	**extensive**
Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**
CoS information	Information about the CoS queue for the physical interface. • **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. Possible values are described in the "Logical Interface Flags" section under "Common Output Fields Description" on page 706.	All levels

VLAN-Tag	Rewrite profile applied to incoming or outgoing frames on the outer (**Out**) VLAN tag or for both the outer and inner (**In**) VLAN tags. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **pop**—The outer VLAN tag of the incoming frame is removed. • **swap**—The outer VLAN tag of the incoming frame is overwritten with the user specified VLAN tag information. • **push**—An outer VLAN tag is pushed in front of the existing VLAN tag. • **push-push**—Two VLAN tags are pushed in from the incoming frame. • **swap-push**—The outer VLAN tag of the incoming frame is replaced by a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame. • **swap-swap**—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user specified VLAN tag value. • **pop-swap**—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame. • **pop-pop**—Both the outer and inner VLAN tags of the incoming frame are removed.	**brief detail extensive** none
Demux:	IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following: • Source Family Inet • Destination Family Inet	**detail extensive** none
Encapsulation	Encapsulation on the logical interface.	All levels
Protocol	Protocol family. Possible values are described in the “Protocol Field” section under “Common Output Fields Description” on page 706.	**detail extensive** none
MTU	Maximum transmission unit size on the logical interface.	**detail extensive** none
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	**detail extensive** none
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. • **Input bytes, Output bytes**—Number of bytes received and transmitted on the interface set. The value in this field also includes the Layer 2 overhead bytes for ingress or egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets, Output packets**—Number of packets received and transmitted on the interface set.	**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.	**extensive**
Local statistics	Number and rate of bytes and packets destined to the routing device.	**extensive**

Transit statistics	Number and rate of bytes and packets transiting the switch. NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the **Output bytes** and **Output packets** interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	**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
Flags	Information about protocol family flags. Possible values are described in the “Family Flags” section under “Common Output Fields Description” on page 706.	**detail extensive**
Donor interface	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	**detail extensive** none
Preferred source address	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	**detail extensive** none
Input Filters	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	**detail extensive**
Output Filters	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	**detail extensive**
Mac-Validate Failures	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under “Common Output Fields Description” on page 706.	**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 address flag (possible values are described in the “Addresses Flags” section under “Common Output Fields Description” on page 706.	**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**

For Gigabit Ethernet IQ PICs, traffic and MAC statistics output varies. The following table describes the traffic and MAC statistics for two sample interfaces, each of which is sending traffic in packets of 500 bytes (including 478 bytes for the Layer 3 packet, 18 bytes for the Layer 2 VLAN traffic header, and 4 bytes for cyclic redundancy check [CRC] information). The **ge-0/3/0** interface is the inbound physical interface, and the **ge-0/0/0** interface is the outbound physical interface. On both interfaces, traffic is carried on logical unit **.50** (VLAN 50).

Table 65: Gigabit and 10 Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type

Interface Type	Sample Command	Byte and Octet Counts Include	Comments
Inbound physical interface	**show interfaces ge-0/3/0 extensive**	Traffic statistics: Input bytes: 496 bytes per packet, representing the Layer 2 packet MAC statistics: Received octets: 500 bytes per packet, representing the Layer 2 packet + 4 bytes	The additional 4 bytes are for the CRC.
Inbound logical interface	**show interfaces ge-0/3/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	
Outbound physical interface	**show interfaces ge-0/0/0 extensive**	Traffic statistics: Input bytes: 490 bytes per packet, representing the Layer 3 packet + 12 bytes MAC statistics: Received octets: 478 bytes per packet, representing the Layer 3 packet	For input bytes, the additional 12 bytes include 6 bytes for the destination MAC address plus 4 bytes for VLAN plus 2 bytes for the Ethernet type.
Outbound logical interface	**show interfaces ge-0/0/0.50 extensive**	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	

Table 66 on page 807 lists the output fields for the **show interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 66: 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.	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
Link-level type	Encapsulation being used on the physical interface.	All levels
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**
MTU	Maximum transmission unit size on the physical interface.	All levels
Link mode	Link mode: Full-duplex or Half-duplex.	
Speed	Speed at which the interface is running.	All levels
BPDU error	Bridge protocol data unit (BPDU) error: Detected or None	
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**.	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: **Enabled** or **Disabled**.	All levels
Remote-fault	(Gigabit Ethernet interfaces) 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 physical link.	All levels
CoS queues	Number of CoS queues configured.	**detail extensive** none
Current address	Configured MAC address.	**detail extensive** none

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
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: 2002-04-26 10:52:40 PDT (04:33:20 ago).**	**detail extensive** none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None
Output Rate	Output rate in bps and pps.	None
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. 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
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.	**detail extensive**

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Input errors	Input errors on the interface. • **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 (usually IPv4) 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 by configuring the **ignore-l3-incompletes** . • **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**
Output errors	Output errors on the interface. • **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; therefore, for Gigabit Ethernet PICs, this number must 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 must 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 interfaces. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Ingress queues	Total number of ingress queues supported on the specified interface.	**extensive**
Queue counters and queue number	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**

MAC statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC subsystem, including the following:
	• **Total octets** and **total packets**—Total number of octets and packets.
	• **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 or a cable 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**—There are two possible conditions regarding the number of oversized frames:
	  ◦ Packet length exceeds 1518 octets, or
	  ◦ Packet length exceeds MRU
	• **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.
	• **Code violations**—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."
		extensive

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Filter statistics	**Receive** and **Transmit** statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet should enter the system or be rejected. • **Input packet count**—Number of packets received from the MAC hardware that the filter processed. • **Input packet rejects**—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • **Input DA rejects**—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local device (which the router is rejecting). • **Input SA rejects**—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • **Output packet count**—Number of packets that the filter has given to the MAC hardware. • **Output packet pad count**—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • **Output packet error count**—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • **CAM destination filters, CAM source filters**—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields must be 0.	**extensive**

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.
		extensive

Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number.	**extensive**

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface. • **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**
Interface transmit statistics	Status of the **interface-transmit-statistics** configuration: Enabled or Disabled.	**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**
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
Traffic statistics	Number and rate of bytes and packets received and transmitted on the specified interface set. • **Input bytes, Output bytes**—Number of bytes received and transmitted on the interface set. The value in this field also includes the Layer 2 overhead bytes for ingress or egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • **Input packets, Output packets**—Number of packets received and transmitted on the interface set.	**detail extensive**

Table 66: show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
Local statistics	Number and rate of bytes and packets destined to the device.	**extensive**
Transit statistics	Number and rate of bytes and packets transiting the switch. NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the **Output bytes** and **Output packets** interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	**extensive**
Security	Security zones that interface belongs to.	**extensive**
Flow Input statistics	Statistics on packets received by flow module.	**extensive**
Flow Output statistics	Statistics on packets sent by flow module.	**extensive**
Flow error statistics (Packets dropped due to)	Statistics on errors in the flow module.	**extensive**
Protocol	Protocol family.	**detail extensive** none
MTU	Maximum transmission unit size on the logical interface.	**detail extensive** none
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
Flags	Information about protocol family flags. .	**detail extensive**
Addresses, 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 interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Sample Output Gigabit Ethernet

show interfaces (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Current address: 00:00:5e:00:53:7c, Hardware address: 00:00:5e:00:53:7c
  Last flapped   : 2006-08-10 17:25:10 PDT (00:01:08 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-3/0/2.0 (Index 72) (SNMP ifIndex 69)
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    Egress account overhead: 100
    Ingress account overhead: 90
    Input packets : 0
    Output packets: 0
    Protocol ccc, MTU: 1522
      Flags: Is-Primary
```

show interfaces (Gigabit Ethernet on MX Series Routers)

```
user@host> show interfaces ge-2/2/2
Physical interface: ge-2/2/2, Enabled, Physical link is Up
  Interface index: 156, SNMP ifIndex: 188
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, 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: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Schedulers     : 0
  Current address: 00:00:5e:00:53:c0, Hardware address: 00:00:5e:00:53:76
  Last flapped   : 2008-09-05 16:44:30 PDT (3d 01:04 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  Logical interface ge-2/2/2.0 (Index 82) (SNMP ifIndex 219)
        Flags: Up SNMP-Traps 0x4004000 Encapsulation: ENET2
    Input packets : 10232
    Output packets: 10294
    Protocol inet, MTU: 1500
      Flags: Sendbcast-pkt-to-re
```

```
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 203.0.113/24, Local: 203.0.113.1, Broadcast: 203.0.113.255
   Protocol inet6, MTU: 1500
    Max nh cache: 4, New hold nh limit: 100000, Curr nh cnt: 4, Curr new hold
cnt: 4, NH drop cnt: 0
      Flags: Is-Primary
      Addresses, Flags: Is-Default Is-Preferred Is-Primary
        Destination: 2001:db8:/32, Local: 2001:db8::5
      Addresses, Flags: Is-Preferred
        Destination: 2001:db8:1::/32, Local: 2001:db8:223:9cff:fe9f:3e78
    Protocol multiservice, MTU: Unlimited
      Flags: Is-Primary
```

show interfaces (link degrade status)

```
user@host> show interfaces et-3/0/0
Physical interface: et-3/0/0, Enabled, Physical link is Down
  Interface index: 157, SNMP ifIndex: 537
  Link-level type: Ethernet, MTU: 1514, MRU: 0, Speed: 100Gbps, BPDU Error: None,
 Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 54:e0:32:23:9d:38, Hardware address: 54:e0:32:23:9d:38
  Last flapped   : 2014-06-18 02:36:38 PDT (02:50:50 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : LINK
  Active defects : LINK
  PCS statistics                     Seconds
    Bit errors                            0
    Errored blocks                        0
  Link Degrade* :
  Link Monitoring                  :  Enable
  Link Degrade Set Threshold:      :  1E-7
  Link Degrade Clear Threshold:    :  1E-12
  Estimated BER                    :  1E-7
  Link-degrade event               :  Seconds     Count    State
                                          782         1     Defect Active
```

show interfaces extensive (Gigabit Ethernet on MX Series Routers showing interface transmit statistics configuration)

```
user@host> show interfaces ge-2/1/2 extensive | match "output|interface"
Physical interface: ge-2/1/2, Enabled, Physical link is Up
  Interface index: 151, SNMP ifIndex: 530, Generation: 154
  Interface flags: SNMP-Traps Internal: 0x4000
   Output bytes  :         240614363944            772721536 bps
   Output packets:           3538446506              1420444 pps
    Direction : Output
  Interface transmit statistics: Enabled

  Logical interface ge-2/1/2.0 (Index 331) (SNMP ifIndex 955) (Generation 146)
     Output bytes  :         195560312716            522726272 bps
     Output packets:           4251311146              1420451 pps

user@host> show interfaces ge-5/2/0.0 statistics detail
Logical interface ge-5/2/0.0 (Index 71) (SNMP ifIndex 573) (Generation 135)
    Flags: SNMP-Traps 0x4000 Encapsulation: ENET2
```

```
    Egress account overhead: 100
    Ingress account overhead: 90
    Traffic statistics:
     Input  bytes  :           271524
     Output bytes  :         37769598
     Input  packets:             3664
     Output packets:           885790
     IPv6 transit statistics:
      Input  bytes  :               0
      Output bytes  :        16681118
      Input  packets:               0
      Output packets:          362633
    Local statistics:
     Input  bytes  :           271524
     Output bytes  :           308560
     Input  packets:             3664
     Output packets:             3659
    Transit statistics:
     Input  bytes  :                0                    0 bps
     Output bytes  :         37461038                    0 bps
     Input  packets:                0                    0 pps
     Output packets:           882131                    0 pps
     IPv6 transit statistics:
      Input  bytes  :               0     0 bps
      Output bytes  :        16681118     0 bps
      Input  packets:               0     0 pps
      Output packets:          362633     0 pps
```

show interfaces brief (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2 brief
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

  Logical interface ge-3/0/2.0
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [ 0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530) Out(swap-push
    0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    ccc

  Logical interface ge-3/0/2.32767
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2
```

show interfaces detail (Gigabit Ethernet)

```
user@host> show interfaces ge-3/0/2 detail
Physical interface: ge-3/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 35, Generation: 177
  Link-level type: 52, MTU: 1522, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
```

```
  CoS queues     : 4 supported, 4 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:7c, Hardware address: 00:00:5e:00:53:7c
  Last flapped   : 2006-08-09 17:17:00 PDT (01:31:33 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
  Ingress traffic statistics at Packet Forwarding Engine:
   Input  bytes  :                   0                    0 bps
   Input  packets:                   0                    0 pps
   Drop   bytes  :                   0                    0 bps
   Drop   packets:                   0                    0 pps
  Ingress queues: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                   0                    0                    0

    1 expedited-fo                  0                    0                    0

    2 assured-forw                  0                    0                    0

    3 network-cont                  0                    0                    0

  Egress queues: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                   0                    0                    0

    1 expedited-fo                  0                    0                    0

    2 assured-forw                  0                    0                    0

    3 network-cont                  0                    0                    0

  Active alarms  : None
  Active defects : None

  Logical interface ge-3/0/2.0 (Index 72) (SNMP ifIndex 69) (Generation 140)
    Flags: SNMP-Traps 0x4000
    VLAN-Tag [0x8100.512 0x8100.513 ] In(pop-swap 0x8100.530)
Out(swap-push 0x8100.512 0x8100.513)
    Encapsulation: VLAN-CCC
    Egress account overhead: 100
    Ingress account overhead: 90
    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 ccc, MTU: 1522, Generation: 149, Route table: 0
      Flags: Is-Primary

  Logical interface ge-3/0/2.32767 (Index 71) (SNMP ifIndex 70)
  (Generation 139)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ]  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
```

show interfaces extensive (Gigabit Ethernet IQ2)

```
user@host> show interfaces ge-7/1/3 extensive
Physical interface: ge-7/1/3, Enabled, Physical link is Up
  Interface index: 170, SNMP ifIndex: 70, Generation: 171
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4004000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Schedulers     : 256
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:74, Hardware address: 00:00:5e:00:53:74
  Last flapped   : 2007-11-07 21:31:41 PST (02:03:33 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :          38910844056                 7952 bps
   Output bytes  :              7174605                 8464 bps
   Input  packets:            418398473                   11 pps
   Output packets:                78903                   12 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Ingress traffic statistics at Packet Forwarding Engine:
   Input  bytes  :          38910799145                 7952 bps
   Input  packets:            418397956                   11 pps
   Drop   bytes  :                    0                    0 bps
   Drop   packets:                    0                    0 pps
  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: 1, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
```



```
  FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Ingress queues: 4 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort            418390823            418390823                    0

  1 expedited-fo                   0                    0                    0

  2 assured-forw                   0                    0                    0

  3 network-cont                7133                 7133                    0

Egress queues: 4 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                 1031                 1031                    0

  1 expedited-fo                   0                    0                    0

  2 assured-forw                   0                    0                    0

  3 network-cont               77872                77872                    0

Active alarms  : None
Active defects : None
MAC statistics:                      Receive         Transmit
  Total octets                   38910844056          7174605
  Total packets                    418398473            78903
  Unicast packets               408021893366             1026
  Broadcast packets                       10               12
  Multicast packets                418398217            77865
  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  OTN Received Overhead Bytes:
  APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58
  Payload Type: 0x08
OTN Transmitted Overhead Bytes:
  APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
  Payload Type: 0x08
Filter statistics:
  Input packet count               418398473
  Input packet rejects                   479
  Input DA rejects                       479
  Input SA rejects                         0
  Output packet count                                   78903
  Output packet pad count                                   0
  Output packet error count                                 0
  CAM destination filters: 0, CAM source filters: 0
Autonegotiation information:
  Negotiation status: Complete
  Link partner:
      Link mode: Full-duplex, Flow control: Symmetric/Asymmetric,
      Remote fault: OK
  Local resolution:
```



```
      Flow control: Symmetric, Remote fault: Link OK
  Packet Forwarding Engine configuration:
    Destination slot: 7
  CoS information:
    Direction : Output
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %            bps     %           usec
    0 best-effort            95      950000000    95              0
low    none
    3 network-control         5       50000000     5              0
low    none
    Direction : Input
    CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                              %            bps     %           usec
    0 best-effort            95      950000000    95              0
low    none
    3 network-control         5       50000000     5              0
low    none

  Logical interface ge-7/1/3.0 (Index 70) (SNMP ifIndex 85) (Generation 150)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :              812400
     Output bytes  :             1349206
     Input  packets:                9429
     Output packets:                9449
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
      Output packets:                  0
    Local statistics:
     Input  bytes  :              812400
     Output bytes  :             1349206
     Input  packets:                9429
     Output packets:                9449
    Transit statistics:
     Input  bytes  :                   0                 7440 bps
     Output bytes  :                   0                 7888 bps
     Input  packets:                   0                   10 pps
     Output packets:                   0                   11 pps
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
      Output packets:                  0
    Protocol inet, MTU: 1500, Generation: 169, Route table: 0
      Flags: Is-Primary, Mac-Validate-Strict
      Mac-Validate Failures: Packets: 0, Bytes: 0
      Addresses, Flags: Is-Preferred Is-Primary
      Input Filters: F1-ge-3/0/1.0-in, F3-ge-3/0/1.0-in
      Output Filters: F2-ge-3/0/1.0-out (53)
      Destination: 203.0.113/24, Local: 203.0.113.2, Broadcast: 203.0.113.255,
        Generation: 196
    Protocol multiservice, MTU: Unlimited, Generation: 170, Route table: 0
      Flags: Is-Primary
      Policer: Input: __default_arp_policer__
```

NOTE: For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics displayed in the **show interfaces** command output might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the interface counters. For detailed information, see the description of the logical interface **Transit statistics** fields in Table 64 on page 777.

show interfaces (Gigabit Ethernet Unnumbered Interface)

```
user@host> show interfaces ge-3/2/0
Physical interface: ge-3/2/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 50
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Current address: 00:00:5e:00:53:f8, Hardware address: 00:00:5e:00:53:f8
  Last flapped   : 2006-10-27 04:42:23 PDT (08:01:52 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 624 bps (1 pps)
  Active alarms  : None
  Active defects : None

  Logical interface ge-3/2/0.0 (Index 67) (SNMP ifIndex 85)
    Flags: SNMP-Traps Encapsulation: ENET2
    Input packets : 0
    Output packets: 6
    Protocol inet, MTU: 1500
      Flags: Unnumbered
      Donor interface: lo0.0 (Index 64)
      Preferred source address: 203.0.113.22
```

show interfaces (ACI Interface Set Configured)

```
user@host> show interfaces ge-1/0/0.4001
  Logical interface ge-1/0/0.4001 (Index 340) (SNMP ifIndex 548)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.4001 ]  Encapsulation: PPP-over-

    Ethernet
    ACI VLAN:
      Dynamic Profile: aci-vlan-set-profile
    PPPoE:
      Dynamic Profile: aci-vlan-pppoe-profile,
      Service Name Table: None,
      Max Sessions: 32000, Max Sessions VSA Ignore: Off,
      Duplicate Protection: On, Short Cycle Protection: Off,
      Direct Connect: Off,
      AC Name: nbc
    Input packets : 9
    Output packets: 8
    Protocol multiservice, MTU: Unlimited
```

show interfaces (ALI Interface Set)

```
user@host> show interfaces ge-1/0/0.10
  Logical interface ge-1/0/0.10 (Index 346) (SNMP ifIndex 554) (Generation 155)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.10 ]  Encapsulation: ENET2
    Line Identity:
```

```
      Dynamic Profile: ali-set-profile
      Circuit-id Remote-id Accept-no-ids
    PPPoE:
      Dynamic Profile: ali-vlan-pppoe-profile,
      Service Name Table: None,
      Max Sessions: 32000, Max Sessions VSA Ignore: Off,
      Duplicate Protection: On, Short Cycle Protection: Off,
      Direct Connect: Off,
      AC Name: nbc
    Input packets : 9
    Output packets: 8
    Protocol multiservice, MTU: Unlimited
```

Sample Output Gigabit Ethernet

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2)

```
user@host> show interfaces xe-5/0/0 extensive
Physical interface: xe-5/0/0, Enabled, Physical link is Up
  Interface index: 177, SNMP ifIndex: 99, Generation: 178
  Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Speed: 10Gbps, Loopback: 
None, Source filtering: Enabled,
  Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 4 maximum usable queues
  Schedulers     : 1024
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:f6, Hardware address: 00:00:5e:00:53:f6
  Last flapped   : Never
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :           6970332384                    0 bps
   Output bytes  :                    0                    0 bps
   Input  packets:             81050506                    0 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Ingress traffic statistics at Packet Forwarding Engine:
   Input  bytes  :           6970299398                    0 bps
   Input  packets:             81049992                    0 pps
   Drop   bytes  :                    0                    0 bps
   Drop   packets:                    0                    0 pps
  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
  Ingress queues: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort             81049992             81049992                    0

    1 expedited-fo                   0                    0                    0
```



```
  2 assured-forw                  0                    0                    0

  3 network-cont                  0                    0                    0

Egress queues: 4 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                   0                    0                    0

  1 expedited-fo                  0                    0                    0

  2 assured-forw                  0                    0                    0

  3 network-cont                  0                    0                    0

Active alarms  : None
Active defects : None
PCS statistics                     Seconds
  Bit errors                           0
  Errored blocks                       0
MAC statistics:                      Receive         Transmit
  Total octets                    6970332384                0
  Total packets                     81050506                0
  Unicast packets                   81050000                0
  Broadcast packets                      506                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
Filter statistics:
  Input packet count                81050506
  Input packet rejects                   506
  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: 0, CAM source filters: 0
Packet Forwarding Engine configuration:
  Destination slot: 5
CoS information:
  Direction : Output
  CoS transmit queue          Bandwidth              Buffer Priority   Limit
                        %           bps     %          usec
  0 best-effort        95     950000000    95          0          low     none
  3 network-control     5      50000000     5         0          low     none

  Direction : Input
  CoS transmit queue          Bandwidth              Buffer Priority   Limit
                        %           bps     %          usec
  0 best-effort        95     950000000    95          0          low     none
  3 network-control     5      50000000     5          0          low     none

Logical interface xe-5/0/0.0 (Index 71) (SNMP ifIndex 95) (Generation 195)
```



```
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ]  Encapsulation: ENET2
    Egress account overhead: 100
    Ingress account overhead: 90
    Traffic statistics:
     Input  bytes  :                  0
     Output bytes  :                 46
     Input  packets:                  0
     Output packets:                  1
     IPv6 transit statistics:
      Input  bytes  :                 0
      Output bytes  :                 0
      Input  packets:                 0
      Output packets:                 0
    Local statistics:
     Input  bytes  :                  0
     Output bytes  :                 46
     Input  packets:                  0
     Output packets:                  1
    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: 253, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.0.2/24, Local: 192.0.2.1, Broadcast: 192.0.2.255,
Generation: 265
    Protocol multiservice, MTU: Unlimited, Generation: 254, Route table: 0
      Flags: None
      Policer: Input: __default_arp_policer__
```

show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode)

```
user@host> show interfaces xe-1/0/0 extensive
Physical interface: xe-1/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 34, Generation: 47
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Loopback: Disabled
  WAN-PHY mode
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps 16384
  Link flags     : None
  CoS queues     : 4 supported
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:9d, Hardware address: 00:00:5e:00:53:9d
  Last flapped   : 2005-07-07 11:22:34 PDT (3d 12:28 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
  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,
    HS Link CRC errors: 0, HS Link FIFO overflows: 0,
```

```
    Resource errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0,
    Aged packets: 0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0,
    Resource errors: 0
  Queue counters:       Queued packets  Transmitted packets     Dropped packets
    0 best-effort                    0                    0                   0
    1 expedited-fo                   0                    0                   0
    2 assured-forw                   0                    0                   0
    3 network-cont                   0                    0                   0
  Active alarms : LOL, LOS, LBL
  Active defects: LOL, LOS, LBL, SEF, AIS-L, AIS-P
  PCS statistics             Seconds       Count
    Bit errors                     0           0
    Errored blocks                 0           0
  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
  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: 0, CAM source filters: 0
  PMA PHY:              Seconds        Count  State
    PLL lock                  0            0  OK
    PHY light             63159            1  Light Missing
 WIS section:
   BIP-B1                     0            0
   SEF                   434430       434438  Defect Active
   LOS                   434430            1  Defect Active
   LOF                   434430            1  Defect Active
   ES-S                  434430
   SES-S                 434430
   SEFS-S                434430
 WIS line:
   BIP-B2                     0            0
   REI-L                      0            0
   RDI-L                      0            0  OK
   AIS-L                 434430            1  Defect Active
   BERR-SF                    0            0  OK
   BERR-SD                    0            0  OK
   ES-L                  434430
   SES-L                 434430
   UAS-L                 434420
   ES-LFE                     0
```

```
    SES-LFE                  0
    UAS-LFE                  0
  WIS path:
    BIP-B3                   0            0
    REI-P                    0            0
    LOP-P                    0            0  OK
    AIS-P               434430            1  Defect Active
    RDI-P                    0            0  OK
    UNEQ-P                   0            0  OK
    PLM-P                    0            0  OK
    ES-P                434430
    SES-P               434430
    UAS-P               434420
    ES-PFE                   0
    SES-PFE                  0
    UAS-PFE                  0
  Received path trace:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
  Transmitted path trace: orissa so-1/0/0
    6f 72 69 73 73 61 20 73 6f 2d 31 2f 30 2f 30 00   orissa so-1/0/0.
    Packet Forwarding Engine configuration:
      Destination slot: 1
    CoS information:
      CoS transmit queue          Bandwidth          Buffer     Priority   Limit
                             %          bps     %    bytes
      0 best-effort         95    950000000    95        0         low      none
      3 network-control      5     50000000     5        0         low      none
```

show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC)

```
user@host> show interfaces ge-7/0/0 extensive
Physical interface: ge-7/0/0, Enabled, Physical link is Down
  Interface index: 143, SNMP ifIndex: 508, Generation: 208
  Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, BPDU Error: None,
  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Enabled
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x4000
  Link flags     : None
  Wavelength     : 1550.12 nm, Frequency: 193.40 THz
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:72, Hardware address: 00:00:5e:00:53:72
  Last flapped   : 2011-04-20 15:48:54 PDT (18:39:49 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: 2, 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, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                    0                    0                    0

  1 expedited-fo                   0                    0                    0

  2 assured-forw                   0                    0                    0

  3 network-cont
Queue number:         Mapped forwarding classes
  0                   best-effort
  1                   expedited-forwarding
  2                   assured-forwarding
  3                   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
  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
OTN alarms           :   None
OTN defects          :   None
OTN FEC Mode       : GFEC
OTN Rate               : Fixed Stuff Bytes 11.0957Gbps
OTN Line Loopback : Enabled
OTN FEC statistics :
  Corrected Errors                                        0
  Corrected Error Ratio (         0 sec average)     0e-0
OTN FEC alarms:         Seconds        Count  State
  FEC Degrade                 0            0  OK
  FEC Excessive               0            0  OK
OTN OC:                 Seconds        Count  State
  LOS                         2            1  OK
  LOF                     67164            2  Defect Active
```

```
    LOM                        67164           71  Defect Active
    Wavelength Lock                0            0  OK
  OTN OTU:
    AIS                            0            0  OK
    BDI                        65919         4814  Defect Active
    IAE                        67158            1  Defect Active
    TTIM                           7            1  OK
    SF                         67164            2  Defect Active
    SD                         67164            3  Defect Active
    TCA-ES                         0            0  OK
    TCA-SES                        0            0  OK
    TCA-UAS                       80           40  OK
    TCA-BBE                        0            0  OK
    BIP                            0            0  OK
    BBE                            0            0  OK
    ES                             0            0  OK
    SES                            0            0  OK
    UAS                          587            0  OK
    Received DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Received SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN Received Overhead Bytes:
    APS/PCC0: 0x02, APS/PCC1: 0x42, APS/PCC2: 0xa2, APS/PCC3: 0x48
    Payload Type: 0x03
  OTN Transmitted Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x03
  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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 7
  CoS information:
    Direction : Output
    CoS transmit queue              Bandwidth               Buffer Priority
Limit
                              %            bps     %            usec
    0 best-effort            95     9500000000    95               0       low
none
    3 network-control         5      500000000     5               0       low
none
    ...
```

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode)

```
user@host> show interfaces xe-7/0/0 extensive
Physical interface: xe-7/0/0, Enabled, Physical link is Up
  Interface index: 173, SNMP ifIndex: 212, Generation: 174
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
Unidirectional: Enabled,
```



```
  Loopback: None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
...
```

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only)

```
user@host> show interfaces xe-7/0/0–tx extensive
Physical interface: xe-7/0/0-tx, Enabled, Physical link is Up
  Interface index: 176, SNMP ifIndex: 137, Generation: 177
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
Unidirectional: Tx-Only
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:83, Hardware address: 00:00:5e:00:53:83
  Last flapped   : 2007-06-01 09:08:19 PDT (3d 02:31 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :      322891152287160           9627472888 bps
   Input  packets:                    0                    0 pps
   Output packets:         328809727380              1225492 pps

...

  Filter statistics:
    Output packet count           328810554250
    Output packet pad count                  0
    Output packet error count                0
...

  Logical interface xe-7/0/0-tx.0 (Index 73) (SNMP ifIndex 138) (Generation 139)

    Flags: SNMP-Traps Encapsulation: ENET2
    Egress account overhead: 100
    Ingress account overhead: 90
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :      322891152287160
     Input  packets:                    0
     Output packets:         328809727380
     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  :      322891152287160           9627472888 bps
     Input  packets:                    0                    0 pps
     Output packets:         328809727380              1225492 pps
     IPv6 transit statistics:
      Input  bytes  :                   0
      Output bytes  :                   0
```

```
      Input  packets:                   0
      Output packets:                   0
    Protocol inet, MTU: 1500, Generation: 147, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.11.12/24, Local: 10.11.12.13, Broadcast: 10.11.12.255,
Generation: 141
    Protocol multiservice, MTU: Unlimited, Generation: 148, Route table: 0
      Flags: None
      Policer: Input: __default_arp_policer__
```

show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only)

```
user@host> show interfaces xe-7/0/0–rx extensive
Physical interface: xe-7/0/0-rx, Enabled, Physical link is Up
  Interface index: 174, SNMP ifIndex: 118, Generation: 175
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
Unidirectional: Rx-Only
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5e:00:53:83, Hardware address: 00:00:5e:00:53:83
  Last flapped   : 2007-06-01 09:08:22 PDT (3d 02:31 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :      322857456303482          9627496104 bps
   Output bytes  :                    0                   0 bps
   Input  packets:         328775413751             1225495 pps
   Output packets:                    0                   0 pps

...

  Filter statistics:
    Input packet count             328775015056
    Input packet rejects                      1
    Input DA rejects                          0

...

  Logical interface xe-7/0/0-rx.0 (Index 72) (SNMP ifIndex 120) (Generation 138)

    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :      322857456303482
     Output bytes  :                    0
     Input  packets:         328775413751
     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  :      322857456303482          9627496104 bps
     Output bytes  :                    0                   0 bps
```



```
      Input  packets:        328775413751             1225495 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: 145, Route table: 0
       Addresses, Flags: Is-Preferred Is-Primary
         Destination: 192.0.2/24, Local: 192.0.2.1, Broadcast: 192.0.2.255,
Generation: 139
     Protocol multiservice, MTU: Unlimited, Generation: 146, Route table: 0
       Flags: None
       Policer: Input: __default_arp_policer__
```

Sample Output

Sample Output SRX Gigabit Ethernet

```
user@host> show interfaces ge-0/0/1
Physical interface: ge-0/0/1, Enabled, Physical link is Down
  Interface index: 135, SNMP ifIndex: 510
  Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed: 1000mbps,

  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
  Current address: 00:00:5e:00:53:01, Hardware address: 00:00:5e:00:53:01
  Last flapped   : 2015-05-12 08:36:59 UTC (1w1d 22:42 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : LINK
  Active defects : LINK
  Interface transmit statistics: Disabled

  Logical interface ge-0/0/1.0 (Index 71) (SNMP ifIndex 514)
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Security: Zone: public
    Protocol inet, MTU: 1500
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255
```

Sample Output SRX Gigabit Ethernet

```
user@host> show interfaces ge-0/0/1
Physical interface: ge-0/0/1, Enabled, Physical link is Down
  Interface index: 135, SNMP ifIndex: 510
  Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed: 1000mbps,

  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
Current address: 00:00:5e:00:53:01, Hardware address: 00:00:5e:00:53:01
Last flapped   : 2015-05-12 08:36:59 UTC (1w1d 22:42 ago)
Input rate     : 0 bps (0 pps)
Output rate    : 0 bps (0 pps)
Active alarms  : LINK
Active defects : LINK
Interface transmit statistics: Disabled

Logical interface ge-0/0/1.0 (Index 71) (SNMP ifIndex 514)
  Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
  Input packets : 0
  Output packets: 0
  Security: Zone: public
  Protocol inet, MTU: 1500
    Flags: Sendbcast-pkt-to-re
    Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
      Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255
```

show interfaces detail (Gigabit Ethernet)

user@host> show interfaces ge-0/0/1 detail

```
Physical interface: ge-0/0/1, Enabled, Physical link is Down
  Interface index: 135, SNMP ifIndex: 510, Generation: 138
  Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed: 1000mbps,
 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: 00:00:5e:00:53:01, Hardware address: 00:00:5e:00:53:01
  Last flapped   : 2015-05-12 08:36:59 UTC (1w2d 00:00 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
  Egress queues: 8 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : LINK
  Active defects : LINK
```



```
 Interface transmit statistics: Disabled

 Logical interface ge-0/0/1.0 (Index 71) (SNMP ifIndex 514) (Generation 136)
   Flags: Device-Down 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
   Security: Zone: public
   Flow Statistics :
   Flow Input statistics :
     Self packets :                   0
     ICMP packets :                   0
     VPN packets :                    0
     Multicast packets :              0
     Bytes permitted by policy :      0
     Connections established :        0
   Flow Output statistics:
     Multicast packets :              0
     Bytes permitted by policy :      0
   Flow error statistics (Packets dropped due to):
     Address spoofing:                0
     Authentication failed:           0
     Incoming NAT errors:             0
     Invalid zone received packet:    0
     Multiple user authentications:   0
     Multiple incoming NAT:           0
     No parent for a gate:            0
     No one interested in self packets: 0
     No minor session:                0
     No more sessions:                0
     No NAT gate:                     0
     No route present:                0
     No SA for incoming SPI:          0
     No tunnel found:                 0
     No session for a gate:           0
     No zone or NULL zone binding     0
     Policy denied:                   0
     Security association not active:   0
     TCP sequence number out of window: 0
     Syn-attack protection:           0
     User authentication errors:      0
   Protocol inet, MTU: 1500, Generation: 150, Route table: 0
     Flags: Sendbcast-pkt-to-re
     Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
       Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255, Generation:
150
```

show interfaces statistics st0.0 detail

```
user@host> show interfaces statistics st0.0 detail
  Logical interface st0.0 (Index 71) (SNMP ifIndex 609) (Generation 136)
    Flags: Up Point-To-Point SNMP-Traps Encapsulation: Secure-Tunnel
    Traffic statistics:
     Input  bytes  :        528152756774
     Output bytes  :        575950643520
     Input  packets:         11481581669
     Output packets:         12520666095
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :                   0          121859888 bps
     Output bytes  :                   0          128104112 bps
     Input  packets:                   0             331141 pps
     Output packets:                   0             348108 pps
    Security: Zone: untrust
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf ospf3 pgm pim rip ripng router-discovery rsvp
    sap vrrp
    Flow Statistics :
    Flow Input statistics :
      Self packets :                    0
      ICMP packets :                    0
      VPN packets :                     0
      Multicast packets :               0
      Bytes permitted by policy :       525984295844
      Connections established :         7
    Flow Output statistics:
      Multicast packets :               0
      Bytes permitted by policy :       576003290222
    Flow error statistics (Packets dropped due to):
      Address spoofing:                 0
      Authentication failed:            0
      Incoming NAT errors:              0
      Invalid zone received packet:     0
      Multiple user authentications:    0
      Multiple incoming NAT:            0
      No parent for a gate:             0
      No one interested in self packets: 0
      No minor session:                 0
      No more sessions:                 0
      No NAT gate:                      0
      No route present:                 2000280
      No SA for incoming SPI:           0
      No tunnel found:                  0
      No session for a gate:            0
      No zone or NULL zone binding      0
      Policy denied:                    0
      Security association not active:  0
      TCP sequence number out of window: 0
      Syn-attack protection:            0
      User authentication errors:       0
    Protocol inet, MTU: 9192
    Max nh cache: 0, New hold nh limit: 0, Curr nh cnt: 0, Curr new hold cnt: 0,
 NH drop cnt: 0
    Generation: 155, Route table: 0
```



```
Flags: Sendbcast-pkt-to-re
```

show interfaces extensive (Gigabit Ethernet)

```
user@host> show interfaces ge-0/0/1.0 extensive
Physical interface: ge-0/0/1, Enabled, Physical link is Down
  Interface index: 135, SNMP ifIndex: 510, Generation: 138
  Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed: 1000mbps,

  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: 00:00:5e:00:53:01, Hardware address: 00:00:5e:00:53:01
  Last flapped   : 2015-05-12 08:36:59 UTC (1w1d 22:57 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
  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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   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
  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: 2, 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            95      950000000    95               0      low
none
    3 network-control         5       50000000     5               0      low
none
  Interface transmit statistics: Disabled

  Logical interface ge-0/0/1.0 (Index 71) (SNMP ifIndex 514) (Generation 136)
    Flags: Device-Down 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
    Security: Zone: public
    Flow Statistics :
    Flow Input statistics :
      Self packets :                     0
      ICMP packets :                     0
      VPN packets :                      0
      Multicast packets :                0
      Bytes permitted by policy :        0
      Connections established :          0
    Flow Output statistics:
      Multicast packets :                0
      Bytes permitted by policy :        0
    Flow error statistics (Packets dropped due to):
      Address spoofing:                  0
```



```
      Authentication failed:            0
      Incoming NAT errors:              0
      Invalid zone received packet:     0
      Multiple user authentications:    0
      Multiple incoming NAT:            0
      No parent for a gate:             0
      No one interested in self packets: 0
      No minor session:                 0
      No more sessions:                 0
      No NAT gate:                      0
      No route present:                 0
      No SA for incoming SPI:           0
      No tunnel found:                  0
      No session for a gate:            0
      No zone or NULL zone binding      0
      Policy denied:                    0
      Security association not active:  0
      TCP sequence number out of window: 0
      Syn-attack protection:            0
      User authentication errors:       0
    Protocol inet, MTU: 1500, Generation: 150, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 1.1.1/24, Local: 1.1.1.1, Broadcast: 1.1.1.255,
        Generation: 150
```

show interfaces terse

```
user@host> show interfaces terse
    Interface               Admin Link Proto    Local                 Remote
    ge-0/0/0                up    up
    ge-0/0/0.0              up    up   inet     10.209.4.61/18
    gr-0/0/0                up    up
    ip-0/0/0                up    up
    st0                     up    up
    st0.1                   up    ready inet
    ls-0/0/0                up    up
    lt-0/0/0                up    up
    mt-0/0/0                up    up
    pd-0/0/0                up    up
    pe-0/0/0                up    up
    e3-1/0/0                up    up
    t3-2/0/0                up    up
    e1-3/0/0                up    up
    se-4/0/0                up    down
    t1-5/0/0                up    up
    br-6/0/0                up    up
    dc-6/0/0                up    up
    dc-6/0/0.32767          up    up
    bc-6/0/0:1              down  up
    bc-6/0/0:1.0            up    down
    dl0                     up    up
    dl0.0                   up    up   inet
    dsc                     up    up
    gre                     up    up
    ipip                    up    up
    lo0                     up    up
    lo0.16385               up    up   inet     10.0.0.1            --> 0/0
                                                10.0.0.16           --> 0/0
```

```
lsi                         up     up
mtun                        up     up
pimd                        up     up
pime                        up     up
pp0                         up     up
```

show interfaces controller (Channelized E1 IQ with Logical E1)

user@host> **show interfaces controller ce1-1/2/6**

```
Controller                                                          Admin Link
ce1-1/2/6                                                           up    up
e1-1/2/6                                                            up    up
```

show interfaces controller (Channelized E1 IQ with Logical DS0)

user@host> **show interfaces controller ce1-1/2/3**

```
Controller                                                          Admin Link
ce1-1/2/3                                                           up    up

ds-1/2/3:1                                                          up    up

ds-1/2/3:2                                                          up    up
```

show interfaces descriptions

user@host> **show interfaces descriptions**

```
 Interface       Admin Link Description
 so-1/0/0        up    up   M20-3#1
 so-2/0/0        up    up   GSR-12#1
 ge-3/0/0        up    up   SMB-OSPF_Area300
 so-3/3/0        up    up   GSR-13#1
 so-3/3/1        up    up   GSR-13#2
 ge-4/0/0        up    up   T320-7#1
 ge-5/0/0        up    up   T320-7#2
 so-7/1/0        up    up   M160-6#1
 ge-8/0/0        up    up   T320-7#3
 ge-9/0/0        up    up   T320-7#4
 so-10/0/0       up    up   M160-6#2
 so-13/0/0       up    up   M20-3#2
 so-14/0/0       up    up   GSR-12#2
 ge-15/0/0       up    up   SMB-OSPF_Area100
 ge-15/0/1       up    up   GSR-13#3
```

show interfaces destination-class all

user@host> **show interfaces destination-class all**

```
Logical interface so-4/0/0.0
                                           Packets                 Bytes
      Destination class              (packet-per-second)   (bits-per-second)
                         gold                        0                     0
                                  (                  0) (                  0)
                       silver                        0                     0
                                  (                  0) (                  0)
  Logical interface so-0/1/3.0
                                           Packets                 Bytes
      Destination class              (packet-per-second)   (bits-per-second)
                         gold                        0                     0
                                  (                  0) (                  0)
```



```
                         silver                         0                    0
                                    (                   0) (                 0)
```

show interfaces diagnostics optics

```
user@host> show interfaces diagnostics optics ge-2/0/0
Physical interface: ge-2/0/0
    Laser bias current                         :  7.408 mA
    Laser output power                         :  0.3500 mW / -4.56 dBm
    Module temperature                         :  23 degrees C / 73 degrees F
    Module voltage                             :  3.3450 V
    Receiver signal average optical power      :  0.0002 mW / -36.99 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                   :  On
    Laser rx power high warning                :  Off
    Laser rx power low warning                 :  On
    Laser bias current high alarm threshold    :  17.000 mA
    Laser bias current low alarm threshold     :  1.000 mA
    Laser bias current high warning threshold :  14.000 mA
    Laser bias current low warning threshold   :  2.000 mA
    Laser output power high alarm threshold    :  0.6310 mW / -2.00 dBm
    Laser output power low alarm threshold     :  0.0670 mW / -11.74 dBm
    Laser output power high warning threshold :  0.6310 mW / -2.00 dBm
    Laser output power low warning threshold   :  0.0790 mW / -11.02 dBm
    Module temperature high alarm threshold    :  95 degrees C / 203 degrees F
    Module temperature low alarm threshold     :  -25 degrees C / -13 degrees F
    Module temperature high warning threshold :  90 degrees C / 194 degrees F
    Module temperature low warning threshold   :  -20 degrees C / -4 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        :  1.2590 mW / 1.00 dBm
    Laser rx power low alarm threshold         :  0.0100 mW / -20.00 dBm
    Laser rx power high warning threshold      :  0.7940 mW / -1.00 dBm
    Laser rx power low warning threshold       :  0.0158 mW / -18.01 dBm
```

show interfaces far-end-interval coc12-5/2/0

```
user@host> show interfaces far-end-interval coc12-5/2/0
Physical interface: coc12-5/2/0, SNMP ifIndex: 121
  05:30-current:
    ES-L: 1, SES-L: 1, UAS-L: 0
```

```
  05:15-05:30:
    ES-L: 0, SES-L: 0, UAS-L: 0
  05:00-05:15:
    ES-L: 0, SES-L: 0, UAS-L: 0
  04:45-05:00:
    ES-L: 0, SES-L: 0, UAS-L: 0
  04:30-04:45:
    ES-L: 0, SES-L: 0, UAS-L: 0
  04:15-04:30:
    ES-L: 0, SES-L: 0, UAS-L: 0
  04:00-04:15:
...
```

show interfaces far-end-interval coc1-5/2/1:1

```
user@host> run show interfaces far-end-interval coc1-5/2/1:1
 Physical interface: coc1-5/2/1:1, SNMP ifIndex: 342
  05:30-current:
    ES-L: 1, SES-L: 1, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  05:15-05:30:
    ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  05:00-05:15:
    ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  04:45-05:00:
    ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  04:30-04:45:
    ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  04:15-04:30:
    ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0, SES-P: 0, UAS-P: 0
  04:00-04:15:
```

show interfaces filters

```
user@host> show interfaces filters
Interface       Admin Link Proto Input Filter         Output Filter
ge-0/0/0        up    up
ge-0/0/0.0      up    up   inet
                           iso
ge-5/0/0        up    up
ge-5/0/0.0      up    up   any                        f-any
                           inet                       f-inet
                           multiservice
gr-0/3/0        up    up
ip-0/3/0        up    up
mt-0/3/0        up    up
pd-0/3/0        up    up
pe-0/3/0        up    up
vt-0/3/0        up    up
at-1/0/0        up    up
at-1/0/0.0      up    up   inet
                           iso
at-1/1/0        up    down
at-1/1/0.0      up    down inet
                           iso
....
```

show interfaces flow-statistics (Gigabit Ethernet)

```
user@host> show interfaces flow-statistics ge-0/0/1.0
```



```
  Logical interface ge-0/0/1.0 (Index 70) (SNMP ifIndex 49)
    Flags: SNMP-Traps Encapsulation: ENET2
    Input packets : 5161
    Output packets: 83
    Security: Zone: zone2
    Allowed host-inbound traffic : bootp bfd bgp  dns dvmrp  ldp msdp nhrp ospf
pgm
    pim rip router-discovery rsvp sap vrrp dhcp finger ftp tftp ident-reset http
 https ike
   netconf ping rlogin rpm rsh snmp snmp-trap ssh telnet traceroute xnm-clear-text
 xnm-ssl
    lsping
    Flow Statistics :
    Flow Input statistics :
      Self packets :                     0
      ICMP packets :                     0
      VPN packets :                      2564
      Bytes permitted by policy :        3478
      Connections established :          1
    Flow Output statistics:
      Multicast packets :                0
      Bytes permitted by policy :        16994
    Flow error statistics (Packets dropped due to):
      Address spoofing:                  0
      Authentication failed:             0
      Incoming NAT errors:               0
      Invalid zone received packet:      0
      Multiple user authentications:     0
      Multiple incoming NAT:             0
      No parent for a gate:              0
      No one interested in self packets: 0
      No minor session:                  0
      No more sessions:                  0
      No NAT gate:                       0
      No route present:                  0
      No SA for incoming SPI:            0
      No tunnel found:                   0
      No session for a gate:             0
      No zone or NULL zone binding       0
      Policy denied:                     0
      Security association not active:   0
      TCP sequence number out of window: 0
      Syn-attack protection:             0
      User authentication errors:        0
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination:  203.0.113.1/24, Local: 203.0.113.2, Broadcast: 2.2.2.255
```

show interfaces interval (Channelized OC12)

```
user@host> show interfaces interval t3-0/3/0:0
Physical interface: t3-0/3/0:0, SNMP ifIndex: 23
  17:43-current:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  17:28-17:43:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  17:13-17:28:
```

```
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  16:58-17:13:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  16:43-16:58:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
...
Interval Total:
    LCV: 230, PCV: 1145859, CCV: 455470, LES: 0, PES: 230, PSES: 230,
    CES: 230, CSES: 230, SEFS: 230, UAS: 238
```

show interfaces interval (E3)

```
user@host> show interfaces interval e3-0/3/0
Physical interface: e3-0/3/0, SNMP ifIndex: 23
  17:43-current:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  17:28-17:43:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  17:13-17:28:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  16:58-17:13:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
    SEFS: 0, UAS: 0
  16:43-16:58:
    LCV: 0, PCV: 0, CCV: 0, LES: 0, PES: 0, PSES: 0, CES: 0, CSES: 0,
....
Interval Total:
    LCV: 230, PCV: 1145859, CCV: 455470, LES: 0, PES: 230, PSES: 230,
    CES: 230, CSES: 230, SEFS: 230, UAS: 238
```

show interfaces interval (SONET/SDH) (SRX devices)

```
user@host> show interfaces interval so-0/1/0
Physical interface: so-0/1/0, SNMP ifIndex: 19
  20:02-current:
    ES-S: 0, SES-S: 0, SEFS-S: 0, ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0,
    SES-P: 0, UAS-P: 0
  19:47-20:02:
    ES-S: 267, SES-S: 267, SEFS-S: 267, ES-L: 267, SES-L: 267, UAS-L: 267,
    ES-P: 267, SES-P: 267, UAS-P: 267
  19:32-19:47:
    ES-S: 56, SES-S: 56, SEFS-S: 56, ES-L: 56, SES-L: 56, UAS-L: 46, ES-P: 56,
    SES-P: 56, UAS-P: 46
  19:17-19:32:
    ES-S: 0, SES-S: 0, SEFS-S: 0, ES-L: 0, SES-L: 0, UAS-L: 0, ES-P: 0,
    SES-P: 0, UAS-P: 0
  19:02-19:17:
.....
```

show interfaces load-balancing (SRX devices)

```
user@host> show interfaces load-balancing
Interface  State            Last change  Member count
ams0       Up               1d 00:50     2
ams1       Up               00:00:59     2
```


show interfaces load-balancing detail (SRX devices)

```
user@host>show interfaces load-balancing detail
Load-balancing interfaces detail
Interface         : ams0
  State           : Up
  Last change     : 1d 00:51
  Member count    : 2
  Members         :
      Interface     Weight   State
      mams-2/0/0     10        Active
      mams-2/1/0     10        Active
```

show interfaces mac-database (All MAC Addresses on a Port SRX devices)

```
user@host> show interfaces mac-database xe-0/3/3
Physical interface: xe-0/3/3, Enabled, Physical link is Up
  Interface index: 372, SNMP ifIndex: 788
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, Loopback:
None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

  Logical interface xe-0/3/3.0 (Index 364) (SNMP ifIndex 829)
    Flags: SNMP-Traps 0x4004000 Encapsulation: ENET2
  MAC address        Input frames     Input bytes  Output frames   Output bytes
  00:00:00:00:00:00             1              56              0              0
  00:00:c0:01:01:02       7023810       323095260              0              0
  00:00:c0:01:01:03       7023810       323095260              0              0
  00:00:c0:01:01:04       7023810       323095260              0              0
  00:00:c0:01:01:05       7023810       323095260              0              0
  00:00:c0:01:01:06       7023810       323095260              0              0
  00:00:c0:01:01:07       7023810       323095260              0              0
  00:00:c0:01:01:08       7023809       323095214              0              0
  00:00:c0:01:01:09       7023809       323095214              0              0
  00:00:c0:01:01:0a       7023809       323095214              0              0
  00:00:c0:01:01:0b       7023809       323095214              0              0
  00:00:c8:01:01:02      30424784      1399540064       37448598     1722635508
  00:00:c8:01:01:03      30424784      1399540064       37448598     1722635508
  00:00:c8:01:01:04      30424716      1399536936       37448523     1722632058
  00:00:c8:01:01:05      30424789      1399540294       37448598     1722635508
  00:00:c8:01:01:06      30424788      1399540248       37448597     1722635462
  00:00:c8:01:01:07      30424783      1399540018       37448597     1722635462
  00:00:c8:01:01:08      30424783      1399540018       37448596     1722635416
  00:00:c8:01:01:09       8836796       406492616        8836795      406492570
  00:00:c8:01:01:0a      30424712      1399536752       37448521     1722631966
  00:00:c8:01:01:0b      30424715      1399536890       37448523     1722632058
  Number of MAC addresses : 21
```

show interfaces mac-database (All MAC Addresses on a Service SRX devices)

```
user@host> show interfaces mac-database xe-0/3/3
Logical interface xe-0/3/3.0 (Index 364) (SNMP ifIndex 829)
    Flags: SNMP-Traps 0x4004000 Encapsulation: ENET2
  MAC address        Input frames     Input bytes  Output frames   Output bytes
  00:00:00:00:00:00             1              56              0              0
```

```
00:00:c0:01:01:02       7023810      323095260           0            0
00:00:c0:01:01:03       7023810      323095260           0            0
00:00:c0:01:01:04       7023810      323095260           0            0
00:00:c0:01:01:05       7023810      323095260           0            0
00:00:c0:01:01:06       7023810      323095260           0            0
00:00:c0:01:01:07       7023810      323095260           0            0
00:00:c0:01:01:08       7023809      323095214           0            0
00:00:c0:01:01:09       7023809      323095214           0            0
00:00:c0:01:01:0a       7023809      323095214           0            0
00:00:c0:01:01:0b       7023809      323095214           0            0
00:00:c8:01:01:02      31016568     1426762128    38040381   1749857526
00:00:c8:01:01:03      31016568     1426762128    38040382   1749857572
00:00:c8:01:01:04      31016499     1426758954    38040306   1749854076
00:00:c8:01:01:05      31016573     1426762358    38040381   1749857526
00:00:c8:01:01:06      31016573     1426762358    38040381   1749857526
00:00:c8:01:01:07      31016567     1426762082    38040380   1749857480
00:00:c8:01:01:08      31016567     1426762082    38040379   1749857434
00:00:c8:01:01:09       9428580      433714680     9428580    433714680
00:00:c8:01:01:0a      31016496     1426758816    38040304   1749853984
00:00:c8:01:01:0b      31016498     1426758908    38040307   1749854122
```

show interfaces mac-database mac-address

user@host> **show interfaces mac-database xe-0/3/3 mac-address (SRX devices) 00:00:c8:01:01:09**

```
Physical interface: xe-0/3/3, Enabled, Physical link is Up
  Interface index: 372, SNMP ifIndex: 788
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, Loopback:
None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

  Logical interface xe-0/3/3.0 (Index 364) (SNMP ifIndex 829)
    Flags: SNMP-Traps 0x4004000 Encapsulation: ENET2
  MAC address: 00:00:c8:01:01:09, Type: Configured,
    Input bytes      : 202324652
    Output bytes     : 202324560
    Input frames     : 4398362
    Output frames    : 4398360
  Policer statistics:
  Policer type      Discarded frames    Discarded bytes
  Output aggregate           3992386          183649756
```

show interfaces mc-ae (SRX devices)

user@host> **show interfaces mc-ae ae0 unit 512**

```
  Member Links    : ae0
  Local Status    : active
  Peer Status     : active
  Logical Interface        : ae0.512
  Core Facing Interface : Label Ethernet Interface
  ICL-PL          : Label Ethernet Interface
```

show interfaces media (SONET/SDH)

The following example displays the output fields unique to the **show interfaces media** command for a SONET interface (with no level of output specified):


```
user@host> show interfaces media so-4/1/2
Physical interface: so-4/1/2, Enabled, Physical link is Up
  Interface index: 168, SNMP ifIndex: 495
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC48,
  Loopback: None, FCS: 16, Payload scrambler: Enabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1783 (00:00:00 ago), Output: 1786 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Not-configured
  CoS queues     : 8 supported
  Last flapped   : 2005-06-15 12:14:59 PDT (04:31:29 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
  SONET errors:
     BIP-B1: 121, BIP-B2: 916, REI-L: 0, BIP-B3: 137, REI-P: 16747, BIP-BIP2: 0
  Received path trace: routerb so-1/1/2
  Transmitted path trace: routera so-4/1/2
```

show interfaces policers (SRX devices)

```
user@host> show interfaces policers
Interface       Admin Link Proto Input Policer         Output Policer
ge-0/0/0        up    up
ge-0/0/0.0      up    up   inet
                           iso
gr-0/3/0        up    up
ip-0/3/0        up    up
mt-0/3/0        up    up
pd-0/3/0        up    up
pe-0/3/0        up    up
...
so-2/0/0        up    up
so-2/0/0.0      up    up   inet  so-2/0/0.0-in-policer so-2/0/0.0-out-policer
                           iso
so-2/1/0        up    down
...
```

show interfaces policers interface-name (SRX devices)

```
user@host> show interfaces policers so-2/1/0
Interface       Admin Link Proto Input Policer         Output Policer
so-2/1/0        up    down
so-2/1/0.0      up    down inet  so-2/1/0.0-in-policer so-2/1/0.0-out-policer
                           iso
                           inet6
```

show interfaces queue (SRX devices)

The following truncated example shows the CoS queue sizes for queues 0, 1, and 3. Queue 1 has a queue buffer size (guaranteed allocated memory) of 9192 bytes.


```
user@host> show interfaces queue
Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Interface index: 134, SNMP ifIndex: 509
Forwarding classes: 8 supported, 8 in use
Egress queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: class0
  Queued:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
  Transmitted:
    Packets              :                    0                     0 pps
    Bytes                :                    0                     0 bps
    Tail-dropped packets :                    0                     0 pps
    RL-dropped packets   :                    0                     0 pps
    RL-dropped bytes     :                    0                     0 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 Buffer Usage:
    Reserved buffer      :            118750000 bytes
  Queue-depth bytes      :
    Current              :                    0
..
..
Queue: 1, Forwarding classes: class1
..
..
 Queue Buffer Usage:
    Reserved buffer      :                 9192 bytes
  Queue-depth bytes      :
    Current              :                    0
..
..
Queue: 3, Forwarding classes: class3
  Queued:
..
..
Queue Buffer Usage:
    Reserved buffer      :              6250000 bytes
  Queue-depth bytes      :
    Current              :                    0
..
..
```

show interfaces redundancy (SRX devices)

```
user@host> show interfaces redundancy
Interface  State         Last change  Primary    Secondary  Current status
rsp0       Not present                sp-1/0/0   sp-0/2/0   both down
rsp1       On secondary  1d 23:56     sp-1/2/0   sp-0/3/0   primary down
rsp2       On primary    10:10:27     sp-1/3/0   sp-0/2/0   secondary down
rlsq0      On primary    00:06:24     lsq-0/3/0  lsq-1/0/0  both up
```


show interfaces redundancy (Aggregated Ethernet SRX devices)

```
user@host> show interfaces redundancy
Interface   State           Last change  Primary      Secondary    Current status
rlsq0       On secondary     00:56:12     lsq-4/0/0    lsq-3/0/0    both up

ae0
ae1
ae2
ae3
ae4
```

show interfaces redundancy detail (SRX devices)

```
user@host> show interfaces redundancy detail
Interface         : rlsq0
  State           : On primary
  Last change     : 00:45:47
  Primary         : lsq-0/2/0
  Secondary       : lsq-1/2/0
  Current status  : both up
  Mode            : hot-standby

Interface         : rlsq0:0
  State           : On primary
  Last change     : 00:45:46
  Primary         : lsq-0/2/0:0
  Secondary       : lsq-1/2/0:0
  Current status  : both up
  Mode            : warm-standby
```

show interfaces routing brief (SRX devices)

```
user@host> show interfaces routing brief
Interface         State Addresses
so-5/0/3.0        Down  ISO   enabled
so-5/0/2.0        Up    MPLS  enabled
                        ISO   enabled
                        INET  192.168.2.120
                        INET  enabled
so-5/0/1.0        Up    MPLS  enabled
                        ISO   enabled
                        INET  192.168.2.130
                        INET  enabled
at-1/0/0.3        Up    CCC   enabled
at-1/0/0.2        Up    CCC   enabled
at-1/0/0.0        Up    ISO   enabled
                        INET  192.168.90.10
                        INET  enabled
lo0.0             Up    ISO   47.0005.80ff.f800.0000.0108.0001.1921.6800.5061.00
                        ISO   enabled
                        INET  127.0.0.1
fxp1.0            Up
fxp0.0            Up    INET  192.168.6.90
```

show interfaces routing detail (SRX devices)

```
user@host> show interfaces routing detail
so-5/0/3.0
  Index: 15, Refcount: 2, State: Up <Broadcast PointToPoint Multicast> Change:<>
```

```
  Metric: 0, Up/down transitions: 0, Full-duplex
  Link layer: HDLC serial line Encapsulation: PPP Bandwidth: 155Mbps
  ISO address (null)
    State: <Broadcast PointToPoint Multicast> Change: <>
    Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
so-5/0/2.0
  Index: 14, Refcount: 7, State: <Up Broadcast PointToPoint Multicast> Change:<>

  Metric: 0, Up/down transitions: 0, Full-duplex
  Link layer: HDLC serial line Encapsulation: PPP Bandwidth: 155Mbps
  MPLS address (null)
    State: <Up Broadcast PointToPoint Multicast> Change: <>
    Preference: 0 (120 down), Metric: 0, MTU: 4458 bytes
  ISO address (null)
    State: <Up Broadcast PointToPoint Multicast> Change: <>
    Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
  INET address 192.168.2.120
    State: <Up Broadcast PointToPoint Multicast Localup> Change: <>
    Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
    Local address: 192.168.2.120
    Destination: 192.168.2.110/32
  INET address (null)
    State: <Up Broadcast PointToPoint Multicast> Change: <>
    Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
...
```

show interfaces routing-instance all (SRX devices)

```
user@host> show interfaces terse routing-instance all
Interface    Admin   Link   Proto    Local              Remote Instance
at-0/0/1     up      up     inet     10.0.0.1/24
ge-0/0/0.0   up      up     inet      192.168.4.28/24           sample-a
at-0/1/0.0   up      up     inet6     fe80::a:0:0:4/64          sample-b
so-0/0/0.0   up      up     inet     10.0.0.1/32
```

show interfaces snmp-index (SRX devices)

```
user@host> show interfaces snmp-index 33
Physical interface: so-2/1/1, Enabled, Physical link is Down
  Interface index: 149, SNMP ifIndex: 33
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC48,
  Loopback: None, FCS: 16, Payload scrambler: Enabled
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point SNMP-Traps 16384
  Link flags     : Keepalives
  CoS queues     : 8 supported
  Last flapped   : 2005-06-15 11:45:57 PDT (05:38:43 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : LOL, PLL, LOS
  SONET defects  : LOL, PLL, LOF, LOS, SEF, AIS-L, AIS-P
```

show interfaces source-class all (SRX devices)

```
user@host> show interfaces source-class all
Logical interface so-0/1/0.0
                                               Packets                Bytes
      Source class                 (packet-per-second)    (bits-per-second)
                             gold              1928095            161959980
```



```
                           (               889) (           597762)
                    bronze                   0                    0
                           (                 0) (                 0)
                    silver                   0                    0
                           (                 0) (                 0)
  Logical interface so-0/1/3.0
                                       Packets                Bytes
      Source class               (packet-per-second)    (bits-per-second)
                      gold                   0                    0
                           (                 0) (                 0)
                    bronze                   0                    0
                           (                 0) (                 0)
                    silver              116113              9753492
                           (               939) (           631616)
```

show interfaces statistics (Fast Ethernet SRX devices)

user@host> **show interfaces fe-1/3/1 statistics**

```
Physical interface: fe-1/3/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 1042
  Description: ford fe-1/3/1
  Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Current address: 00:90:69:93:04:dc, Hardware address: 00:90:69:93:04:dc
  Last flapped   : 2006-04-18 03:08:59 PDT (00:01:24 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0
  Active alarms  : None
  Active defects : None
  Logical interface fe-1/3/1.0 (Index 69) (SNMP ifIndex 50)
    Flags: SNMP-Traps Encapsulation: ENET2
    Protocol inet, MTU: 1500
      Flags: Is-Primary, DCU, SCU-in
                                       Packets                Bytes
      Destination class          (packet-per-second)    (bits-per-second)
                   silver1                   0                    0
                           (                 0) (                 0)
                   silver2                   0                    0
                           (                 0) (                 0)
                   silver3                   0                    0
                           (                 0) (                 0)
      Addresses, Flags: Is-Default Is-Preferred Is-Primary
        Destination: 10.27.245/24, Local: 10.27.245.2,
        Broadcast: 10.27.245.255
    Protocol iso, MTU: 1497
      Flags: Is-Primary
```

show interfaces switch-port (SRX devices)

user@host# **show interfaces ge-*slot*/0/0 switch-port *port-number***

```
Port 0, Physical link is Up
        Speed: 100mbps, Auto-negotiation: Enabled
   Statistics:                          Receive         Transmit
          Total bytes                    28437086         21792250
          Total packets                    409145            88008
```

```
            Unicast packets                      9987            83817
            Multicast packets                  145002                0
            Broadcast packets                  254156             4191
            Multiple collisions                    23               10
            FIFO/CRC/Align errors                   0                0
            MAC pause frames                        0                0
            Oversized frames                        0
            Runt frames                             0
            Jabber frames                           0
            Fragment frames                         0
            Discarded frames                        0
          Autonegotiation information:
            Negotiation status: Complete
            Link partner:
                Link mode: Full-duplex, Flow control: None, Remote fault: OK, Link
 partner Speed: 100 Mbps
            Local resolution:
                Flow control: None, Remote fault: Link OK
```

show interfaces transport pm (SRX devices)

```
user@host> show interfaces transport pm all current et-0/1/0
Physical interface: et-0/1/0, SNMP ifIndex 515
  14:45-current           Elapse time:900 Seconds
  Near End       Suspect Flag:False            Reason:None
    PM                 COUNT            THRESHOLD       TCA-ENABLED      TCA-RAISED

  OTU-BBE                0                800               No               No
  OTU-ES                 0                135               No               No
  OTU-SES                0                90                No               No
  OTU-UAS                427              90                No               No
  Far End        Suspect Flag:True             Reason:Unknown
    PM                 COUNT            THRESHOLD       TCA-ENABLED      TCA-RAISED

  OTU-BBE                0                800               No               No
  OTU-ES                 0                135               No               No
  OTU-SES                0                90                No               No
  OTU-UAS                0                90                No               No
  Near End       Suspect Flag:False            Reason:None
    PM                 COUNT            THRESHOLD       TCA-ENABLED      TCA-RAISED

  ODU-BBE                0                800               No               No
  ODU-ES                 0                135               No               No
  ODU-SES                0                90                No               No
  ODU-UAS                427              90                No               No
  Far End        Suspect Flag:True             Reason:Unknown
    PM                 COUNT            THRESHOLD       TCA-ENABLED      TCA-RAISED

  ODU-BBE                0                800               No               No
  ODU-ES                 0                135               No               No
  ODU-SES                0                90                No               No
  ODU-UAS                0                90                No               No
  FEC            Suspect Flag:False            Reason:None
    PM                 COUNT            THRESHOLD       TCA-ENABLED      TCA-RAISED

  FEC-CorrectedErr       2008544300       0                 NA               NA
  FEC-UncorrectedWords   0                0                 NA               NA
  BER            Suspect Flag:False            Reason:None
    PM                MIN       MAX       AVG       THRESHOLD      TCA-ENABLED
     TCA-RAISED
  BER                 3.6e-5    5.8e-5    3.6e-5     10.0e-3         No
```



```
       Yes
Physical interface: et-0/1/0, SNMP ifIndex 515
  14:45-current
  Suspect Flag:True             Reason:Object Disabled
    PM                           CURRENT   MIN       MAX      AVG       THRESHOLD
      TCA-ENABLED       TCA-RAISED
                                                                           (MIN)
(MAX)    (MIN)  (MAX)       (MIN)  (MAX)
  Lane chromatic dispersion        0        0         0         0         0
 0         NA     NA          NA      NA
  Lane differential group delay    0        0         0         0         0
 0         NA     NA          NA      NA
    q Value                          120      120       120       120       0
   0         NA     NA          NA      NA
  SNR                               28       28        29        28        0
 0         NA     NA          NA      NA
  Tx output power(0.01dBm)         -5000    -5000     -5000     -5000     -300
 -100      No     No          No      No
  Rx input power(0.01dBm)          -3642    -3665     -3626     -3637     -1800
 -500      No     No          No      No
  Module temperature(Celsius)       46       46        46        46        -5
 75        No     No          No      No
  Tx laser bias current(0.1mA)     0        0         0         0         0
 0         NA     NA          NA      NA
  Rx laser bias current(0.1mA)     1270     1270      1270      1270      0
 0         NA     NA          NA      NA
  Carrier frequency offset(MHz)    -186     -186      -186      -186      -5000
 5000      No     No          No      No
```

show security zones (SRX devices)

```
user@host> show security zones
Functional zone: management
   Description: This is the management zone.
   Policy configurable: No
   Interfaces bound: 1
   Interfaces:
     ge-0/0/0.0
Security zone: Host
   Description: This is the host zone.
   Send reset for non-SYN session TCP packets: Off
   Policy configurable: Yes
   Interfaces bound: 1
   Interfaces:
     fxp0.0
Security zone: abc
   Description: This is the abc zone.
   Send reset for non-SYN session TCP packets: Off
   Policy configurable: Yes
   Interfaces bound: 1
   Interfaces:
     ge-0/0/1.0
Security zone: def
   Description: This is the def zone.
   Send reset for non-SYN session TCP packets: Off
   Policy configurable: Yes
   Interfaces bound: 1
   Interfaces:
     ge-0/0/2.0
```


show interfaces (Serial)

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.

Description

Display status information about serial interfaces, including RS-232, RS-422/449, EIA-530, X.21, and V.35.

Options

interface-type—On M Series and T Series routers, the interface type is **se-*fpc/pic/port***.

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.

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

List of Sample Output

show interfaces (Serial, EIA-530) on page 858
show interfaces brief (Serial, EIA-530) on page 858
show interfaces detail (Serial, EIA-530) on page 859
show interfaces extensive (Serial, EIA-530) on page 859
show interfaces (Serial, V.35) on page 860
show interfaces brief (Serial, V.35) on page 861
show interfaces detail (Serial, V.35) on page 861
show interfaces extensive (Serial, V.35) on page 862
show interfaces statistics detail (RS 449) on page 863

Output Fields

Table 67 on page 852 lists the output fields for the **show interfaces** (Serial) command. Output fields are listed in the approximate order in which they appear.

Table 67: show interfaces (Serial) Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under “Common Output Fields Description” on page 706.	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 being used on the physical interface.	All levels
MTU	Maximum transmission unit (MTU) size on the physical interface.	All levels
Maximum speed	Maximum speed. The nonconfigurable value is 16,384 kbps.	**detail extensive** none
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under “Common Output Fields Description” on page 706.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 706.	All levels
Link flags	Information about the link. Possible values are described in the “Link Flags” section under “Common Output Fields Description” on page 706.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail extensive**
Keepalive settings	(PPP and HDLC) Configured settings for keepalive packets. • **Interval** ***seconds***—Time between successive keepalive requests. The range of values, in seconds, is 10 to 32,767. The default value is 10. • **Up-count** ***number***—Number of keepalive packets a destination must receive to change a link's status from down to up. The range of values is 1 to 255. The default value is 1. • **Down-count** ***number***—Number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 to 255. The default value is 3.	All levels
Keepalive	(PPP and HDLC) Information about keepalive packets. • **Input:** ***number*** **(*hh:mm:ss* ago)**—Number of keepalive packets received by PPP and the time since the last keepalive packet was received. • **Output:** ***number*** **(*hh:mm:ss* ago)**—Number of keepalive packets sent by PPP and the time since the last keepalive packet was sent.	**brief** none

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
Keepalive statistics	(PPP and HDLC) Information about keepalive packets. • **Input:** *number* **(last seen** *hh:mm:ss* **ago)**—Number of keepalive packets received by PPP and the time since the last keepalive packet was received. • **Output:** *number* **(last seen** *hh:mm:ss* **ago)**—Number of keepalive packets sent by PPP and the time since the last keepalive packet was sent.	**detail extensive**
LCP state	(PPP) Link Control Protocol state. • **Conf-ack-received**—Acknowledgement was received. • **Conf-ack-sent**—Acknowledgement was sent. • **Conf-req-sent**—Request was sent. • **Down**—LCP negotiation is incomplete (not yet completed or has failed). • **Not-configured**—LCP is not configured on the interface. • **Opened**—LCP negotiation is successful.	**detail extensive** none
NCP state	(PPP) Network Control Protocol state. • **Conf-ack-received**—Acknowledgement was received. • **Conf-ack-sent**—Acknowledgement was sent. • **Conf-req-sent**—Request was sent. • **Down**—NCP negotiation is incomplete (not yet completed or has failed). • **Not-configured**—NCP is not configured on the interface. • **Opened**—NCP negotiation is successful.	**detail extensive** none
CHAP state	(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction. • **Chap-Chal-received**—Challenge was received but response not yet sent. • **Chap-Chal-sent**—Challenge was sent. • **Chap-Resp-received**—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication.) • **Chap-Resp-sent**—Response was sent for the challenge received. • **Closed**—CHAP authentication is incomplete. • **Failure**—CHAP authentication failed. • **Not-configured**—CHAP is not configured on the interface. • **Success**—CHAP authentication was successful.	**detail extensive** none
CoS queues	Number of CoS queues configured.	**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: 2002-04-26 10:52:40 PDT (04:33:20 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

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
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.	**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.	**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 PIC 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 exceeds the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**
Egress queues supported	Total number of egress queues supported on the specified interface. Displayed with the **statistics** option.	**detail extensive**
Egress queues in use	Total number of egress queues in use on the specified interface. Displayed with the **statistics** option.	**detail extensive**

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
Queue counters	CoS queue number and its associated user-configured forwarding class name. Displayed with the **statistics** option. • **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**

Serial media information	Information about the physical media:
	• **Line protocol**—**eia530**, **eia530a**, **rs232**, **rs449**, **v.35**, or **x.21**..
	• **Resync history**—Information about resynchronization events:
	  ◦ **Sync loss count**—Number of times the synchronization was lost.
	• **Data signal**—(X.21 and V.35) Information about the data signal:
	  ◦ **Rx Clock**—Receive clock status: OK (DTE is receiving the receive clock signal) or Not detected (receive clock signal is not being received).
	• **Control signals**—Information about modem control signals:
	  ◦ **Local mode:DCE** (data communication equipment) or **DTE** (data terminal equipment)
	  ◦ **To DCE**—Control signals that the Serial PIC sent to the DCE: DTR (Data Terminal Ready:**up** or **down**) or RTS (Request To Send: **up** or **down**.)
	  ◦ **From DC**—Control signals that the Serial PIC received from the DCE: CTS (Clear To Send: **up** or **down**), DCD (Data Carrier Detect: **up** or **down**), **DSR** (Data Set Ready: **up** or **down**), or TM (Test Mode: **up** or **down**).
	• **Clocking mode**—Clocking used for the transmit clock:
	  ◦ **dte**—Transmit clock is generated by DTE.
	  ◦ **dce**—Transmit clock is generated by the DCE and is looped back as the transmit clock.
	  ◦ **loop-timed**—Receive clock from the DCE is looped back as the transmit clock.
	• **Clock rate**—Rate, in megahertz (MHz), at which the clock is configured.
	• **Loopback**—Configured loopback mode for the interface: **dce-remote**, **dce-local**, **liu**, **local**, or **none**.
	• **Tx clock**—Clocking phase of the transmit clock: **invert** (transmit clock polarity is inverted) or **non-invert** (transmit clock polarity is not inverted).
	• **Line encoding**—Type of line encoding used: **nrz** (nonreturn to zero) or **nrzi** (return to zero inverted).
		detail extensive

Packet Forwarding Engine configuration	Information about the configuration of the Packet Forwarding Engine: • **Destination slot**—FPC slot number. • **PLP byte**—Packet Level Protocol byte.	**extensive**

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
CoS information	Information about the CoS queue for the physical interface: • **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	Logical interface index number, which reflects its initialization sequence.	**detail extensive** none
SNMP ifIndex	Logical interface SNMP interface index number.	**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” on page 706.	All levels
Encapsulation	Encapsulation on the logical interface.	All levels
protocol-family	Protocol family configured on the logical interface. If the protocol is **inet**, the source and destination address are also displayed.	**brief**
Protocol	Protocol family configured on the logical interface, such as iso, inet6, mpls.	**detail extensive** none
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 protocol family flags. Possible values are described in the “Family Flags” section under “Common Output Fields Description” on page 706.	**detail extensive**

Table 67: show interfaces (Serial) Output Fields (continued)

Field Name	Field Description	Level of Output
Addresses, Flags	Information about the address flags. Possible values are described in the "Addresses Flags" section under "Common Output Fields Description" on page 706.	**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 (Serial, EIA-530)

```
user@host> show interfaces se-5/0/1
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 32 (00:00:10 ago), Output: 31 (00:00:07 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 15:10:18 PDT (00:05:22 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3
```

show interfaces brief (Serial, EIA-530)

```
user@host> show interfaces se-5/0/1 brief
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Type: Serial, Link-level type: PPP, MTU: 1504
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 235 (00:00:10 ago), Output: 234 (00:00:00 ago)

  Logical interface se-5/0/1.0
```



```
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    inet  12.0.0.1/30
```

show interfaces detail (Serial, EIA-530)

```
user@host> show interfaces se-5/0/1 detail
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41, Generation: 25
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 37 (last seen 00:00:06 ago)
    Output: 35 (last sent 00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 15:10:18 PDT (00:06:02 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                  928                   40 bps
   Output bytes  :                 1023                   48 bps
   Input  packets:                   76                    0 pps
   Output packets:                   77                    0 pps
  Serial media information:
    Line protocol: eia530
    Resync history:
      Sync loss count: 0
    Data signal:
      Rx Clock: OK
    Control signals:
      Local mode: DTE
      To DCE: DTR: up, RTS: up
      From DCE: CTS: up, DCD: up, DSR: up
    Clocking mode: loop-timed
    Clock rate: 8.0 MHz
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz

  Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45) (Generation 9)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 1500, Generation: 15, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3,
        Generation: 23
```

show interfaces extensive (Serial, EIA-530)

```
user@host> show interfaces se-5/0/1 extensive
Physical interface: se-5/0/1, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 41, Generation: 25
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running
```

```
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : Keepalives
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 40 (last seen 00:00:00 ago)
    Output: 37 (last sent 00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 15:10:18 PDT (00:06:28 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 988                   40 bps
   Output bytes  :                1088                   48 bps
   Input  packets:                  81                    0 pps
   Output packets:                  82                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 2, Runts: 0, Giants: 0,
    Policed discards: 0, Resource errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, MTU errors: 0,
    Resource errors: 0
  Serial media information:
    Line protocol: eia530
    Resync history:
      Sync loss count: 0
    Data signal:
      Rx Clock: OK
    Control signals:
      Local mode: DTE
      To DCE: DTR: up, RTS: up
      From DCE: CTS: up, DCD: up, DSR: up
    Clocking mode: loop-timed
    Clock rate: 8.0 MHz
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz
  Packet Forwarding Engine configuration:
    Destination slot: 5, PLP byte: 1 (0x00)
  CoS information:
    CoS transmit queue       Bandwidth          Buffer  Priority   Limit
                          %         bps     %     usec
    0 best-effort        95    15564800    95        0        low    none
    3 network-control     5      819200     5        0        low    none

  Logical interface se-5/0/1.0 (Index 71) (SNMP ifIndex 45) (Generation 9)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
    Protocol inet, MTU: 1500, Generation: 15, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 12.0.0.0/30, Local: 12.0.0.1, Broadcast: 12.0.0.3,
        Generation: 23
```

show interfaces (Serial, V.35)

```
user@host> show interfaces se-5/0/0
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Interface index: 150, SNMP ifIndex: 39
```



```
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags     : Loose-NCP
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 14:51:27 PDT (01:02:23 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27)
    Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
    Encapsulation: PPP
    Protocol inet, MTU: 1500
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3
```

show interfaces brief (Serial, V.35)

```
user@host> show interfaces se-5/0/0 brief
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Type: Serial, Link-level type: PPP, MTU: 1504
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags     : Loose-NCP
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 0 (never)

  Logical interface se-5/0/0.0
    Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
    Encapsulation: PPP
    inet  13.0.0.2/30
```

show interfaces detail (Serial, V.35)

```
user@host> show interfaces se-5/0/0 detail
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Interface index: 150, SNMP ifIndex: 39, Generation: 31
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags     : Loose-NCP
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 14:51:27 PDT (01:03:15 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
  Serial media information:
    Line protocol: v.35
    Resync history:
      Sync loss count: 0
    Data signal:
      Rx Clock: Not Detected
    Control signals:
      Local mode: DCE
      To DTE: CTS: down, DCD: down, DSR: up
      From DTE: DTR: down, RTS: down
    DCE loopback override: Off
    Clocking mode: internal
    Clock rate: 38.4 KHz
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz

  Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27) (Generation 12)
    Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
    Encapsulation: PPP
    Protocol inet, MTU: 1500, Generation: 17, Route table: 0
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3,
        Generation: 23
```

show interfaces extensive (Serial, V.35)

```
user@host> show interfaces se-5/0/0 extensive
Physical interface: se-5/0/0, Enabled, Physical link is Down
  Interface index: 150, SNMP ifIndex: 39, Generation: 31
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 16384kbps
  Device flags   : Present Running Down
  Interface flags: Hardware-Down Point-To-Point Internal: 0x4000
  Link flags     : Loose-NCP
  Hold-times     : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 0 (last seen: never)
    Output: 0 (last sent: never)
  LCP state: Down
  NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
  mpls: Not-configured
  CHAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2006-04-26 14:51:27 PDT (01:04:17 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
  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
    Serial media information:
      Line protocol: v.35
      Resync history:
        Sync loss count: 0
      Data signal:
        Rx Clock: Not Detected
      Control signals:
        Local mode: DCE
        To DTE: CTS: down, DCD: down, DSR: up
        From DTE: DTR: down, RTS: down
      DCE loopback override: Off
      Clocking mode: internal
      Clock rate: 38.4 KHz
      Loopback: none
      Tx clock: non-invert
      Line encoding: nrz
    Packet Forwarding Engine configuration:
      Destination slot: 5, PLP byte: 1 (0x00)
    CoS information:
      CoS transmit queue          Bandwidth          Buffer      Priority   Limit
                        %               bps     %    usec
      0 best-effort        95        15564800    95       0           low     none
      3 network-control     5          819200     5       0           low     none

    Logical interface se-5/0/0.0 (Index 73) (SNMP ifIndex 27) (Generation 12)
      Flags: Hardware-Down Device-Down Point-To-Point SNMP-Traps
      Encapsulation: PPP
      Protocol inet, MTU: 1500, Generation: 17, Route table: 0
        Flags: Protocol-Down
        Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
          Destination: 13.0.0.0/30, Local: 13.0.0.2, Broadcast: 13.0.0.3,
          Generation: 23
```

show interfaces statistics detail (RS 449)

```
user@host> show interfaces se-6/0/0 statistics detail
 Interface index: 149, SNMP ifIndex: 59, Generation: 150
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 8mbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x4000
  Link flags     : No-Keepalives Loose-NCP
  Hold-times     : Up 0 ms, Down 0 ms
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  PAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2007-11-28 19:38:36 PST (00:14:06 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                  744                   0 bps
   Output bytes  :                 5978                   0 bps
   Input  packets:                   33                   0 pps
   Output packets:                  129                   0 pps
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
 0,
     Resource errors: 0
```

```
 Output errors:
   Carrier transitions: 13, Errors: 0, Drops: 0, MTU errors: 0, Resource errors:
0
 Egress queues: 8 supported, 5 in use
 Queue counters:       Queued packets  Transmitted packets      Dropped packets

   0 best-effort                   24                   24                    0

   1 expedited-fo                   0                    0                    0

   2 bulk                           0                    0                    0

   3 assured-forw                 105                  105                    0

   4 voip                           0                    0                    0

 Serial media information:
   Line protocol: rs449
   Resync history:
     Sync loss count: 0
   Data signal:
     Rx Clock: OK
   Control signals:
     Local mode: DTE
     To DCE: DTR: up, RTS: up
     From DCE: CTS: up, DCD: up, DSR: up
   Clocking mode: internal
   Loopback: none
   Tx clock: non-invert
   Line encoding: nrz

 Logical interface se-6/0/0.0 (Index 75) (SNMP ifIndex 69) (Generation 141)
   Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
   Protocol inet, MTU: 256, Generation: 145, Route table: 0
     Flags: None
     Addresses, Flags: Is-Preferred Is-Primary
       Destination: 11.11.11/24, Local: 11.11.11.2, Broadcast: 11.11.11.255,
       Generation: 157
```


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.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX 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.

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 381
- *Installing a Transceiver*
- *Installing a Transceiver in a QFX Series Device*
- *Removing a Transceiver*
- *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 872
show interfaces diagnostics optics xe-0/1/0 (SFP+ Transceiver) on page 873
show interfaces diagnostics optics xe-0/1/0 (XFP Transceiver) on page 874
show interfaces diagnostics optics et-3/0/0 (QSFP+ Transceiver) on page 875
show interfaces diagnostics optics et-4/1/0 (CFP Transceiver) on page 876

Output Fields

Table 68 on page 866 lists the output fields for the **show interfaces diagnostics optics** command. Output fields are listed in the approximate order in which they appear.

Table 68: show interfaces diagnostics optics Output Fields

Field Name	Field Description
Physical interface	Displays the name of the physical interface.
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 68: 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 68: 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 68: 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 68: 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 68: 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 68: 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 extensive

Syntax show interfaces extensive

Release Information Command introduced before Junos OS Release 7.4.
Command introduced in Junos OS Release 12.1x48 for PTX Series Packet Transport Routers.
Command introduced in Junos OS Release 17.2 for PT1000 and PTX10008 Packet Transport Routers.

Description Display extensive information about all interfaces configured on the router.

NOTE:

- At some times, the cumulative byte counters displayed with the **show interfaces extensive** command on the 10-Gigabit Ethernet MPC with SFP+ is not always increasing and cumulative and does not give the correct results. There is a time lag in collecting these statistics, during which the display might decrease or go from a nonzero number to zero. Eventually, the counter will display the correct result.
- When the **show interfaces extensive** command is executed on a router with an MPC or a T4000 Type 5 FPC, the **Input packet rejects** counter of the **Filter statistics** field also displays statistics related to the following packet errors:
  - Invalid VLAN range
  - Tagged packet received on an untagged interface
- When the **show interfaces extensive** command is executed on an interface that is configured on a T4000 Type 5 FPC, the **IPv6 transit statistics** field displays:
  - Total statistics (sum of transit and local statistics) at the physical interface level
  - Transit statistics at the logical interface level
- When the **show interfaces extensive** command is executed on an aggregate interface in a T1600 Core Router, the IPv6 **Input bytes** is displayed for an aggregate interface. However, the IPv6 **Input bytes** is always zero on a member link of an aggregated bundle even when there is IPv6 transit traffic on the member link. This is because the logical interface index of the aggregate logical interface is updated but not the logical interface of the member links in the channel lookup table.
- The **Output packets** field under the **Traffic statistics** section in the output of the **show interfaces extensive** command includes both IPv4 and IPv6 packets. For example, in a scenario in which both IPv4 and IPv6 packets are being mirrored on the same interface and when you deactivate an IPv4 port-mirroring instance on the chassis, the output of the **show interfaces extensive** command shows a value in the Output packets field of the Traffic statistics section, which is the value of IPv6 packets that are mirrored and not of the IPv4 packets. This behavior is expected.
- For IQ2 PIC interfaces, the output of the **show interfaces extensive** command displays byte statistics that includes Layer 2 headers.
- If there are active OTN defects when an ISSU is performed, and the defect persists after the upgrade completes, the OTN alarm count is incremented by 1. For example, if an OTN alarm is active with a count of 1 and the defect remains after ISSU, the alarm count is incremented to 2. This behavior is expected.

Options This command has no options.

Required Privilege Level view

List of Sample Output

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show interfaces extensive (MX2010 Router with MPC6E and 10-Gigabit Ethernet Interface) on page 917
show interfaces extensive (T4000 Routers with Type 5 FPCs) on page 919
show interfaces extensive (Aggregated Ethernet) on page 920

Output Fields For more information, see the output fields table for the particular interface type in which you are interested. For information about destination class and source class statistics, see the “Destination Class Field” section and the “Source Class Field” section under “Common Output Fields Description” on page 706. For sample output for specific interfaces, see the other topics in this collection.

Sample Output

show interfaces extensive (Circuit Emulation)

If a Circuit Emulation (CE) PIC is configured for SAToP pseudowire, then pseudowire statistics are displayed in the CE information section of the **show interface extensive** output. If SAToP pseudowire is not configured on the CE PIC, then all CE information counters display 0 (zero).

```
user@host> show interface t1-0/0/0 extensive
Physical interface :t1-0/0/0, Enabled, Physical Link : Up
        Interface index:61441
```



```
Speed : 1.54 Mbps, Loopback: Disabled
Operational state : Enabled,    Encapsulation : Trans
Encoding : b8zs,        Framing    : unframe,   Build-out : 0-30
Inversion    : enable,  Clock source : master
Description :
Traffic statistics:
T1 media:       Seconds
ES              1643
SES             1643

CE Info         Packets                 Bytes
CE Rx     :     2395529                 306627712
CE Tx     :     2396259                 306721152
CE Rx Drop:     0                       0
CE Tx Drop:     0                       0

CE Overrun  Events: 0
CE Underrun Events: 0
```

Sample Output

show interfaces extensive (Fast Ethernet)

```
user@host> show interfaces fe-0/2/1 extensive
Physical interface: fe-0/2/0, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 23, Generation: 130
  Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2006-04-16 23:00:41 PDT (02:08:05 ago)
  Statistics last cleared: 2006-04-16 21:42:00 PDT (03:26:46 ago)
  Traffic statistics:
   Input  bytes  :                17539                 152 bps
   Output bytes  :                92968                 224 bps
   Input  packets:                  348                   0 pps
   Output packets:                 1349                   0 pps
  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: 3, 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: 4 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                   66                   66                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                1283                 1283                    0

  Active alarms  : None
  Active defects : None
```

```
MAC statistics:                      Receive         Transmit
  Total octets                         24721           105982
  Total packets                          348             1349
  Unicast packets                        347              430
  Broadcast packets                        1               37
  Multicast packets                        0              882
  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
Filter statistics:
  Input packet count                     348
  Input packet rejects                     0
  Input DA rejects                         0
  Input SA rejects                         0
  Output packet count                                    1349
  Output packet pad count                                   0
  Output packet error count                                 0
  CAM destination filters: 3, CAM source filters: 0
Autonegotiation information:
  Negotiation status: Complete
  Link partner:
      Link mode: Full-duplex, Flow control: None, Remote fault: OK
Packet Forwarding Engine configuration:
  Destination slot: 0
CoS information:
  CoS transmit queue               Bandwidth      Buffer    Priority    Limit

                            %            bps   %   usec
  0 best-effort            95       95000000  95    0           low    none
  3 network-control         5        5000000   5    0           low    none
Logical interface fe-0/2/0.0 (Index 66) (SNMP ifIndex 46) (Generation 133)
  Flags: SNMP-Traps Encapsulation: ENET2
  Protocol inet, MTU: 1500, Generation: 142, Route table: 0
    Flags: DCU, SCU-out
                                          Packets                Bytes
    Destination class             (packet-per-second)    (bits-per-second)
                      silv1_new                   0                    0
                                (                 0) (                 0)
                      silv2_new                   0                    0
                                (                 0) (                 0)
                      silv_misc                   0                    0
                                (                 0) (                 0)
                        silver0                   0                    0
                                (                 0) (                 0)
                        silver2                   0                    0
                                (                 0) (                 0)
                        silver3                   0                    0
                                (                 0) (                 0)
                        silver4                   0                    0
                                (                 0) (                 0)
                        silver5                   0                    0
                                (                 0) (                 0)
                        silver6                   0                    0
                                (                 0) (                 0)
                        silver7                   0                    0
```

```
                              (                   0) (                0)
                      silver9                     0                   0
                              (                   0) (                0)
                                            Packets               Bytes
      Source class                 (packet-per-second)    (bits-per-second)
                        gold1                     0                   0
                              (                   0) (                0)
                        gold2                 16600             1062400
                              (                   0) (                0)
                        gold3                     0                   0
                              (                   0) (                0)
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.220.24/30, Local: 192.168.220.26, Broadcast:
192.168.220.27,         Generation: 150
```

show interfaces extensive (Gigabit Ethernet)

```
user@host> show interfaces ge-5/0/0.0 extensive

  Logical interface ge-5/0/0.0 (Index 71) (SNMP ifIndex 1930) (Generation 139)
    Flags: SNMP-Traps 0x4000 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                     0
     Output bytes  :                    42
     Input  packets:                     0
     Output packets:                     1
    Local statistics:
     Input  bytes  :                     0
     Output bytes  :                    42
     Input  packets:                     0
     Output packets:                     1
    Transit statistics:
     Input  bytes  :                     0                    0 bps
     Output bytes  :                     0                    0 bps
     Input  packets:                     0                    0 pps
     Output packets:                     0                    0 pps
    Output Filters: f-any
    Protocol inet, MTU: 1500, Generation: 155, Route table: 0
      Output Filters: f-inet,
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 192.168.220.24/30, Local: 192.168.220.26, Broadcast:
192.168.220.27,
        Generation: 170
    Protocol multiservice, MTU: Unlimited, Generation: 156, Route table: 0
      Flags: Is-Primary
      Policer: Input: __default_arp_policer__
```

show interfaces extensive (10-Gigabit Ethernet)

```
user@host> show interfaces xe-2/1/0 extensive

Physical interface: xe-2/1/0, Enabled, Physical link is Up
  Interface index: 258, SNMP ifIndex: 762, Generation: 2046
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
 None, Loopback: None, Source filtering: Disabled,
  Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
```



```
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2011-12-17 00:19:02 PST (07:36:37 ago)
  Statistics last cleared: 2011-12-17 07:55:24 PST (00:00:15 ago)
  Traffic statistics:
   Input  bytes  :              110000                    0 bps
   Output bytes  :                   0                    0 bps
   Input  packets:                1000                    0 pps
   Output packets:                   0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :             110000
    Output bytes  :                  0
    Input  packets:               1000
    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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0
  MAC statistics:                      Receive         Transmit
    Total octets                        128000                0
    Total packets                         1000                0
    Unicast packets                       1000                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
  Filter statistics:
    Input packet count                    1000
    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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 2
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %              usec
    0 best-effort            95     9500000000    95                 0       low
none
    3 network-control         5      500000000     5                 0       low
none
  Interface transmit statistics: Disabled

  Logical interface xe-2/1/0.0 (Index 83) (SNMP ifIndex 1677) (Generation 10082)

    Flags: SNMP-Traps 0x4004000 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :              110000
     Output bytes  :                   0
     Input  packets:                1000
     Output packets:                   0
     IPv6 transit statistics:
      Input  bytes  :              55000
      Output bytes  :                  0
      Input  packets:                500
      Output packets:                  0
    Local statistics:
     Input  bytes  :               55000
     Output bytes  :                   0
     Input  packets:                 500
     Output packets:                   0
    Transit statistics:
     Input  bytes  :               55000                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                 500                    0 pps
     Output packets:                   0                    0 pps
     IPv6 transit statistics:
      Input  bytes  :              55000
      Output bytes  :                  0
      Input  packets:                500
      Output packets:                  0
    Protocol inet6, MTU: 1500, Generation: 23739, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 2001:0db8:0a0b:12f0:0000:0000:0000/112, Local:
2001:0db8:0a0b:12f0:0000:0000:0000:0001
    Generation: 506
      Addresses, Flags: Is-Preferred
        Destination: 0db8::/64, Local: 0db8::21d:b5ff:fef8:6deb
    Protocol multiservice, MTU: Unlimited, Generation: 508
    Generation: 23740, Route table: 0
      Policer: Input: __default_arp_policer__
```

show interfaces extensive (IQ2 and IQ2E)

```
user@host> show interfaces ge-3/2/2 extensive
```

```
    Physical interface: ge-3/2/2, Enabled, Physical link is Up
      Interface index: 156, SNMP ifIndex: 548, Generation: 159
      Link-level type: Ethernet, MTU: 1518, Speed: 1000mbps, 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: 0x4000
      CoS queues     : 8 supported, 8 maximum usable queues
      Schedulers     : 128
      Hold-times     : Up 0 ms, Down 0 ms
      Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
      Last flapped   : 2010-03-17 04:03:11 PDT (00:45:30 ago)
      Statistics last cleared: Never
      Traffic statistics:
       Input  bytes  :             1716096                    0 bps
       Output bytes  :             1716448                    0 bps
       Input  packets:               13407                    0 pps
       Output packets:               13411                    0 pps
       IPv6 total statistics:
        Input  bytes  :            1716096
        Output bytes  :            1716096
        Input  packets:              13407
        Output packets:              13407
      Ingress traffic statistics at Packet Forwarding Engine:
       Input  bytes  :             1716096                    0 bps
       Input  packets:               13407                    0 pps
       Drop   bytes  :                   0                    0 bps
       Drop   packets:                   0                    0 pps
      Input errors:
        Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 1, L2 mismatch timeouts: 0, FIFO errors:
0,
        Resource errors: 0
      Output errors:
       Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0, Aged packets:
 0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
      Ingress queues: 8 supported, 4 in use
      Queue counters:       Queued packets  Transmitted packets      Dropped
packets
        0 best-effort                13407                13407
   0
        1 expedited-fo                   0                    0
   0
        2 assured-forw                   0                    0
   0
        3 network-cont                   0                    0
   0
      Egress queues: 8 supported, 4 in use
      Queue counters:       Queued packets  Transmitted packets      Dropped
packets
        0 best-effort                13407                13407
   0
        1 expedited-fo                   0                    0
   0
        2 assured-forw                   0                    0
   0
        3 network-cont                   4                    4
   0
      Active alarms  : None
      Active defects : None
      MAC statistics:                      Receive         Transmit
```

```
      Total octets                       1716096          1716448
      Total packets                        13407            13411
      Unicast packets                      13407            13407
      Broadcast packets                        0                0
      Multicast packets                        0                4
      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
    Filter statistics:
      Input packet count                   13407
      Input packet rejects                     0
      Input DA rejects                         0
      Input SA rejects                         0
      Output packet count                                   13411
      Output packet pad count                                   0
      Output packet error count                                 0
      CAM destination filters: 0, CAM source filters: 0
    Autonegotiation information:
      Negotiation status: Complete
      Link partner:
          Link mode: Full-duplex, Flow control: None, Remote fault: OK
      Local resolution:
          Flow control: Symmetric, Remote fault: Link OK
    Packet Forwarding Engine configuration:
      Destination slot: 3
    CoS information:
      Direction : Output
      CoS transmit queue               Bandwidth               Buffer Priority
 Limit
                              %            bps     %            usec
      0 best-effort          95      950000000    95               0      low
  none
      3 network-control       5       50000000     5               0      low
  none
      Direction : Input
      CoS transmit queue               Bandwidth               Buffer Priority
 Limit
                              %            bps     %            usec
      0 best-effort          95      950000000    95               0      low
  none
      3 network-control       5       50000000     5               0      low
  none

    Logical interface ge-3/2/2.0 (Index 83) (SNMP ifIndex 6080) (Generation
148)
      Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ]  Encapsulation: ENET2
      Traffic statistics:
       Input  bytes  :                 0
       Output bytes  :               336
       Input  packets:                 0
       Output packets:                 4
       IPv6 total statistics:
        Input  bytes  :          1716096
        Output bytes  :          1716096
        Input  packets:            13407
```



```
          Output packets:              13407
        Local statistics:
         Input  bytes  :                   0
         Output bytes  :                 336
         Input  packets:                   0
         Output packets:                   4
        Transit statistics:
         Input  bytes  :                   0                    0 bps
         Output bytes  :                   0                    0 bps
         Input  packets:                   0                    0 pps
         Output packets:                   0                    0 pps
         IPv6 total statistics:
          Input  bytes  :            1716096
          Output bytes  :            1716096
          Input  packets:              13407
          Output packets:              13407
        Protocol inet6, MTU: 1500, Generation: 159, Route table: 0
          Flags: Is-Primary
          Addresses, Flags: Is-Default Is-Primary
            Destination: Unspecified, Local: 2000::2
        Generation: 146
          Addresses, Flags: Is-Preferred
            Destination: fe80::/64, Local: fe80::214:f600:6412:86fa
        Protocol multiservice, MTU: Unlimited, Generation: 148
        Generation: 160, Route table: 0
          Policer: Input: __default_arp_policer__

     Logical interface ge-3/2/2.32767 (Index 84) (SNMP ifIndex 6081) (Generation
 149)
        Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x0000.0 ]  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 multiservice, MTU: Unlimited, Generation: 161, Route table: 0
          Flags: None
          Policer: Input: __default_arp_policer__
```

show interfaces extensive (100-Gigabit Ethernet Type 4 PIC with CFP)

```
user@host> show interfaces et-0/0/0:0 extensive
Physical interface: et-0/0/0:0, Enabled, Physical link is Down
  Interface index: 156, SNMP ifIndex: 516, Generation: 163
  Link-level type: Ethernet, MTU: 9192, Speed: 50000mbps, BPDU Error: None,
MAC-REWRITE Error: None,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
```

```
  Hold-times     : Up 0 ms, Down 0 ms
  Damping      : half-life: 5 sec, max-suppress: 20 sec, reuse 1000, suppress:
2000, state: enabled
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2010-01-07 16:36:49 PST (18:02:35 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 DEFAULT, NC-                   0                    0                    0

    1 REALTIME                       0                    0                    0

    2 PRIVATE, NC-                   0                    0                    0

    3 CONTROL                     1253                 1253                    0

    4 BC-H, CLASS_                   0                    0                    0

    5 BC-M, CLASS_                   0                    0                    0

    6 IA, CLASS_V_                   0                    0                    0

    7 CLASS_S_OUTP                   0                    0                    0

  Queue       Mapped Forwarding Class
  0        DEFAULT, NC-Q0
    1        REALTIME
    2        PRIVATE, NC-Q1
    3        CONTROL
    4        BC-H, CLASS-Q4
    5        BC-M, CLASS-Q5
    6        IA, CLASS_V_OUTPUT
    7        CLASS_S_OUTPUT
  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
  Packet Forwarding Engine configuration:
    Destination slot: 0
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority Limit

                              %            bps     %            usec
    0 best-effort            95    47500000000    95               0      low none

    3 network-control         5     2500000000     5               0      low none


  Logical interface et-0/0/0:0.0 (Index 68) (SNMP ifIndex 546) (Generation 161)
    Flags: Deviet-Down SNMP-Traps 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 inet, MTU: 9178, Generation: 220, Route table: 0
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 192.168.220.24/30, Local: 192.168.220.26, Broadcast:
192.168.220.27, Generation: 192
    Protocol mpls, MTU: 9166, Maximum labels: 3, Generation: 221, Route table: 0

    Protocol multiservice, MTU: Unlimited, Generation: 222, Route table: 0
      Policer: Input: __default_arp_policer
```

show interfaces extensive (PTX5000 Packet Transport Router)

```
user@host> show interfaces et-0/0/6 extensive
Physical interface: et-0/0/6, Enabled, Physical link is Up
  Interface index: 347, SNMP ifIndex: 531, Generation: 350
  Link-level type: Ethernet, MTU: 1514, Speed: 40Gbps, BPDU Error: None, Loop
Detect PDU Error: None, Loopback: Disabled, Source filtering: Disabled, Flow
control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Damping        : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0,
```

```
 state: unsuppressed
  Current address: 30:b6:4f:02:29:06, Hardware address: 30:b6:4f:02:29:06
  Last flapped   : 2017-02-15 21:40:06 PST (22:55:13 ago)
  Statistics last cleared: 2017-02-16 20:33:02 PST (00:02:17 ago)
  Traffic statistics:
   Input  bytes  :             1760000                    0 bps
   Output bytes  :             1540000                    0 bps
   Input  packets:               16000                    0 pps
   Output packets:               14000                    0 pps
   IPv6 transit statistics:
    Input  bytes  :             880000
    Output bytes  :             770000
    Input  packets:               8000
    Output packets:               7000
  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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                             7000                 7000                    0

    1                                0                    0                    0

    2                                0                    0                    0

    3                             7000                 7000                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                            0
    Errored blocks                        0
  MAC statistics:                      Receive         Transmit
    Total octets                       2048000          1792000
    Total packets                        16000            14000
    Unicast packets                      16000            14000
    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
  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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue              Bandwidth              Buffer Priority
Limit
                            %            bps     %           usec
    0 best-effort          95    38000000000    95              0      low
none
    3 network-control       5     2000000000     5              0      low
none
  Preclassifier statistics:
    Traffic Class        Received Packets   Transmitted  Packets      Dropped
Packets
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
    best-effort                        0                      0
    0
  Link Degrade :
    Link Monitoring                   :  Disable
  Interface transmit statistics: Disabled

  Logical interface et-0/0/6.0 (Index 93) (SNMP ifIndex 841) (Generation 158)
    Flags: Up SNMP-Traps 0x4004000 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :             1760000
     Output bytes  :             1540000
     Input  packets:               16000
     Output packets:               14000
     IPv6 transit statistics:
      Input  bytes  :             880000
      Output bytes  :             770000
      Input  packets:               8000
      Output packets:               7000
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :             1760000                   0 bps
     Output bytes  :             1540000                   0 bps
     Input  packets:               16000                   0 pps
     Output packets:               14000                   0 pps
```

```
     IPv6 transit statistics:
      Input  bytes  :              880000
      Output bytes  :              770000
      Input  packets:                8000
      Output packets:                7000
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new 
hold cnt: 0, NH drop cnt: 0
    Generation: 206, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
       Destination: 11.0.0/24, Local: 11.0.0.2, Broadcast: 11.0.0.255, Generation:
 228
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new 
hold cnt: 0, NH drop cnt: 0
    Generation: 207, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1100::/120, Local: 1100::2
    Generation: 230
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4fff:fe02:2906
    Protocol multiservice, MTU: Unlimited, Generation: 232
    Generation: 208, Route table: 0
      Policer: Input: __default_arp_policer__
```

sshow interfaces extensive (PTX Routers)

user@host> **show interfaces ae31 extensive**

```
Physical interface: ae31, Enabled, Physical link is Up
  Interface index: 137, SNMP ifIndex: 511, Generation: 140
  Link-level type: Ethernet, MTU: 1518, Speed: 3Gbps, BPDU Error: None, MAC-REWRITE
 Error: None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Disabled
  Pad to minimum frame size: Disabled
  Minimum links needed: 1, Minimum bandwidth needed: 1bps
  Device flags : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000, LAG_Enhanced
```

show interfaces extensive (PTX10008 Routers)

user@host> **show interfaces ae0 extensive**

```
Physical interface: ae0, Enabled, Physical link is Up
  Interface index: 917, SNMP ifIndex: 817, Generation: 4436
  Link-level type: Ethernet, MTU: 1518, Speed: 20Gbps, BPDU Error: None, 
MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled, Flow 
control: Disabled, Minimum links needed: 1,
  Minimum bandwidth needed: 1bps
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Current address: 30:b6:4f:e9:7c:05, Hardware address: 30:b6:4f:e9:7c:05
  Last flapped   : 2017-04-10 05:20:29 PDT (00:03:52 ago)
  Statistics last cleared: 2017-04-10 05:21:52 PDT (00:02:29 ago)
  Traffic statistics:
   Input  bytes  :         36463816334                    0 bps
   Output bytes  :         36463816334                    0 bps
   Input  packets:            24671053                    0 pps
   Output packets:            24671053                    0 pps
   IPv6 transit statistics:
```

```
    Input  bytes  :        18231905950
    Output bytes  :        18231905950
    Input  packets:           12335525
    Output packets:           12335525
  MAC statistics:                     Receive        Transmit
    Broadcast packets                       0               0
    Multicast packets                       0               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
  Egress queues: 8 supported, 4 in use
  Queue counters:      Queued packets  Transmitted packets      Dropped packets

    0                        24671053             24671053                    0

    1                               0                    0                    0

    2                               0                    0                    0

    3                               0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control

  Logical interface ae0.0 (Index 99) (SNMP ifIndex 832) (Generation 43813)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.2 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :       4934211          0    7292763858            0
        Output:       4934211          0    7292763858            0
    Adaptive Statistics:
        Adaptive Adjusts:         0
        Adaptive Scans  :         0
        Adaptive Updates:         0
    Link:
      et-0/0/28:0.0
        Input :       4934211          0    7292763858            0
        Output:       4934211          0    7292763858            0
      et-0/0/28:3.0
        Input :             0          0             0            0
        Output:             0          0             0            0


    Aggregate member links: 2

    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.0            0           0            0            0
      et-0/0/28:3.0            0           0            0            0
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89219, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
       Destination: 21.0.0.0/30, Local: 21.0.0.1, Broadcast: 21.0.0.3, Generation:
```



```
 62420
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 2, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89220, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 3001::1500:0/126, Local: 3001::1500:1
    Generation: 62422
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4f00:2e9:7c05
    Protocol multiservice, MTU: Unlimited, Generation: 62424
    Generation: 89221, Route table: 0
      Policer: Input: __default_arp_policer__

  Logical interface ae0.1 (Index 100) (SNMP ifIndex 833) (Generation 43814)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.3 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :       4934211          0    7292763858            0
        Output:       4934211          0    7292763858            0
    Adaptive Statistics:
        Adaptive Adjusts:          0
        Adaptive Scans  :          0
        Adaptive Updates:          0
    Link:
      et-0/0/28:0.1
        Input :             0          0             0            0
        Output:       4934211          0    7292763858            0
      et-0/0/28:3.1
        Input :       4934211          0    7292763858            0
        Output:             0          0             0            0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.1             0           0            0            0
      et-0/0/28:3.1             0           0            0            0
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89222, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
       Destination: 21.0.0.4/30, Local: 21.0.0.5, Broadcast: 21.0.0.7, Generation:
 62426
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 2, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89223, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 3001::1500:4/126, Local: 3001::1500:5
    Generation: 62428
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4f00:3e9:7c05
    Protocol multiservice, MTU: Unlimited, Generation: 62430
    Generation: 89224, Route table: 0
      Policer: Input: __default_arp_policer__

  Logical interface ae0.2 (Index 101) (SNMP ifIndex 834) (Generation 43815)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.4 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :       4934211          0    7292763858            0
        Output:       4934211          0    7292763858            0
```



```
    Adaptive Statistics:
        Adaptive Adjusts:         0
        Adaptive Scans  :         0
        Adaptive Updates:         0
    Link:
      et-0/0/28:0.2
        Input :       2467106         0    3646382668           0
        Output:       4934211         0    7292763858           0
      et-0/0/28:3.2
        Input :       2467105         0    3646381190           0
        Output:             0         0             0           0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.2             0           0            0            0
      et-0/0/28:3.2             0           0            0            0
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89225, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 21.0.0.8/30, Local: 21.0.0.9, Broadcast: 21.0.0.11,
Generation: 62432
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89226, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 3001::1500:8/126, Local: 3001::1500:9
    Generation: 62434
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4f00:4e9:7c05
    Protocol multiservice, MTU: Unlimited, Generation: 62436
    Generation: 89227, Route table: 0
      Policer: Input: __default_arp_policer__

  Logical interface ae0.3 (Index 102) (SNMP ifIndex 835) (Generation 43816)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.5 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :       4934210         0    7292762380           0
        Output:       4934210         0    7292762380           0
    Adaptive Statistics:
        Adaptive Adjusts:         0
        Adaptive Scans  :         0
        Adaptive Updates:         0
    Link:
      et-0/0/28:0.3
        Input :       4934210         0    7292762380           0
        Output:             0         0             0           0
      et-0/0/28:3.3
        Input :             0         0             0           0
        Output:       4934210         0    7292762380           0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.3             0           0            0            0
      et-0/0/28:3.3             0           0            0            0
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89228, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
```



```
        Destination: 21.0.0.12/30, Local: 21.0.0.13, Broadcast: 21.0.0.15,
Generation: 62438
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 2, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89229, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 3001::1500:c/126, Local: 3001::1500:d
    Generation: 62440
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4f00:5e9:7c05
    Protocol multiservice, MTU: Unlimited, Generation: 62442
    Generation: 89230, Route table: 0
      Policer: Input: __default_arp_policer__

  Logical interface ae0.4 (Index 103) (SNMP ifIndex 836) (Generation 43817)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.6 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :       4934210          0    7292762380           0
        Output:       4934210          0    7292762380           0
    Adaptive Statistics:
        Adaptive Adjusts:         0
        Adaptive Scans  :         0
        Adaptive Updates:         0
    Link:
      et-0/0/28:0.4
        Input :       2467105          0    3646381190           0
        Output:       2467105          0    3646381190           0
      et-0/0/28:3.4
        Input :       2467105          0    3646381190           0
        Output:       2467105          0    3646381190           0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.4             0          0            0            0
      et-0/0/28:3.4             0          0            0            0
    Protocol inet, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 1, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89231, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 21.0.0.16/30, Local: 21.0.0.17, Broadcast: 21.0.0.19,
Generation: 62444
    Protocol inet6, MTU: 1500
    Max nh cache: 100000, New hold nh limit: 100000, Curr nh cnt: 2, Curr new
hold cnt: 0, NH drop cnt: 0
    Generation: 89232, Route table: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 3001::1500:10/126, Local: 3001::1500:11
    Generation: 62446
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::32b6:4f00:6e9:7c05
    Protocol multiservice, MTU: Unlimited, Generation: 62448
    Generation: 89233, Route table: 0
      Policer: Input: __default_arp_policer__

  Logical interface ae0.32767 (Index 104) (SNMP ifIndex 5645) (Generation 43818)

    Flags: Up SNMP-Traps 0x4004000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
```



```
        Input :              0          0             0            0
        Output:              0          0             0            0
    Adaptive Statistics:
        Adaptive Adjusts:          0
        Adaptive Scans  :          0
        Adaptive Updates:          0
    Link:
      et-0/0/28:0.32767
        Input :              0          0             0            0
        Output:              0          0             0            0
      et-0/0/28:3.32767
        Input :              0          0             0            0
        Output:              0          0             0            0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      et-0/0/28:0.32767          0           0            0            0
      et-0/0/28:3.32767          0           0            0            0
    Protocol multiservice, MTU: Unlimited, Generation: 89234, Route table: 0
      Flags: None
      Policer: Input: __default_arp_policer__
```

show interfaces extensive (PTX1000 Routers)

```
user@host> show interfaces et-0/0/48:1 extensive
Physical interface: et-0/0/48:1, Enabled, Physical link is Up
  Interface index: 306, SNMP ifIndex: 697, Generation: 311
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
 None, Loop Detect PDU Error: None, MAC-REWRITE Error: None, Loopback: None,
Source filtering: Disabled,
  Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Damping        : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0,
 state: unsuppressed
  Current address: ec:13:db:62:4a:f6, Hardware address: ec:13:db:62:4a:f6
  Last flapped   : 2017-05-08 11:07:59 PDT (12:08:13 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
  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: 3, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                                0                    0                    0
```



```
    1                                0                    0                    0

    2                                0                    0                    0

    3                                0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             3
    Errored blocks                         3
  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
  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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %            usec
    0 best-effort            95     9500000000    95               0      low
none
    3 network-control         5      500000000     5               0      low
none
  Link Degrade :
    Link Monitoring                   :  Disable
  Interface transmit statistics: Disabled
```

show interfaces extensive (MX Series Routers)

```
user@host> show interfaces xe-0/0/0 extensive
Physical interface: xe-0/0/0, Enabled, Physical link is Up
  Interface index: 145, SNMP ifIndex: 592, Generation: 148
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
```



```
None,
 Loopback: None, Source filtering: Disabled, Flow control: Enabled
 Pad to minimum frame size: Enabled
 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: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
 Last flapped   : 2013-10-26 03:20:40 test (2w3d 03:15 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
 Dropped traffic statistics due to STP State:
  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, 4 in use
 Queue counters:       Queued packets  Transmitted packets      Dropped packets

   0                             0                    0                    0

   1                             0                    0                    0

   2                             0                    0                    0

   3                             0                    0                    0

 Queue number:         Mapped forwarding classes
   0                   best-effort
   1                   expedited-forwarding
   2                   assured-forwarding
   3                   network-control
 Active alarms  : LINK
 Active defects : LINK
 PCS statistics                      Seconds
   Bit errors                           109
   Errored blocks                       109
 MAC statistics:                       Receive         Transmit
   1                             0                    0                    0

   2                             0                    0                    0
```

```
    3                                0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : LINK
  Active defects : LINK
  PCS statistics                      Seconds
    Bit errors                          109
    Errored blocks                      109
  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
    Total errors                             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: 0, 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            95     9500000000    95              0       low
none
    3 network-control         5      500000000     5              0       low
none
  Interface transmit statistics: Disabled
```

When an ASIC is wedged, the interfaces are brought down along with the IFD. The reason for the link down is displayed as **ASIC-Error** in the **Device flags**.

```
user@host> show interfaces xe-1/0/0 extensive
Physical interface: xe-1/0/0, Administratively down, Physical link is Down
  Interface index: 147, SNMP ifIndex: 563, Generation: 150
  Link-level type: Ethernet, MTU: 1514, MRU: 0, LAN-PHY mode, Speed: 10Gbps, BPDU
 Error: None, Loop Detect PDU Error: None,
  MAC-REWRITE Error: None, Loopback: None, Source filtering: Disabled, Flow
control: Disabled
  Pad to minimum frame size: Disabled
```



```
  Device flags   : Present Running Down ASIC-Error
  Interface flags: Hardware-Down Down Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Schedulers     : 0
  Hold-times     : Up 0 ms, Down 0 ms
  Damping        : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0,
 state: unsuppressed
  Current address: cc:e1:7f:a8:05:4a, Hardware address: cc:e1:7f:a8:05:4a
  Last flapped   : 2017-06-05 17:20:54 PDT (00:03:51 ago)
  Statistics last cleared: Never
```

show interfaces extensive (MX480 Router with MPC5E and 10-Gigabit Ethernet OTN Interface)

```
user@host> show interfaces xe-0/0/3 extensive
Physical interface: xe-0/0/3, Enabled, Physical link is Up
  Interface index: 200, SNMP ifIndex: 577, Generation: 203
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, LAN-PHY mode, Speed: 10Gbps,
BPDU Error: None, MAC-REWRITE Error: None, Loopback: None, Source filtering:
Disabled, Flow control: Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Schedulers     : 0
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2014-06-26 18:16:50 PDT (04:58:35 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
  Dropped traffic statistics due to STP State:
   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: 5, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                               0                    0                    0

    1                               0                    0                    0

    2                               0                    0                    0
```

```
    3                                0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                    Seconds
    Bit errors                          0
    Errored blocks                      4
  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
    Total errors                          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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                            %            bps     %            usec
    0 best-effort          95     9500000000    95               0       low
none
    3 network-control       5      500000000     5               0       low
none
  Interface transmit statistics: Disabled
```

show interfaces extensive (MX480 Router with MPC5E and 100-Gigabit Ethernet OTN Interface)

```
user@host> show interfaces et-2/1/0 extensive
Physical interface: et-2/1/0, Enabled, Physical link is Up
  Interface index: 215, SNMP ifIndex: 872, Generation: 218
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, Speed: 100Gbps, BPDU Error:
None, Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
```



```
  CoS queues     : 8 supported, 8 maximum usable queues
  Schedulers     : 0
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2014-06-26 18:42:04 PDT (04:36:58 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
  Dropped traffic statistics due to STP State:
   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: 263, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                                0                    0                    0

    1                                0                    0                    0

    2                                0                    0                    0

    3                                0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                       754
  MAC statistics:                      Receive         Transmit
    Total octets                         14960                0
    Total packets                          104                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                            2
```

```
    Fragment frames                         6
    VLAN tagged frames                      0
    Code violations                         0
    Total errors                           98                0
  Filter statistics:
    Input packet count                    104
    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: 0, CAM source filters: 0
  OTN alarms        : None
  OTN defects       : None
  OTN FEC Mode      : GFEC
  OTN Rate          :     OTU4 100Gbps
  OTN Line Loopback : None
  OTN Local Loopback: None
  OTN Payload PRBS   : None
  OTN FEC statistics:
    Corrected Errors                            169828399453
    Uncorrected Words                            28939961456
    Corrected Error Ratio (      17963 sec average)  8.46e-05
  OTN FEC alarms:          Seconds        Count  State
    FEC Degrade               1180            3  OK
    FEC Excessive             1160            5  OK
  OTN OC:                  Seconds        Count  State
    LOS                        129            1  OK
    LOF                          2            1  OK
    LOM                          0            0  OK
    Wavelength Lock              0            0  OK
  OTN OTU:
    AIS                          0            0  OK
    BDI                          7            1  OK
    IAE                          0            0  OK
    TTIM                       168           45  OK
    BIAE                         0            0  OK
    TSF                          0            0  OK
    SSF                          0            0  OK
    Received DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Received SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN ODU:
    AIS                        130            1  OK
    OCI                          0            0  OK
    LCK                          0            0  OK
 BDI                         7            1  OK
    TTIM                       133            1  OK
    IAE                          0            0  OK
    LTC                          0            0  OK
    CSF                          8            4  OK
    TSF                          0            0  OK
    SSF                          0            0  OK
    PTIM                       130            1  OK
    Received DAPI:
```



```
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Received SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN Received Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x00
  ODU Delay Management :
    Result  : 0x00
  PRBS:
    Result: Test not enabled
  OTN Transmitted Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x00
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort            95     95000000000    95              0       low
none
    3 network-control         5      5000000000     5              0       low
none
  Interface transmit statistics: Disabled
```

show interfaces extensive ((MX960 Router with MPC3E and 100-Gigabit DWDM OTN MIC)

```
user@host> show interfaces et-3/0/0 extensive
Physical interface: et-3/0/0, Enabled, Physical link is Up
  Interface index: 163, SNMP ifIndex: 564, Generation: 166
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, Speed: 100Gbps, BPDU Error:
None, Loopback: Disabled, Source filtering:
Disabled,
  Flow control: Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  Wavelength     : 1550.12 nm, Frequency: 193.40 THz
  CoS queues     : 8 supported, 8 maximum usable queues
  Schedulers     : 0
  Hold-times     : Up 0 ms, Down 0 ms
  Damping        : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0,
 state: unsuppressed
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2016-02-17 14:26:31 PST (09:04:28 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
  Dropped traffic statistics due to STP State:
   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: 5, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                             0                    0                    0

    1                             0                    0                    0

    2                             0                    0                    0

    3                             0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
  1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                            8
    Errored blocks                       10
  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
    Total errors                             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: 0, CAM source filters: 0
```



```
  OTN alarms        : None
  OTN defects       : None
  OTN FEC Mode      : SDFEC
  OTN Rate          :     OTU4 (120.5Gbps)
  OTN Line Loopback : None
  OTN Local Loopback: None
  OTN Payload PRBS   : None
  OTN Laser Enable   : On
  OTN FEC statistics:
    Corrected Errors                            7065332638
    Uncorrected Words                              3412572
    Corrected Error Ratio (      32785 sec average)  1.79e-06 (INVALID)
 OTN FEC alarms:          Seconds        Count  State
    FEC Degrade                 0            0  OK
    FEC Excessive               3            1  OK
  OTN OC:                  Seconds        Count  State
    LOS                         3            1  OK
    LOF                        50            3  OK
    LOM                         3            3  OK
    Wavelength Lock             0            0  OK
  OTN OTU:
    AIS                         0            0  OK
    BDI                         4            4  OK
    IAE                         4            4  OK
    TTIM                        1            1  OK
    BIAE                        3            3  OK
    TSF                        50            3  OK
    SSF                        50            3  OK
    Received DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Received SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN ODU:
    AIS                        20            2  OK
    OCI                         4            4  OK
    LCK                         4            4  OK
    BDI                         2            2  OK
    TTIM                       20            2  OK
    IAE                         0            0  OK
    LTC                         0            0  OK
    CSF                        18            2  OK
    TSF                        66            2  OK
    SSF                        66            2  OK
    PTIM                       43            2  OK
    Received DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Received SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN Received Overhead Bytes:
APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x07
  ODU Delay Management :
    Result  : 0ms
```

```
  PRBS:
    Result: Test not enabled
  OTN Transmitted Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x07
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                             %            bps     %            usec
    0 best-effort           95    95000000000    95               0       low
none
    3 network-control        5     5000000000     5               0       low
none
  Interface transmit statistics: Disabled
```

show interfaces extensive (PTX3000 Router with 5-port 100-Gigabit DWDM OTN PIC)

```
user@host > show interfaces extensive et-4/0/0
Physical interface: et-4/0/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 544, Generation: 161
  Link-level type: Ethernet, MTU: 1514, Speed: 100Gbps, BPDU Error: None, Loopback:
 Disabled, Source filtering: Disabled,
  Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  Wavelength     : 1550.12 nm, Frequency: 193.40 THz
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Damping        : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0,
 state: unsuppressed
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2016-06-04 21:42:42 PDT (1d 05:09 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: 3, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                                0                    0                    0

    1                                0                    0                    0
```



```
  2                              0                    0                    0

  3                              0                    0                    0

Queue number:         Mapped forwarding classes
  0                   best-effort
  1                   expedited-forwarding
  2                   assured-forwarding
  3                   network-control
Active alarms  : None
Active defects : None
PCS statistics                      Seconds
  Bit errors                             7
Errored blocks                       10
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
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: 0, CAM source filters: 0
OTN alarms        : None
OTN defects       : None
OTN FEC Mode      : SDFEC
OTN Rate          :     OTU4 (120.5Gbps)
OTN Line Loopback : None
OTN Local Loopback: None
OTN Payload PRBS   : None
OTN Laser Enable   : On
OTN FEC statistics:
  Corrected Errors                               19637746
  Uncorrected Words                                     0
  Corrected Error Ratio (     104923 sec average)  1.55e-09
OTN FEC alarms:          Seconds        Count  State
  FEC Degrade                  0            0  OK
  FEC Excessive                0            0  OK
OTN OC:                  Seconds        Count  State
  LOS                          0            0  OK
  LOF                          2            1  OK
  LOM                          2            1  OK
  Wavelength Lock              0            0  OK
OTN OTU:
  AIS                          0            0  OK
```

```
      BDI                        2            1  OK
      IAE                        0            0  OK
      TTIM                       0            0  OK
      BIAE                       0            0  OK
      TSF                        2            1  OK
      SSF                        0            0  OK
      Received DAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Received SAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Transmitted DAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Transmitted SAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    OTN ODU:
      AIS                        0            0  OK
      OCI                        0            0  OK
      LCK                        0            0  OK
      BDI                        2            1  OK
      TTIM                       0            0  OK
      IAE                        0            0  OK
      LTC                        0            0  OK
      CSF                        0            0  OK
      TSF                        2            1  OK
      SSF                        0            0  OK
      PTIM                       2            1  OK
      Received DAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Received SAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Transmitted DAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
      Transmitted SAPI:
      00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    OTN Received Overhead Bytes:
      APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
      Payload Type: 0x07
    ODU Delay Management :
      Result  : 0ms
    PRBS:
      Result: Test not enabled
    OTN Transmitted Overhead Bytes:
      APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
   Payload Type: 0x07
    Packet Forwarding Engine configuration:
      Destination slot: 0 (0x00)
    CoS information:
      Direction : Output
      CoS transmit queue              Bandwidth              Buffer Priority
  Limit
                             %            bps     %            usec
      0 best-effort         95     95000000000    95               0       low
  none
      3 network-control      5      5000000000     5               0       low
  none
    Interface transmit statistics: Disabled
```

show interfaces extensive (MX2020 Router with MPC6E and OTN MIC)

`user@host>` **show interfaces xe-3/0/0 extensive**


```
Physical interface: xe-3/0/0, Enabled, Physical link is Up
  Interface index: 166, SNMP ifIndex: 516, Generation: 169
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, LAN-PHY mode, Speed: 10Gbps,
BPDU Error:
None, MAC-REWRITE Error: None, Loopback: None, Source filtering: Disabled, Flow
control:
Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2014-05-28 17:53:12 PDT (05:56:24 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
  Dropped traffic statistics due to STP State:
   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: 3, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-forwarding                   0                    0
       0
    2 assured-forwarding                   0                    0
     0
    3 network-control                  0                    0
  0
  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             2
    Errored blocks                         2
```

```
 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
   Total errors                             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: 0, CAM source filters: 0
 OTN alarms        : None
 OTN defects       : None
 OTN FEC Mode      : GFEC
 OTN Rate          : Fixed Stuff Bytes 11.0957Gbps
 OTN Line Loopback : None
 OTN Local Loopback: None
 OTN Payload PRBS   : None
 OTN FEC statistics:
   Corrected Errors                                      0
   Uncorrected Words                                     0
   Corrected Error Ratio (      21387 sec average)  0.00e+00
 OTN FEC alarms:         Seconds        Count  State
   FEC Degrade                 0            0  OK
   FEC Excessive               0            0  OK
 OTN OC:                 Seconds        Count  State
   LOS                         0            0  OK
   LOF                         0            0  OK
   LOM                         0            0  OK
   Wavelength Lock             0            0  OK
 OTN OTU:
   AIS                         0            0  OK
   BDI                         0            0  OK
   IAE                         0            0  OK
   TTIM                        0            0  OK
   BIAE                        0            0  OK
   TSF                         0            0  OK
   SSF                         0            0  OK
   Received DAPI:
   00 53 4d 2d 54 52 43 20 44 41 50 49 2d 53 45 43   .SM-TRC DAPI-SEC
   Received SAPI:
   00 53 4d 2d 54 52 43 20 53 41 50 49 2d 53 45 43   .SM-TRC SAPI-SEC
   Transmitted DAPI:
   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
   Transmitted SAPI:
   00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
 OTN ODU:
```



```
    AIS                         0            0  OK
    OCI                         0            0  OK
 LCK                         0            0  OK
    BDI                         0            0  OK
    TTIM                        0            0  OK
    IAE                         0            0  OK
    LTC                         0            0  OK
    CSF                         0            0  OK
    TSF                         0            0  OK
    SSF                         0            0  OK
    PTIM                        0            0  OK
    Received DAPI:
    00 50 4d 2d 54 52 43 20 44 41 50 49 2d 53 45 43   .PM-TRC DAPI-SEC
    Received SAPI:
    00 50 4d 2d 54 52 43 20 53 41 50 49 2d 53 45 43   .PM-TRC SAPI-SEC
    Transmitted DAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
    Transmitted SAPI:
    00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00   ................
  OTN Received Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x00
  ODU Delay Management :
    Result  : 0x00
  PRBS:
    Result: Test not enabled
  OTN Transmitted Overhead Bytes:
    APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
    Payload Type: 0x00
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort            95      9500000000    95              0       low
none
    3 network-control         5       500000000     5              0       low
none
  Interface transmit statistics: Disabled
```

show interfaces extensive (MX2010 Router with MPC6E and 100-Gigabit Ethernet OTN Interface)

```
user@host> show interfaces et-9/0/0 extensive
Physical interface: et-9/0/0, Enabled, Physical link is Up
  Interface index: 196, SNMP ifIndex: 623, Generation: 199
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, Speed: 100Gbps, BPDU Error:
None, Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2014-06-26 18:18:34 PDT (04:17:07 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
  Dropped traffic statistics due to STP State:
   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: 1, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0                              0                    0                    0

    1                              0                    0                    0

    2                              0                    0                    0

    3                              0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0
  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
    Total errors                             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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue              Bandwidth               Buffer Priority
Limit
                            %            bps     %            usec
    0 best-effort          95    95000000000    95               0      low
none
    3 network-control       5     5000000000     5               0      low
none
  Interface transmit statistics: Disabled
```

show interfaces extensive (MX2010 Router with MPC6E and 10-Gigabit Ethernet Interface)

```
user@host> show interfaces xe-6/1/0 extensive
Physical interface: xe-6/1/0, Enabled, Physical link is Up
  Interface index: 159, SNMP ifIndex: 603, Generation: 162
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, LAN-PHY mode, Speed: 10Gbps,
BPDU Error: None, MAC-REWRITE Error: None, Loopback: None, Source filtering:
Disabled, Flow control: Enabled
  Pad to minimum frame size: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Schedulers     : 0
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2014-06-26 18:16:50 PDT (04:21:04 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
  Dropped traffic statistics due to STP State:
   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: 1, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
```

```
    0                                0                    0                     0

    1                                0                    0                     0

    2                                0                    0                     0

    3                                0                    0                     0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                            0
    Errored blocks                        1
  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
    Total errors                             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: 0, CAM source filters: 0
  Packet Forwarding Engine configuration:
    Destination slot: 0 (0x00)
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                            %             bps     %            usec
    0 best-effort          95      9500000000    95               0      low
none
    3 network-control       5       500000000     5               0      low
none
  Interface transmit statistics: Disabled
```


show interfaces extensive (T4000 Routers with Type 5 FPCs)

The output fields for the **show interfaces *interface* extensive** command remains the same for 12-port 10-Gigabit Ethernet LAN/WAN PIC with SFP+ (PF-12XGE-SFPP), 24-port 10-Gigabit Ethernet LAN/WAN PIC with SFP+ (PF-24XGE-SFPP), and 100-Gigabit Ethernet Type 5 PIC with CFP (PF-1CGE-CFP).

```
user@host> show interfaces xe-4/0/0 extensive
Physical interface: xe-4/0/0, Enabled, Physical link is Up
  Interface index: 200, SNMP ifIndex: 592, Generation: 203
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
 None, Loopback: None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Damping      : half-life: 5 sec, max-suppress: 20 sec, reuse 1000, suppress:
2000, state: enabled
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2013-06-03 16:01:56 PDT (06:04:07 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: 1, 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, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                   0                    0                    0

    1 expedited-fo                  0                    0                    0

    2 assured-forw                  0                    0                    0

    3 network-cont                  0                    0                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0
```

```
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
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: 0, CAM source filters: 0
Packet Forwarding Engine configuration:
  Destination slot: 0 (0x00)
CoS information:
  Direction : Output
  CoS transmit queue             Bandwidth             Buffer Priority  Limit
                        %            bps     %           usec
  0 best-effort        95     9500000000    95              0      low    none
  3 network-control     5      500000000     5              0      low    none
Preclassifier statistics:
 Traffic Class       Received Packets   Transmitted Packets      Dropped Packets

 real-time                         0                    0                    0
 network-control                   0                    0                    0
 best-effort                       0                    0                    0
Interface transmit statistics: Disabled
```

show interfaces extensive (Aggregated Ethernet)

```
user@host> show interfaces ae0 extensive
Physical interface: ae0, Enabled, Physical link is Up
  Interface index: 199, SNMP ifIndex: 570, Generation: 202
  Link-level type: Ethernet, MTU: 1514, Speed: 2Gbps, BPDU Error: None,
  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Disabled, Minimum links needed: 1, Minimum bandwidth needed: 0
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Current address: 00:00:5E:00:53:00, Hardware address: 00:00:5E:00:53:00
  Last flapped   : 2012-06-06 23:33:03 PDT (00:00:58 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                18532                 1984 bps
   Output bytes  :                    0                    0 bps
   Input  packets:                  158                    2 pps
   Output packets:                    0                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
```



```
    Input  packets:                  0
    Output packets:                  0
  Dropped traffic statistics due to STP State:
   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
  Ingress queues: 8 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                   0                    0                    0

  Egress queues: 8 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                   57                   57                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont               63605                63605                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control

  Logical interface ae0.0 (Index 331) (SNMP ifIndex 583) (Generation 142)
    Flags: SNMP-Traps 0x4004000 Encapsulation: ENET2
    Statistics        Packets        pps         Bytes          bps
    Bundle:
        Input :           149          2         17416         1984
        Output:             0          0             0            0
    Link:
      ge-3/2/5.0
        Input :            90          1         10100          992
        Output:             0          0             0            0
      ge-3/3/9.0
        Input :            59          1          7316          992
        Output:             0          0             0            0
    LACP info:        Role            System             System         Port
     Port  Port
                            priority         identifier  priority       number
      key
      ge-3/2/5.0     Actor           100   00:00:00:00:00:01        127       1
    1
```

```
      ge-3/2/5.0   Partner        127  00:24:dc:98:67:c0       127       1     1

      ge-3/3/9.0     Actor          100  00:00:00:00:00:01       127       2
1
      ge-3/3/9.0   Partner        127  00:24:dc:98:67:c0       127       2     1

    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-3/2/5.0               38         137            0            0
      ge-3/3/9.0               36         139            0            0
    Marker Statistics:   Marker Rx     Resp Tx   Unknown Rx   Illegal Rx
      ge-3/2/5.0                0           0            0            0
      ge-3/3/9.0                0           0            0            0
    Protocol inet, MTU: 1500, Generation: 169, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1.1.1/24, Local: 1.1.1.2, Broadcast: 1.1.1.255, Generation:
153
    Protocol multiservice, MTU: Unlimited, Generation: 170, Route table: 0
      Flags: Is-Primary
      Policer: Input: __default_arp_policer__
```


show interfaces fabric

Syntax

show interfaces fabric
<*interface-name*>
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 12.3 for the QFX Series.

Description

Display status information about the specified fabric interface.

Options

interface-name—(QFabric systems only) Either the serial number or the alias of the QFabric switch component, such as a Node device, Interconnect device, or QFabric infrastructure. The name can 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 all routing instances or the name of an individual routing instance.

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 381
- Troubleshooting Network Interfaces on page 384
- Troubleshooting an Aggregated Ethernet Interface on page 394
- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces fabric on page 930
show interfaces fabric brief on page 931
show interfaces fabric detail on page 939
show interfaces fabric extensive on page 940
show interfaces fabric terse on page 942

show interfaces fabric device-name on page 942

Output Fields Table 69 on page 924 lists the output fields for the **show interfaces fabric** command. Output fields are listed in the approximate order in which they appear.

Table 69: show interfaces fabric 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
Type	Physical interface type; for example, Ethernet.	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
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Clocking	Reference clock source.	detail
Speed	Speed at which the interface is running.	All levels
Duplex	Duplex mode of the interface, either Full-Duplex or Half-Duplex.	All levels
MAC-REWRITE Error	Specifies if the encapsulation of the packet has been changed.	none
BPDU Error	Specifies if a BPDU has been received on a blocked interface.	none
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. This field is only displayed if asymmetric flow control is not configured.	All levels
Device flags	Information about the physical device.	All levels
Interface flags	Information about the interface.	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

Table 69: show interfaces fabric Output Fields (continued)

Field Name	Field Description	Level of Output
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
Statistics last cleared	Date, time, and how long ago the statistics for the interface were cleared. The format is **Statistics last cleared:** ***year-month-day hour*****:*****minute*****:*****second*****:*****timezone*** **(*****hour*****:*****minute*****:*****second*** **ago)**. For example, 2010-05-17 07:51:28 PDT (00:04:33 ago).	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.	detail extensive
IPv6 transit statistics	If IPv6 statistics tracking is enabled, number of IPv6 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. NOTE: The bandwidth bps counter is not enabled.	detail extensive

Table 69: show interfaces fabric 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 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 69: show interfaces fabric 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 fabric 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	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
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
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

Table 69: show interfaces fabric 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 exceed 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
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. • 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		

Table 69: show interfaces fabric Output Fields (continued)

Field Name	Field Description	Level of Output
Item	Type of QFabric system component being viewed. Possible values include Node group, Interconnect device, Fabric control, Fabric manager, Diagnostic routing engine, and Ungrouped Node device.	none
Identifier	Hardware serial identifier of a QFabric system component. When you configure an alias name for a component, the ID is displayed.	none
Connection	Status of a QFabric system component: either Connected or Disconnected, depending on whether or not the Director software has detected keepalive messages for the listed component.	none
Configuration	Whether or not the configuration for a QFabric system component has been received and installed. The configuration can be Configured, Failed (unsuccessful), Pending (in the process of being written or retried), or Unknown.	none
Node group	Name of the Node groups associated with the QFabric system, and the Node devices assigned to each Node group. The group can be either Connected or Disconnected, depending on whether or not the Director software has detected keepalive messages for the devices in the group. This field also displays the serial ID for the Node group and the status for the Node group.	none
Fabric control	Name of the virtual Junos Routing Engines responsible for route selection within a QFabric system partition. The fabric control Routing Engine can be either Connected or Disconnected, depending on whether or not the Director software has detected keepalive messages for this virtual device. It also displays the identifier and configuration status for the fabric control Routing Engine.	none
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
Flags	Information about the logical interface. 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.	All levels
Encapsulation	Encapsulation method used on the logical interface.	All levels

Table 69: show interfaces fabric 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
Local statistics	• 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
Transit statistics	• 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
protocol-family	Protocol family configured on the logical interface. If the protocol is inet, the IP address of the interface is also displayed.	brief
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

Sample Output

show interfaces fabric

```
user@switch> show interfaces fabric
Item                    Identifier              Connection      Configuration
Node group
  BBAK3775                                      Connected       Configured
  NW-NG-0                                       Connected       Configured
  P2659-C                                       Connected       Configured
  ptor-0                                        Connected       Configured
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
```

show interfaces fabric brief

```
user@switch> show interfaces fabric brief
Physical interface: BBAK0372:fte-0/1/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface BBAK0372:fte-0/1/0.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: BBAK0372:fte-0/1/2, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface BBAK0372:fte-0/1/2.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: BBAK0394:fte-0/1/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000

  Logical interface BBAK0394:fte-0/1/0.32768
    Flags: SNMP-Traps Encapsulation: ENET2
    eth-switch

Physical interface: BBAK0394:fte-0/1/2, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000

  Logical interface BBAK0394:fte-0/1/2.32768
    Flags: SNMP-Traps Encapsulation: ENET2
    eth-switch

Physical interface: BBAK3775:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface BBAK3775:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.16/2
          128.0.32.0/2
    tnp   0x10

  Logical interface BBAK3775:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.13/2
          128.0.130.0/2

  Logical interface BBAK3775:bme0.2
```

```
    Flags: Encapsulation: ENET2
    inet  128.0.0.13/8
          128.0.130.0/8
          169.254.128.13/16
          169.254.193.0/16

Physical interface: BBAK3775:qfabric, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface BBAK3775:qfabric.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet
    mpls
    eth-switch

Physical interface: BBAK3775:vcp0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface BBAK3775:vcp0.32769
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: BBAK3775:vcp1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface BBAK3775:vcp1.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: BBAK3775:vcp2, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface BBAK3775:vcp2.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: BBAK3775:fte-0/1/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface BBAK3775:fte-0/1/0.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: EE3093:fte-0/1/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface EE3093:fte-0/1/0.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch
```



```
Physical interface: EE3093:fte-0/1/2, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface EE3093:fte-0/1/2.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/0.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/4, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/4.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/6, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/6.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/13, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/13.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/15, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/15.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch
```

```
Physical interface: IC-WS001:fte-1/0/2, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/2.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-1/0/7, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/7.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-1/0/10, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/10.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface IC-WS001:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.32.0       --> 0/0

  Logical interface IC-WS001:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.7/2
          128.0.130.2/2

  Logical interface IC-WS001:bme0.2
    Flags: Encapsulation: ENET2
    inet  128.0.0.7/8
          128.0.130.2/8
          169.254.128.7/16
          169.254.193.1/16

Physical interface: IC-WS001:bme1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface IC-WS001:bme1.0
    Flags: Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.4/2
```



```
            128.0.0.16/2
            128.0.0.17/2
            128.0.0.24/2
            128.0.0.25/2
            128.0.0.26/2
            128.0.0.28/2
            128.0.0.29/2
            128.0.0.31/2
      tnp   0x4

  Physical interface: IC-WS001:qfabric, Enabled, Physical link is Up
    Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
  Speed: Unspecified
    Device flags   : Present Running
    Interface flags: SNMP-Traps

    Logical interface IC-WS001:qfabric.0
      Flags: SNMP-Traps Encapsulation: ENET2
      inet
      mpls
      eth-switch

  Physical interface: IC-WS001:pme0, Enabled, Physical link is Up
    Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
  Speed: 1000mbps
    Device flags   : Present Running
    Interface flags: SNMP-Traps

  Physical interface: IC-WS001:pme1, Enabled, Physical link is Up
    Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
  Speed: 1000mbps
    Device flags   : Present Running
    Interface flags: SNMP-Traps

  Physical interface: IC-WS001:pme2, Enabled, Physical link is Down
    Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
  Speed: 1000mbps
    Device flags   : Present Running
    Interface flags: SNMP-Traps

  Physical interface: IC-WS001:pme3, Enabled, Physical link is Down
    Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
  Speed: 1000mbps
    Device flags   : Present Running
    Interface flags: SNMP-Traps

  Physical interface: IC-WS001:vcp0, Enabled, Physical link is Up
    Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
  1000mbps
    Device flags   : Present Running

    Logical interface IC-WS001:vcp0.32769
      Flags: LinkAddress 0-0 Encapsulation: ENET2

  Physical interface: IC-WS001:vcp1, Enabled, Physical link is Up
    Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
  1000mbps
    Device flags   : Present Running

    Logical interface IC-WS001:vcp1.32768
      Flags: LinkAddress 0-0 Encapsulation: ENET2
```

```
Physical interface: IC-WS001:vcp2, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp2.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp3, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp3.32768
    Flags: Device-Down LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp4, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp4.32768
    Flags: Device-Down LinkAddress 0-0 Encapsulation: ENET2

Physical interface: NW-NG-0:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface NW-NG-0:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.5/2
          128.0.32.0/2
    tnp   0x5

  Logical interface NW-NG-0:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.9/2
          128.0.128.4/2

  Logical interface NW-NG-0:bme0.2
    Flags: Encapsulation: ENET2
    inet  128.0.0.9/8
          128.0.128.68/8
          169.254.128.9/16
          169.254.192.34/16

Physical interface: NW-NG-0:qfabric, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface NW-NG-0:qfabric.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet
    mpls
    eth-switch
```



```
Physical interface: NW-NG-0:vcp0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface NW-NG-0:vcp0.32769
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: NW-NG-0:vcp1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface NW-NG-0:vcp1.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: P2659-C:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface P2659-C:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.16/2
          128.0.32.0/2
    tnp   0x10

  Logical interface P2659-C:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.8/2
          128.0.130.4/2

  Logical interface P2659-C:bme0.2
    Flags: Encapsulation: ENET2
    inet  128.0.0.8/8
          128.0.130.4/8
          169.254.128.8/16
          169.254.193.2/16

Physical interface: P2659-C:qfabric, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface P2659-C:qfabric.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet
    mpls
    eth-switch

Physical interface: P2659-C:vcp0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface P2659-C:vcp0.32769
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: P2659-C:vcp1, Enabled, Physical link is Up
```

```
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface P2659-C:vcp1.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: P2659-C:vcp2, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface P2659-C:vcp2.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: P2659-C:fte-0/1/2, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface P2659-C:fte-0/1/2.32768
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: ptor-0:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface ptor-0:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.17/2
          128.0.32.0/2
    tnp   0x11

  Logical interface ptor-0:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.16/2
          128.0.130.18/2

  Logical interface ptor-0:bme0.2
    Flags: Encapsulation: ENET2
    inet  128.0.0.16/8
          128.0.130.18/8
          169.254.128.16/16
          169.254.193.9/16

Physical interface: ptor-0:qfabric, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface ptor-0:qfabric.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet
    mpls
    eth-switch
```



```
Physical interface: ptor-0:vcp0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface ptor-0:vcp0.32769
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: ptor-0:vcp1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface ptor-0:vcp1.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: ptor-0:vcp2, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1496, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface ptor-0:vcp2.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2
```

show interfaces fabric detail

```
user@switch> show interfaces fabric detail
Physical interface: BBAK0372:fte-0/1/0, Enabled, Physical link is Up
  Interface index: 49165, SNMP ifIndex: 1212678666, Generation: 140
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 84:18:88:d1:fa:1f, Hardware address: 84:18:88:d1:fa:1f
  Last flapped   : 2012-11-09 21:36:41 UTC (4d 00:23 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :             14256654                    0 bps
   Output bytes  :              9618986                    0 bps
   Input  packets:                90511                    0 pps
   Output packets:                60101                    0 pps
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0
  Egress queues: 12 supported, 5 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    0                    0                    0

    3 fcoe                           0                    0                    0

    4 no-loss                        0                    0                    0

    7 network-cont                   0                    0                    0

    8 mcast                          0                    0                    0
```

```
  Active alarms  : None
  Active defects : None

 Logical interface BBAK0372:fte-0/1/0.32768 (Index 71) (SNMP ifIndex 1212678667)
(Generation 136)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :           12450372
     Output bytes  :           11986557
     Input  packets:              90510
     Output packets:              62750
    Local statistics:
     Input  bytes  :           12450372
     Output bytes  :           11986557
     Input  packets:              90510
     Output packets:              62750
    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: 163, Route table: 0
```

show interfaces fabric extensive

user@switch> **show interfaces fabric extensive**

```
Physical interface: IC-WS001:fte-0/0/6, Enabled, Physical link is Up
  Interface index: 49176, SNMP ifIndex: 1209008655, Generation: 155
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:00:00:00:06, Hardware address: 00:00:00:00:00:06
  Last flapped   : 2012-11-13 23:53:30 UTC (00:53:20 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                91179                    0 bps
   Output bytes  :         361268221791            952985992 bps
   Input  packets:                  590                    0 pps
   Output packets:           2580487185               850880 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: 1, 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, 5 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets
```



```
    0 fabric_fcset                  0                    0                    0

    1 fabric_fcset                  0                    0                    0

    2 fabric_fcset                  0                    0                    0

    3 fabric_fcset                  0                    0                    0

    4 fabric_fcset                  0                    0                    0

    5 fabric_fcset                  0                    0                    0

    6 fabric_fcset                  0                    0                    0

    7 fabric_fcset                  0                    0                    0

    8 fabric_fcset                  0           2582632925                    0

    9 fabric_fcset                  0                    0                    0

    10 fabric_fcset                  0                    0
0
    11 fabric_fcset                  0                    0
0
  Active alarms  : None
  Active defects : None
  MAC statistics:                      Receive         Transmit
    Total octets                         91179     361268221791
    Total packets                          590       2580487185
    Unicast packets                        590       2580487185
    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
  Packet Forwarding Engine configuration:
    Destination slot: 0
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort             5     2000000000     5              0       low
none
    3 fcoe                   35    14000000000    35              0       low
none
    4 no-loss                35    14000000000    35              0       low
```

```
none
    7 network-control         5      2000000000     5              0       low
none
    8 mcast                  20      8000000000    20              0       low
none

  Logical interface IC-WS001:fte-0/0/6.32768 (Index 85) (SNMP ifIndex 1209008656)
 (Generation 150)
    Flags: SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :               79496
     Output bytes  :              179860
     Input  packets:                 590
     Output packets:                 948
    Local statistics:
     Input  bytes  :               79496
     Output bytes  :              179860
     Input  packets:                 590
     Output packets:                 948
    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: 178, Route table: 0
```

show interfaces fabric terse

```
user@switch> show interfaces fabric terse
Item                    Identifier              Connection      Configuration
Node group
  BBAK3775                                      Connected       Configured
  NW-NG-0                                       Connected       Configured
  P2659-C                                       Connected       Configured
  ptor-0                                        Connected       Configured
Fabric control
  FC-0                                          Connected       Configured
  FC-1                                          Connected       Configured
```

show interfaces fabric device-name

```
user@switch> show interfaces fabric IC-WS001:fte-0/0/13
Physical interface: IC-WS001:fte-0/0/13, Enabled, Physical link is Up
  Interface index: 49177, SNMP ifIndex: 1209008767
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:0d, Hardware address: 00:00:00:00:00:0d
  Last flapped   : 2012-11-13 23:55:15 UTC (00:55:38 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface IC-WS001:fte-0/0/13.32768 (Index 86) (SNMP ifIndex 1209008768)
```



```
Flags: SNMP-Traps 0x0 Encapsulation: ENET2
Input packets : 748
Output packets: 954
Protocol eth-switch, MTU: 0
```

show interfaces ge

List of Syntax

Syntax (EX Series) on page 944
Syntax (QFX Series) on page 944

Syntax (EX Series)

show interfaces ge-*fpc/pic/port*
<brief | detail | extensive | terse>
<media>
<statistics>

Syntax (QFX Series)

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 9.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Display status information about the specified Gigabit Ethernet interface. This command does not display statistics for routed VLAN interfaces.

NOTE: You must have a transceiver plugged into an SFP or SFP+ port before information about the interface can be displayed.

Options

ge-*fpc/pic/port*—(EX Series) Display standard information about the specified Gigabit Ethernet interface.

brief | detail | extensive | terse—(Optional) (EX Series) Display the specified level of output.

media—(Optional) (EX Series) Display media-specific information about network interfaces.

statistics—(Optional) (EX Series) Display static interface statistics.

brief | detail | extensive | terse—(Optional) (QFX Series) Display the specified level of output.

device-name*:*type-fpc/pic/port— (QFX Series) 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) (QFX Series) Display interface description strings.

media—(Optional) (QFX Series) Display media-specific information about network interfaces.

routing instance (all | *instance-name*)—(Optional) (QFX Series) Display the name of an individual routing-instance or display all routing-instances.

snmp-index *snmp-index*—(Optional) (QFX Series) Display information for the specified SNMP index of the interface.

statistics—(Optional) (QFX Series) Display static interface statistics.

Required Privilege Level

view

Related Documentation

- *Monitoring Interface Status and Traffic*
- Troubleshooting Network Interfaces on EX3200 Switches on page 384
- Troubleshooting Network Interfaces on EX4200 Switches on page 386
- Troubleshooting an Aggregated Ethernet Interface on page 395
- *Junos OS Ethernet Interfaces Configuration Guide*
- Monitoring Interface Status and Traffic on page 381
- Troubleshooting Network Interfaces on page 384
- Troubleshooting an Aggregated Ethernet Interface on page 394
- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces ge-0/0/0 on page 952
show interfaces ge-0/0/0 brief on page 952
show interfaces ge-0/0/0 brief (with EEE Enabled on the EEE-capable Base-T copper Ethernet interfaces) on page 953
show interfaces ge-0/0/0 detail on page 953
show interfaces ge-0/0/4 extensive on page 954

Output Fields

Table 70 on page 945 lists the output fields for the **show interfaces ge-** command. Output fields are listed in the approximate order in which they appear.

Table 70: 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

Table 70: show interfaces ge- Output Fields (continued)

Field Name	Field Description	Level of Output
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. Default is 1514.	All levels
Speed	Speed of the interface: Auto if autonegotiation of speed is enabled; speed in megabits per second if the interface speed is explicitly configured.	All levels
Duplex	Link mode of the interface: Auto if autonegotiation of link mode is enabled; Full-Duplex or Half-Duplex if the link mode is explicitly configured.	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**.	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
IEEE 802.3az Energy Efficient Ethernet	IEEE 802.3az Energy Efficient Ethernet status: **Enabled** or **Disabled** (appears only for EEE-capable Base-T copper Ethernet interfaces).	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

Table 70: show interfaces ge- Output Fields (continued)

Field Name	Field Description	Level of Output
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**
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 the 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 70: 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**
Active alarms and Active defects	Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain time, it is promoted to an alarm. Based on the switch configuration, a defect can activate 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 70: 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 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 frames that exceed 1518 octets. • **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. • **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 70: show interfaces ge- Output Fields (continued)

<table>
<tr><th>Field Name</th><th>Field Description</th><th>Level of Output</th></tr>
<tr><td>Autonegotiation information</td><td>Information about link autonegotiation:
Negotiation status:
Complete—The autonegotiation process between the local and remote Ethernet interfaces was successful.
Incomplete—Remote Ethernet interface has the speed or link mode configured or does not perform autonegotiation.
No autonegotiation—Local Ethernet interface has autonegotiation disabled and the link mode and speed are manually configured.
Link partner—Information from the link partner:
Link mode—Depending on the capability of the attached Ethernet device, either Full-duplex or Half-duplex. If the link mode of the remote device cannot be determined, the value is Unknown.
Flow control—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, the 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—Resolution of the autonegotiation process on the local interface:
Flow control—Type of flow control that is used by the local interface. For Gigabit Ethernet interfaces, the 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).
Link mode—Link mode of local interface: either Full-duplex or Half-duplex. Displayed when Negotiation status is Incomplete.
Local link speed—Speed of the local interface. Displayed when Negotiation status is Incomplete.
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).</td><td>extensive</td></tr>
<tr><td>Packet Forwarding Engine configuration</td><td>Information about the configuration of the Packet Forwarding Engine:
Destination slot—FPC slot number:
On standalone switches with built-in interfaces, the slot number refers to the switch itself and is always 0.
On Virtual Chassis composed of switches with built-in interfaces, the slot number refers to the member ID of the switch.
On switches with line cards or on Virtual Chassis composed of switches with line cards, the slot number refers to the line card slot number on the switch or Virtual Chassis.</td><td>extensive</td></tr>
<tr><td colspan="3">Logical Interface</td></tr>
</table>

Table 70: show interfaces ge- 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 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. NOTE: For logical interfaces on EX Series switches, the traffic statistics fields in **show interfaces** commands show only control traffic; the traffic statistics do not include data traffic.	**detail extensive**
IPv6 transit statistics	EX Series switches do not support the collection and reporting of IPv6 transit statistics.	**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

Table 70: show interfaces ge- Output Fields (continued)

Field Name	Field Description	Level of Output
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 ge-0/0/0

```
user@switch> show interfaces ge-0/0/0
Physical interface: ge-0/0/0, 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-0/0/0.0 (Index 65) (SNMP ifIndex 22)
    Flags: SNMP-Traps
    Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch
      Flags: None
```

show interfaces ge-0/0/0 brief

```
user@switch> show interfaces ge-0/0/0 brief
Physical interface: ge-0/0/0, 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-0/0/0.0
```

```
    Flags: Device-Down SNMP-Traps Encapsulation: ENET2
    eth-switch
```

show interfaces ge-0/0/0 brief (with EEE Enabled on the EEE-capable Base-T copper Ethernet interfaces)

```
user@switch> show interfaces ge-0/0/0 brief
Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, Duplex: Auto,
  Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online,
  IEEE 802.3az Energy Efficient Ethernet: Enabled, NO LPI
  Device flags   : Present Running
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  Link flags     : None
```

show interfaces ge-0/0/0 detail

```
user@switch> show interfaces ge-0/0/0 detail
Physical interface: ge-0/0/0, 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-0/0/0.0 (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 ge-0/0/4 extensive

```
user@switch> show interfaces ge-0/0/4 extensive
Physical interface: ge-0/0/4, Enabled, Physical link is Up
  Interface index: 165, SNMP ifIndex: 152, Generation: 168
  Link-level type: Ethernet, MTU: 1514, Speed: Auto, Duplex: Auto,
  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:12:33:65:44, Hardware address: 00:1f:12:33:65:44
  Last flapped   : 2008-09-17 11:02:25 UTC (16:32:54 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 0                    0 bps
   Output bytes  :           2989761                  984 bps
   Input  packets:                 0                    0 pps
   Output packets:             24307                    1 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: 1, 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, 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                24307                  0

  Active alarms  : None
  Active defects : None
  MAC statistics:                      Receive         Transmit
    Total octets                             0          2989761
    Total packets                            0            24307
    Unicast packets                          0                0
    Broadcast packets                        0                0
    Multicast packets                        0            24307
    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
    Code violations                          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: None, Remote fault: Link OK
  Packet Forwarding Engine configuration:
    Destination slot: 0
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort            95      950000000    95             NA      low
none
    7 network-control         5       50000000     5             NA      low
none

  Logical interface ge-0/0/4.0 (Index 82) (SNMP ifIndex 184) (Generation 147)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :             4107883
     Input  packets:                   0
     Output packets:               24307
     IPv6 transit statistics:
      Input  bytes  :                  0
      Output bytes  :                  0
      Input  packets:                  0
      Output packets:                  0
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :             4107883
     Input  packets:                   0
     Output packets:               24307
    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 eth-switch, Generation: 159, Route table: 0
    Flags: None
    Input Filters: f2,
    Output Filters: f1,,,,
```

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.
Command introduced in Junos OS Release 13.2 for the QFX Series.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Command introduced before Junos OS Release 17.3R1.

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***.

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 *MPLS Applications Feature Guide*.

Required Privilege Level

view

List of Sample Output

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show interfaces brief (GRE) on page 962
show interfaces detail (GRE) on page 962
show interfaces (Layer 2 Services Over GRE Interfaces) on page 963
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show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch on page 964
show interfaces extensive (GRE) on page 965
show interfaces gr-2/0/10 for GRE IPv6 tunnel on page 965

Output Fields

Table 71 on page 958 lists the output fields for the **show interfaces** (GRE) command. Output fields are listed in the approximate order in which they appear.

Table 71: 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” on page 706.	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” on page 706.	All levels
Interface Flags	Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 706.	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**

Table 71: GRE show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
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
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” on page 706. 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
L2 Routing Instance	Name of the Layer 2 routing instance associated with the GRE interface.	All levels
L3 Routing Instance	Name of the Layer 3 routing instance associated with the GRE interface.	All levels

Table 71: GRE show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
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
Traffic statistics	Total number 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**

Table 71: GRE show interfaces Output Fields (continued)

Field Name	Field Description	Level of Output
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” on page 706.	**detail extensive** none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under “Common Output Fields Description” on page 706.	**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 192.0.2.2:192.0.2.1:47:df:64:0000000000000000 Encapsulation: GRE-NULL

  Input packets : 0
  Output packets: 0
    Protocol inet, MTU: 1476
      Flags: None
      Addresses, Flags: Is-Primary
        Local: 198.51.100.1
```

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 192.0.2.2:192.0.2.1:47: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: 198.51.100.1, Broadcast: Unspecified,
        Generation: 15
```

show interfaces (Layer 2 Services Over GRE Interfaces)

```
user@host> show interfaces gr-2/2/10
show interfaces gr-2/2/10
Physical interface: gr-2/2/10, Enabled, Physical link is Up
  Interface index: 214, SNMP ifIndex: 690
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 1000mbps
  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-2/2/10.0 (Index 342) (SNMP ifIndex 10834)
    Flags: Up Point-To-Point SNMP-Traps 0x4000 IP-Header
203.0.113.1:203.0.113.254:47:df:64:0000000000000000 Encapsulation: GRE-NULL
    L2 Routing Instance: vs1, L3 Routing Instance: default
    Copy-tos-to-outer-ip-header: Off
    Gre keepalives configured: Off, Gre keepalives adjacency state: down
    Input packets : 2
    Output packets: 0
    Protocol bridge, MTU: 1476
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 6/8, Local: 6.0.0.1, Broadcast: 6.255.255.255
```

show interfaces extensive (Layer 2 Services Over GRE Interfaces)

```
user@host> show interfaces gr-2/2/10.0 extensive

     Flags: SNMP-Traps Encapsulation: ENET2
     L2 Routing Instance: vs1, L3 Routing Instance: default
     Traffic statistics:
      Input  bytes  :             58851250
      Output bytes  :                    0
      Input  packets:              1279375
      Output packets:                    0
     Local statistics:
      Input  bytes  :                    0
```

```
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
    Transit statistics:
     Input  bytes  :            58851250                 75136 bps
     Output bytes  :                   0                     0 bps
     Input  packets:             1279375                   204 pps
     Output packets:                   0                     0 pps
    Protocol bridge, MTU: 1476, Generation: 175, Route table: 7
      Flags: Access-Mode
```

show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch

```
user@host> 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: 00:00:5e:00:53:d2, Hardware address: 00:00:5e:00:53: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 192.168.30.2:192.168.20.3:47: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: 10.10.10/8, Local: 10.10.10.10, Broadcast: 10.10.10.255,
        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 192.168.40.2:192.168.30.1:47: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: 10.10.10/8, Local: 10.10.10.10, Broadcast: 10.10.10.255,
        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 962 and show interfaces detail (GRE) on an EX4200 Virtual Chassis Member Switch on page 964.

show interfaces gr-2/0/10 for GRE IPv6 tunnel

```
user@host> show interfaces gr-2/0/10
show interfaces gr-2/0/10
Physical interface: gr-2/0/10, Enabled, Physical link is Up
  Interface index: 140, SNMP ifIndex: 559
  Type: GRE, Link-level type: GRE, MTU: Unlimited, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Input rate     : 4952 bps (3 pps)
  Output rate    : 200 bps (0 pps)

  Logical interface gr-2/0/10.0 (Index 355) (SNMP ifIndex 857)
    Flags: Up Point-To-Point SNMP-Traps 0x4000 IP-Header
1000::11:0:11:1-1000::11:2:13:2-47-64-0-0-0000000000000000 Encapsulation: GRE-NULL

    Copy-tos-to-outer-ip-header: Off, Copy-tos-to-outer-ip-header-transit: Off
    Gre keepalives configured: Off, Gre keepalives adjacency state: down
    Input packets : 60
    Output packets: 83
    Protocol inet, MTU: 9082
    Max nh cache: 0, New hold nh limit: 0, Curr nh cnt: 0, Curr new hold cnt: 0,
 NH drop cnt: 0
      Flags: Sendbcast-pkt-to-re
```



```
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 14.0.13/24, Local: 14.0.13.1, Broadcast: 14.0.13.255
    Protocol iso, MTU: 9082
    Protocol inet6, MTU: 9082
    Max nh cache: 0, New hold nh limit: 0, Curr nh cnt: 0, Curr new hold cnt: 0,
NH drop cnt: 0
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 1400::14:0:13:0/120, Local: 1400::14:0:13:1
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::2a0:a520:2875:4992
    Protocol mpls, MTU: 9070, Maximum labels: 3
      Flags: Is-Primary
```


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 971
show interfaces irb snmp-index on page 972

Output Fields

Table 72 on page 967 lists the output fields for the **show interfaces irb** command. Output fields are listed in the approximate order in which they appear.

Table 72: show interfaces irb Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels

Table 72: show interfaces irb Output Fields (continued)

Field Name	Field Description	Level of Output
Enabled	State of the physical interface. Possible values are described in the “Enabled Field” section under “Common Output Fields Description” on page 706.	All levels
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” on page 706.	**detail extensive brief** none
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 706.	**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” on page 706.	**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

Table 72: show interfaces irb Output Fields (continued)

Field Name	Field Description	Level of Output
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.	**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**

Table 72: show interfaces irb Output Fields (continued)

Field Name	Field Description	Level of Output
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 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" on page 706.	**detail extensive**
Encapsulation	Encapsulation on the logical interface.	**detail extensive**
Bandwidth	Dummy value that is ignored by an IRB interface. IRB interfaces are pseudo interfaces and do not have physical bandwidth associated with them.	**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" on page 706.	**detail extensive**
MTU	Maximum transmission unit size on the logical interface.	**detail extensive**

Table 72: show interfaces irb Output Fields (continued)

Field Name	Field Description	Level of Output
Maximum labels	Maximum number of MPLS labels configured for the MPLS protocol family 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**
Addresses, Flags	Information about address flags. Possible values are described in the "Addresses Flags" section under "Common Output Fields Description" on page 706.	**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" on page 706.	**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: 10.51.1/8, 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: 10.51.1/8, Local: 10.51.1.2, Broadcast: 10.51.1.255
Protocol multiservice, MTU: 1500
  Flags: Is-Primary
```

show interfaces mc-ae

Syntax **show interfaces mc-ae id** ***identifier*** **unit** ***number***

Release Information Command introduced in Junos OS Release 9.6 for the MX Series.
Command introduced in Junos OS Release 12.2 for the QFX Series.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.
Configuration Consistency Check output field added in Junos OS Release 15.1X53-D60 for the QFX Series.

Description On peers with multichassis aggregated Ethernet (**mc-ae*X***) interfaces, use this command to display information about the multichassis aggregated Ethernet interfaces.

NOTE: **In Junos OS Release 17.4R1, this command is not supported on EX4300, EX9200, PTX10000, QFX10002, and QFX10008 devices.**

Options **id** ***identifier***—(Optional) Specify the name of the multichassis aggregated Ethernet interface.

unit ***number***—(Optional) Specify the logical interface by unit number.

Required Privilege Level view

List of Sample Output
show interfaces mc-ae (EX Series) on page 975
show interfaces mc-ae (MX Series) on page 975
show interfaces mc-ae (Active/Active Bridging and VRRP over IRB on MX Series) on page 976

Output Fields Table 73 on page 974 lists the output fields for the **show interfaces mc-ae** command. Output fields are listed in the approximate order in which they appear.

Table 73: show interfaces mc-ae Output Fields

Output Field Name	Field Description
Current State Machine's State	Specifies the state of the MC-LAG initialization state machine.
Configuration Consistency Check	Specifies the status of the MC-LAG configuration consistency check feature. The status is either **Passed** or **Failed**. If the status is **Failed**, the system will display the name of the parameter that failed consistency check. If there are multiple inconsistencies, only the first inconsistency is shown. If the enforcement level for the MC-LAG parameter was mandatory, and you did not configure that parameter correctly, the command will show that the MC-LAG interface is down.

Table 73: show interfaces mc-ae Output Fields (continued)

Output Field Name	Field Description
Member Link	Specifies the identifiers of the configured multichassis link aggregated interface members.
Local Status	Specifies the status of the local link: **active** or **standby**.
Peer Status	Specifies the status of the peer link: **active** or **standby**.
Peer State	Specifies the status of the local and peer links in an **active/active** MC-LAG configuration.
Logical Interface	Specifies the identifier and unit of the AE interface.
Topology Type	Specifies the bridge configured on the AE.
Local State	Specifies if the local device is up or down.
Peer State	Specifies if the peer device is up or down.
Peer Ip/MCP/State	Specifies the multichassis protection (MCP) link or the interchassis link-protection link (ICL-PL) for all of the multichassis aggregated Ethernet interfaces that are part of the peer.

Sample Output

show interfaces mc-ae (EX Series)

```
user@switch> show interfaces mc-ae ae1 512
 Member Link                  : ae1
  Current State Machine's State: mcae active state
  Configuration Consistency Check    : Failed (redundancy group id mismatch)
  Local Status                 : active
  Local State                  : up
  Peer Status                  : standby
  Peer State                   : up
      Logical Interface        : ae1.0
      Topology Type            : bridge
      Local State              : up
      Peer State               : up
      Peer Ip/MCP/State        : 10.1.1.1 ae0.0 up
```

show interfaces mc-ae (MX Series)

```
user@host> show interfaces mc-ae ae0 unit 512
  Member Links    : ae0
  Local Status    : active
  Peer Status     : active
  Logical Interface         : ae0.512
  Core Facing Interface : Label Ethernet Interface
  ICL-PL          : Label Ethernet Interface
```

show interfaces mc-ae (Active/Active Bridging and VRRP over IRB on MX Series)

```
user@host# show interfaces mc-ae ge-0/0/0.0
 Member Link                  : ae0
 Current State Machine's State: active
 Local Status                 : active
 Local State                  : up
 Peer Status                  : active
 Peer State                   : up
     Logical Interface        : ae0.0
     Topology Type            : bridge
     Local State              : up
     Peer State               : up
     Peer Ip/ICL-PL/State     : 192.168.100.10 ge-0/0/0.0 up
```


show interfaces me0

Syntax

show interfaces me0
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance>
<statistics>

Release Information Command introduced in Junos OS Release 9.0 for EX Series switches.

Description Display status information about the management Ethernet interface.

Options

none—Display standard information about the management Ethernet interface.

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—(Optional) Display the name of the routing instance.

statistics—(Optional) Display static interface statistics.

Required Privilege Level view

Related Documentation

- *Example: Configuring a Firewall Filter on a Management Interface on an EX Series Switch*
- *Configuring Firewall Filters (CLI Procedure)*

List of Sample Output

show interfaces me0 on page 981
show interfaces me0 brief on page 981
show interfaces me0 detail on page 981
show interfaces me0 extensive on page 982

Output Fields Table 74 on page 977 lists the output fields for the **show interfaces me0** command. Output fields are listed in the approximate order in which they appear.

Table 74: show interfaces me0 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

Table 74: show interfaces me0 Output Fields (continued)

Field Name	Field Description	Level of Output
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**
Type	Information about the type of functional interface.	All levels
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
Clocking	Interface that acts as a clock source. This field is not supported on EX Series switches and the default value is always **Unspecified**.	**detail extensive**
Speed	Speed at which the interface is running.	All levels
Device flags	Information about the physical device.	All levels
Interface flags	Information about the interface.	All levels
Link type	Information about whether the link is duplex and whether the negotiation is manual or automatic.	**detail extensive** none
Physical info	Information about the device dependent physical interface selector. This field is applied only when a clocking option is specified. This field is not supported on EX Series switches and the default value is always **Unspecified**.	**detail 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	MAC address of the hardware.	**detail extensive** none
Alternate link address	Information about alternate hardware address.	**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 hour:minute:second timezone*** **(*weeksw:daysdhour:minute:second* ago)**. For example, **Last flapped: 2008–01–16 10:52:40 UTC (3w:3d 22:58 ago).**	**detail extensive** none
Statistics last cleared	Time when the statistics for the interface was last set to zero. The format is **Last flapped:** ***year-month-day hour:minute:second timezone*** **(*weeksw:daysdhour:minute:second* ago)**. For example, **Last flapped: 2008–01–16 10:52:40 UTC (3w:3d 22:58 ago).**	**detail extensive**

Table 74: show interfaces me0 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. Following are fields in **Traffic statistics**: • **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 and rate of bytes and IPv6 packets received and transmitted on the physical interface. Following are fields in **IPv6 transit statistics**: • **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 frame checksum (FCS) errors. • **Drops**—Number of packets dropped by the input queue of the I/O Manager ASIC. • **Framing errors**—Number of packets received with an invalid FCS. • **Runts**—Number of frames received that are smaller than the runt threshold. • **Giants**— Number of packets that exceed the size for the medium. For example, if the medium is Ethernet, the **Giant** field shows the count of packets with size greater than 1518 bytes. • **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.	**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. It increases 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 increment 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. • **MTU errors**—Number of packets whose size exceeded the MTU of the interface. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 74: show interfaces me0 Output Fields (continued)

Field Name	Field Description	Level of Output
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
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.	**detail extensive**
Local statistics	Number and rate of bytes and packets destined to and exiting from the switch.	**extensive**
Protocol	Protocol family.	**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 protocol family flags.	**detail extensive**
Input Filter	Ingress filter name.	**extensive**
Output Filter	Egress filter name.	**extensive**
Addresses	Information about the management interface addresses.	**detail extensive** none
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 interface.	**detail extensive** none
Generation	Unique number for use by Juniper Networks technical support only.	**detail extensive**

Sample Output

show interfaces me0

```
user@switch> show interfaces me0
Physical interface: me0, Enabled, Physical link is Up
  Interface index: 1, SNMP ifIndex: 33
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:1f:12:35:3c:bf, Hardware address: 00:1f:12:35:3c:bf
  Last flapped   : 2010-07-31 23:45:50 PDT (5d 00:32 ago)
    Input packets : 1661830
    Output packets: 3200

  Logical interface me0.0 (Index 3) (SNMP ifIndex 34)
    Flags: SNMP-Traps Encapsulation: ENET2
    Input packets : 1661830
    Output packets: 3200
    Protocol inet
      Flags: Is-Primary
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.204.32/20, Local: 10.204.33.103,
        Broadcast: 10.204.47.255
    Protocol inet6
      Flags: Is-Primary
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::21f:12ff:fe35:3cbf
```

show interfaces me0 brief

```
user@switch> show interfaces me0 brief
Physical interface: me0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface me0.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet  10.204.33.103/20
    inet6 fe80::21f:12ff:fe35:3cbf/64
```

show interfaces me0 detail

```
user@switch> show interfaces me0 detail
Physical interface: me0, Enabled, Physical link is Up
  Interface index: 1, SNMP ifIndex: 33, Generation: 1
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:35:3c:bf, Hardware address: 00:1f:12:35:3c:bf
  Alternate link address: Unspecified
```



```
  Last flapped   : 2010-07-31 23:45:50 PDT (5d 00:37 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :            366663167
   Output bytes  :               498590
   Input  packets:              1664031
   Output packets:                 3259
   IPv6 transit statistics:
    Input  bytes  :                   0
    Output bytes  :                   0
    Input  packets:                   0
    Output packets:                   0

  Logical interface me0.0 (Index 3) (SNMP ifIndex 34) (Generation 1)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :            366665637
     Output bytes  :               500569
     Input  packets:              1664048
     Output packets:                 3275
     IPv6 transit statistics:
      Input  bytes  :                   0
      Output bytes  :                   0
      Input  packets:                   0
      Output packets:                   0
    Local statistics:
     Input  bytes  :            366665637
     Output bytes  :               500569
     Input  packets:              1664048
     Output packets:                 3275
    Protocol inet, Generation: 1, Route table: 0
      Flags: Is-Primary
      Addresses, Flags: Is-Preferred Is-Primary
       Destination: 10.204.32/20, Local: 10.204.33.103, Broadcast: 10.204.47.255,
 Generation: 1
    Protocol inet6, Generation: 2, Route table: 0
      Flags: Is-Primary
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::21f:12ff:fe35:3cbf
    Generation: 2
```

show interfaces me0 extensive

```
user@switch> show interfaces me0 extensive
Physical interface: me0, Enabled, Physical link is Up
  Interface index: 1, SNMP ifIndex: 33, Generation: 1
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
  Speed: 100mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:38:58:bf, Hardware address: 00:1f:12:38:58:bf
  Alternate link address: Unspecified
  Last flapped   : 2010-08-15 06:27:33 UTC (03:06:22 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :             82310392
   Output bytes  :              1966952
   Input  packets:               110453
```



```
 Output packets:                17747
 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: 1, Errors: 0, Drops: 0, MTU errors: 0,
  Resource errors: 0

Logical interface me0.0 (Index 3) (SNMP ifIndex 34) (Generation 1)
  Flags: SNMP-Traps Encapsulation: ENET2
  Traffic statistics:
   Input  bytes  :            82310392
   Output bytes  :             1966952
   Input  packets:              110453
   Output packets:               17747
  Local statistics:
   Input  bytes  :            82310392
   Output bytes  :             1966952
   Input  packets:              110453
   Output packets:               17747
  Protocol inet, Generation: 1, Route table: 0
    Flags: Is-Primary
    Input Filters: mgmt_filter,
    Addresses, Flags: Is-Default Is-Preferred Is-Primary
      Destination: 10.204.96/20, Local: 10.204.96.234,
      Broadcast: 10.204.111.255, Generation: 1
```

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.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

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 75 on page 985. 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 75 on page 985.

Table 75: Layer 2 Overhead and Transmitted Packets or Byte Counts

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), Modular Port Concentrators (MPCs), or Enhanced Queuing DPCs, 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 related CoS operational mode commands, see the CLI Explorer.

Required Privilege Level

view

List of Sample Output

show interfaces queue (Rate-Limited Interface on a Gigabit Ethernet MIC in an MPC) on page 993
show interfaces queue (Aggregated Ethernet on a T320 Router) on page 994
show interfaces queue (Gigabit Ethernet on a T640 Router) on page 996
show interfaces queue aggregate (Gigabit Ethernet Enhanced DPC) on page 996
show interfaces queue (Gigabit Ethernet IQ2 PIC) on page 1000
show interfaces queue both-ingress-egress (Gigabit Ethernet IQ2 PIC) on page 1003

show interfaces queue ingress (Gigabit Ethernet IQ2 PIC) on page 1005
show interfaces queue egress (Gigabit Ethernet IQ2 PIC) on page 1006
show interfaces queue remaining-traffic (Gigabit Ethernet Enhanced DPC) on page 1008
show interfaces queue (Channelized OC12 IQE Type 3 PIC in SONET Mode) on page 1010
show interfaces queue (QFX Series) on page 1020
show interfaces queue l2-statistics (lsq interface) on page 1021
show interfaces queue lsq (lsq-ifd) on page 1022
show interfaces queue (Aggregated Ethernet on a MX series Router) on page 1023

Output Fields Table 76 on page 988 lists the output fields for the **show interfaces queue** command. Output fields are listed in the approximate order in which they appear.

Table 76: 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” on page 706.
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.

Table 76: show interfaces queue Output Fields (continued)

Field Name	Field Description
Queue counters (Ingress)	CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces. • **Queued packets**—Number of queued packets. NOTE: This field is not supported on QFX5100, QFX5110, QFX5200, and QFX5210 switches due to hardware limitations. • **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.
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 986. NOTE: This field is not supported on QFX5100, QFX5110, QFX5200, and QFX5210 switches due to hardware limitations.
Queued Bytes	Number of bytes queued to this queue. The byte counts vary by interface hardware. For more information, see Table 77 on page 992. 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 986. NOTE: This field is not supported on QFX5100, QFX5110, QFX5200, and QFX5210 switches due to hardware limitations.
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 984

Table 76: show interfaces queue Output Fields (continued)

Field Name	Field Description
Transmitted Bytes	Number of bytes transmitted by this queue. The byte counts vary by interface hardware. For more information, see Table 77 on page 992. 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 984
Tail-dropped packets	Number of packets dropped because of tail drop. NOTE: Starting with Junos OS 18.3R1, the **Tail-dropped packets** counter is supported on PTX Series Packet Transport Routers.
RL-dropped packets	Number of packets dropped due to rate limiting. For rate-limited interfaces hosted on MICs, MPCs, and Enhanced Queuing DPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 986. NOTE: The **RL-dropped packets** counter is not supported on the PTX Series Packet Transport Routers, and is omitted from the output.
RL-dropped bytes	Number of bytes dropped due to rate limiting. For rate-limited interfaces hosted on MICs, MPCs, and Enhanced Queuing DPCs only, this statistic is not included in the queued traffic statistics. For more information, see "Additional Information" on page 986.

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.
	
	• (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.

Table 76: show interfaces queue Output Fields (continued)

Field Name	Field Description

RED-dropped bytes	Number of bytes dropped because of RED. The byte counts vary by interface hardware. For more information, see Table 77 on page 992.
	
	• (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.
	
	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.

Queue-depth bytes	Displays queue-depth average, current, peak, and maximum values for RTP queues. Because queue-depth values cannot be aggregated, displays the values for RTP queues regardless of whether **aggregate**, **remaining-traffic**, or neither option is selected.
Queue-depth bytes	Displays queue-depth average, current, peak, and maximum values for RTP queues. Because queue-depth values cannot be aggregated, displays the values for RTP queues regardless of whether **aggregate**, **remaining-traffic**, or neither option is selected.
Last-packet enqueued	Starting with Junos OS Release 16.1, **Last-packet enqueued** output field is introduced. If **packet-timestamp** is enabled for an FPC, shows the day, date, time, and year in the format *day-of-the-week month day-date hh:mm:ss yyyy* when a packet was enqueued in the CoS queue. When the timestamp is aggregated across all active Packet Forwarding Engines, the latest timestamp for each CoS queue is reported.

Byte counts vary by interface hardware. Table 77 on page 992 shows how the byte counts on the outbound interfaces vary depending on the interface hardware. Table 77 on page 992 is based on the assumption that outbound interfaces are sending IP traffic with 478 bytes per packet.

Table 77: 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: The sum of the transmitted bytes and the RED dropped bytes. • Transmitted: Full Layer 2 overhead (including all L2 encapsulation and CRC) + 12 inter-packet gap + 8 for the preamble. • RED dropped: Full Layer 2 overhead (including all L2 encapsulation and CRC) + 12 inter-packet gap + 8 for the preamble (does not include the VLAN header or MPLS pushed bytes).	The Layer 2 overhead is 14 bytes for non-VLAN traffic and 18 bytes for VLAN traffic.

Table 77: 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 (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 queue lsq (lsq-ifd)

```
user@switch> show interfaces queue lsq-1/0/0
Logical interface lsq-1/0/0 (Index 348) (SNMP ifIndex 660)
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Burst size: 0
Queue: 0, Forwarding classes: be
  Queued:
    Packets              :              55576                 1206 pps
    Bytes                :           29622008              5145472 bps
  Transmitted:
    Packets              :              55576                 1206 pps
    Bytes                :           29622008              5145472 bps
    Tail-dropped packets :                  0                    0 pps
    RL-dropped packets   :                  0                    0 pps
    RL-dropped bytes     :                  0                    0 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: ef
  Queued:
    Packets              :                  0                    0 pps
    Bytes                :                  0                    0 bps
  Transmitted:
    Packets              :                  0                    0 pps
    Bytes                :                  0                    0 bps
    Tail-dropped packets :                  0                    0 pps
    RL-dropped packets   :                  0                    0 pps
    RL-dropped bytes     :                  0                    0 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: 2, Forwarding classes: af
  Queued:
    Packets              :                  0                    0 pps
```



```
    Bytes              :                 0                    0 bps
  Transmitted:
    Packets            :                 0                    0 pps
    Bytes              :                 0                    0 bps
    Tail-dropped packets :               0                    0 pps
    RL-dropped packets   :               0                    0 pps
    RL-dropped bytes     :               0                    0 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: 3, Forwarding classes: nc
  Queued:
    Packets            :             22231                  482 pps
    Bytes              :          11849123              2057600 bps
  Transmitted:
    Packets            :             22231                  482 pps
    Bytes              :          11849123              2057600 bps
    Tail-dropped packets :               0                    0 pps
    RL-dropped packets   :               0                    0 pps
    RL-dropped bytes     :               0                    0 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
```

Sample Output

show interfaces queue (Aggregated Ethernet on a MX series Router)

```
user@host> show interfaces queue ae0 remaining-traffic

Physical interface: ae0    , Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 543
Forwarding classes: 16 supported, 4 in use
Egress queues: 8 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets            :                16                    0 pps
    Bytes              :              1896                    0 bps
  Transmitted:
    Packets            :                16                    0 pps
    Bytes              :              1896                    0 bps
    Tail-dropped packets :               0                    0 pps
    RL-dropped packets   :               0                    0 pps
    RL-dropped bytes     :               0                    0 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-depth bytes    :
     Average             :                    0
     Current             :                    0
     Peak                :                    0
     Maximum             :            119013376
  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
     RL-dropped packets  :                    0                    0 pps
     RL-dropped bytes    :                    0                    0 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-depth bytes    :
     Average             :                    0
     Current             :                    0
     Peak                :                    0
     Maximum             :                32768
  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
     RL-dropped packets  :                    0                    0 pps
     RL-dropped bytes    :                    0                    0 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-depth bytes    :
     Average             :                    0
     Current             :                    0
     Peak                :                    0
```



```
    Maximum              :                 32768
  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
      RL-dropped packets   :                   0                     0 pps
      RL-dropped bytes     :                   0                     0 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-depth bytes    :
      Average            :                     0
      Current            :                     0
      Peak               :                     0
      Maximum            :               6258688
```


show interfaces queue fabric

Syntax

show interfaces queue fabric
<egress>
<forwarding-class *forwarding-class*>
<interface-name *interface-name*>

Release Information

Command introduced in Junos OS Release 12.3 for the QFX Series.

Description

Display class-of-service (CoS) queue information for the fabric interfaces that are configured between Node devices and Interconnect devices.

Options

none—Show detailed CoS queue statistics for all physical interfaces.

egress—(Optional) Display egress queue statistics.

forwarding-class ***forwarding-class***—(Optional) Forwarding class name for this queue. Show detailed CoS statistics for the queue associated with the specified forwarding class.

interface-name ***interface-name***—(Optional) Show detailed CoS queue statistics for the specified interface.

Required Privilege Level

view

Related Documentation

- show interfaces fabric on page 923

List of Sample Output

show interfaces queue fabric on page 1027
show interfaces queue fabric egress on page 1036
show interfaces queue fabric interface-name egress on page 1046
show interfaces queue fabric interface-name egress forwarding-class forwarding-class-name on page 1047

Output Fields

Table 76 on page 988 lists the output fields for the **show interfaces queue fabric** command. Output fields are listed in the approximate order in which they appear.

Table 78: show interfaces queue fabric Output Fields

Field Name	Field Description
Physical interface	Name of the physical interface.

Table 78: show interfaces queue fabric Output Fields (continued)

Field Name	Field Description
Enabled	State of the interface. Possible values are: • Administratively down, Physical link is Down—The interface is turned off, and the physical link is inoperable. • Administratively down, Physical link is Up—The interface is turned off, but the physical link is operational and can pass packets when it is enabled. • Enabled, Physical link is Down—The interface is turned on, but the physical link is inoperable and cannot pass packets. • Enabled, Physical link is Up—The interface is turned on, and the physical link is operational and can pass packets.
Interface index	Physical interface's index number, which reflects its initialization sequence.
SNMP ifIndex	SNMP index number for the physical interface.
Forwarding classes	Number of forwarding classes supported and in use for the interface.
Egress queues	Number of output queues supported and in use on the specified interface.
Queue	CoS queue number.
Transmitted	Number of packets and bytes transmitted by this queue. Information on transmitted packets and bytes can include: • Packets—Number of packets transmitted. • Bytes—Number of bytes transmitted. • Tail-dropped packets—Number of arriving packets dropped because output queue buffers were full. • Total-dropped pkts—Number of transmitted packets dropped. • Total dropped bytes—Number of transmitted bytes dropped.
Queued	Number of packets and bytes queued to this queue. • Packets—Number of packets queued. • Bytes—Number of bytes queued.

Sample Output

show interfaces queue fabric

```
user@switch> show interfaces queue fabric
Physical interface: IC-WS001:fte-0/0/15, Enabled, Physical link is Up
  Interface index: 49178, SNMP ifIndex: 1208484475
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  Queued:
    Packets              :                     0                     0 pps
    Bytes                :                     0                     0 bps
  Transmitted:
```

```
      Packets             :             62665971                     0 pps
      Bytes               :           7770580404                    0 bps
      Tail-dropped packets : Not Available
      Total-dropped pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 1, Forwarding classes: fabric_fcset_noloss1
    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 pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 2, Forwarding classes: fabric_fcset_noloss2
    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 pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 3, Forwarding classes: fabric_fcset_noloss3
    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 pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 4, Forwarding classes: fabric_fcset_noloss4
    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 pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 5, Forwarding classes: fabric_fcset_noloss5
    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 pkts   :                    0                    0 pps
      Total-dropped bytes  :                    0                    0 bps
  Queue: 6, Forwarding classes: fabric_fcset_noloss6
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 7, Forwarding classes: fabric_fcset_strict_high
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 8, Forwarding classes: fabric_fcset_mcast1
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 9, Forwarding classes: fabric_fcset_mcast2
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 10, Forwarding classes: fabric_fcset_mcast3
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 11, Forwarding classes: fabric_fcset_mcast4
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps

  Physical interface: IC-WS001:fte-1/0/2, Enabled, Physical link is Up
    Interface index: 49211, SNMP ifIndex: 1208484377
  Forwarding classes: 16 supported, 5 in use
  Egress queues: 12 supported, 5 in use
  Queue: 0, Forwarding classes: fabric_fcset_be
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 1, Forwarding classes: fabric_fcset_noloss1
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 2, Forwarding classes: fabric_fcset_noloss2
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 3, Forwarding classes: fabric_fcset_noloss3
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 4, Forwarding classes: fabric_fcset_noloss4
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 5, Forwarding classes: fabric_fcset_noloss5
    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 pkts   :                 0                     0 pps
      Total-dropped bytes  :                 0                     0 bps
  Queue: 6, Forwarding classes: fabric_fcset_noloss6
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 7, Forwarding classes: fabric_fcset_strict_high
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 8, Forwarding classes: fabric_fcset_mcast1
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 9, Forwarding classes: fabric_fcset_mcast2
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 10, Forwarding classes: fabric_fcset_mcast3
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps
  Queue: 11, Forwarding classes: fabric_fcset_mcast4
    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 pkts   :                   0                    0 pps
      Total-dropped bytes  :                   0                    0 bps

  Physical interface: IC-WS001:fte-1/0/7, Enabled, Physical link is Up
    Interface index: 49212, SNMP ifIndex: 1208484365
  Forwarding classes: 16 supported, 5 in use
```

```
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
```



```
Queue: 6, Forwarding classes: fabric_fcset_noloss6
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 7, Forwarding classes: fabric_fcset_strict_high
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 8, Forwarding classes: fabric_fcset_mcast1
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 9, Forwarding classes: fabric_fcset_mcast2
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 10, Forwarding classes: fabric_fcset_mcast3
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 11, Forwarding classes: fabric_fcset_mcast4
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
```



```
Physical interface: IC-WS001:fte-1/0/10, Enabled, Physical link is Up
  Interface index: 49213, SNMP ifIndex: 1208484625
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 6, Forwarding classes: fabric_fcset_noloss6
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 7, Forwarding classes: fabric_fcset_strict_high
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 8, Forwarding classes: fabric_fcset_mcast1
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 9, Forwarding classes: fabric_fcset_mcast2
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 10, Forwarding classes: fabric_fcset_mcast3
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 11, Forwarding classes: fabric_fcset_mcast4
  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 pkts   :                    0                      0 pps
    Total-dropped bytes  :                    0                      0 bps

Physical interface: P2659-C:fte-0/1/2, Enabled, Physical link is Up
  Interface index: 49161, SNMP ifIndex: 1209008630
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 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 pkts   :                    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 pkts   :                    0                      0 pps
    Total-dropped bytes  :                    0                      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 pkts   :                    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 pkts   :                    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 pkts   :                    0                      0 pps
    Total-dropped bytes  :                    0                      0 bps
```

show interfaces queue fabric egress

```
user@switch> show interfaces queue fabric egress
```

```
Physical interface: IC-WS001:fte-0/0/15, Enabled, Physical link is Up
  Interface index: 49178, SNMP ifIndex: 1208484475
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :             62665971                     0 pps
    Bytes                :           7770580404                    0 bps
    Tail-dropped packets : Not Available
    Total-dropped pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
  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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 6, Forwarding classes: fabric_fcset_noloss6
    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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 7, Forwarding classes: fabric_fcset_strict_high
    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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 8, Forwarding classes: fabric_fcset_mcast1
    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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 9, Forwarding classes: fabric_fcset_mcast2
    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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 10, Forwarding classes: fabric_fcset_mcast3
    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 pkts   :                    0                     0 pps
      Total-dropped bytes  :                    0                     0 bps
  Queue: 11, Forwarding classes: fabric_fcset_mcast4
    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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps

Physical interface: IC-WS001:fte-1/0/2, Enabled, Physical link is Up
  Interface index: 49211, SNMP ifIndex: 1208484377
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 6, Forwarding classes: fabric_fcset_noloss6
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 7, Forwarding classes: fabric_fcset_strict_high
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 8, Forwarding classes: fabric_fcset_mcast1
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 9, Forwarding classes: fabric_fcset_mcast2
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 10, Forwarding classes: fabric_fcset_mcast3
  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 pkts   :                   0                   0 pps
    Total-dropped bytes  :                   0                   0 bps
Queue: 11, Forwarding classes: fabric_fcset_mcast4
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps

Physical interface: IC-WS001:fte-1/0/7, Enabled, Physical link is Up
  Interface index: 49212, SNMP ifIndex: 1208484365
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                     0                    0 pps
    Total-dropped bytes  :                     0                    0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
```

```
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 6, Forwarding classes: fabric_fcset_noloss6
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 7, Forwarding classes: fabric_fcset_strict_high
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 8, Forwarding classes: fabric_fcset_mcast1
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 9, Forwarding classes: fabric_fcset_mcast2
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 10, Forwarding classes: fabric_fcset_mcast3
  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 pkts   :                  0                    0 pps
    Total-dropped bytes  :                  0                    0 bps
Queue: 11, Forwarding classes: fabric_fcset_mcast4
  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 pkts   :                   0                     0 pps
    Total-dropped bytes  :                   0                     0 bps

Physical interface: IC-WS001:fte-1/0/10, Enabled, Physical link is Up
  Interface index: 49213, SNMP ifIndex: 1208484625
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: fabric_fcset_be
  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 pkts   :                   0                     0 pps
    Total-dropped bytes  :                   0                     0 bps
Queue: 1, Forwarding classes: fabric_fcset_noloss1
  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 pkts   :                   0                     0 pps
    Total-dropped bytes  :                   0                     0 bps
Queue: 2, Forwarding classes: fabric_fcset_noloss2
  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 pkts   :                   0                     0 pps
    Total-dropped bytes  :                   0                     0 bps
Queue: 3, Forwarding classes: fabric_fcset_noloss3
  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 pkts   :                   0                     0 pps
    Total-dropped bytes  :                   0                     0 bps
Queue: 4, Forwarding classes: fabric_fcset_noloss4
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 5, Forwarding classes: fabric_fcset_noloss5
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 6, Forwarding classes: fabric_fcset_noloss6
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 7, Forwarding classes: fabric_fcset_strict_high
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 8, Forwarding classes: fabric_fcset_mcast1
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 9, Forwarding classes: fabric_fcset_mcast2
  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 pkts   :                    0                     0 pps
    Total-dropped bytes  :                    0                     0 bps
Queue: 10, Forwarding classes: fabric_fcset_mcast3
  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 pkts   :                    0                     0 pps
```



```
    Total-dropped bytes  :                    0                    0 bps
Queue: 11, Forwarding classes: fabric_fcset_mcast4
  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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps

Physical interface: P2659-C:fte-0/1/2, Enabled, Physical link is Up
  Interface index: 49161, SNMP ifIndex: 1209008630
Forwarding classes: 16 supported, 5 in use
Egress queues: 12 supported, 5 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 pkts   :                    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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    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 pkts   :                    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 pkts   :                    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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
```

show interfaces queue fabric interface-name egress

```
user@switch> show interfaces queue fabric BBAK0394:fte-0/1/0 egress
Physical interface: BBAK0394:fte-0/1/0, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 1091568120 Forwarding classes: 16 supported,
 5 in use Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets             :                    0                    0 pps
    Bytes               :                    0                    0 bps
  Transmitted:
    Packets             :          74777763341               844587 pps
    Bytes               :        9272442654284            837830728 bps
    Tail-dropped packets : Not Available
    Total-dropped pkts   :                    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 pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    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 pkts   :                    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 pkts   :                    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 pkts   :                    0                    0 pps
```



```
    Total-dropped bytes  :                    0                    0 bps
```

show interfaces queue fabric interface-name egress forwarding-class forwarding-class-name

user@switch> **show interfaces queue fabric BBAK0394:fte-0/1/0 egress forwarding-class best-effort**

```
Physical interface: BBAK0394:fte-0/1/0, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 1091568120 Forwarding classes: 16 supported,
 5 in use Egress queues: 12 supported, 5 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                    0                    0 pps
    Bytes                :                    0                    0 bps
  Transmitted:
    Packets              :          74793424543               844612 pps
    Bytes                :        9274384643332            837855936 bps
    Tail-dropped packets : Not Available
    Total-dropped pkts   :                    0                    0 pps
    Total-dropped bytes  :                    0                    0 bps
```

show interfaces xe

List of Syntax

Syntax (QFX Series) on page 1048
Syntax (EX Series) on page 1048

Syntax (QFX Series)

show interfaces *device-name*:*type-fpc/pic/port*
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>
<statistics>

Syntax (EX Series)

show interfaces xe-*fpc/pic/port*
<brief | detail | extensive | terse>
<media>
<statistics>

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Display status information about the specified 10-Gigabit Ethernet interface. This command does not display statistics for routed VLAN interfaces.

NOTE: You must have a transceiver plugged into an SFP+ or an XFP port before information about the interface can be displayed.

NOTE: On an EX Series switch, the traffic statistics for a LAG might vary slightly from the cumulative traffic statistics of the member interfaces of the LAG. This difference is more likely to be seen when the traffic is bursty in nature, and because the statistics are not fetched from the LAG and the members in the same instant. For accurate traffic statistics for a LAG, use the aggregated Ethernet counters.

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) (QFX Series) Display the specified level of output.

descriptions—(Optional) (QFX Series) Display interface description strings.

media—(Optional) (QFX Series) Display media-specific information about network interfaces.

routing-instance (all | *instance-name*)—(Optional) (QFX Series) Display the name of an individual routing instance or display all routing instances.

snmp-index *snmp-index*—(Optional) (QFX Series) Display information for the specified SNMP index of the interface.

statistics—(Optional) (QFX Series) Display static interface statistics.

xe-*fpc/pic/port*—(EX Series) Display standard information about the specified 10-Gigabit Ethernet interface.

brief | detail | extensive | terse—(Optional) (EX Series) Display the specified level of output.

media—(Optional) (EX Series) Display media-specific information about network interfaces. For 10-Gigabit Ethernet interfaces, using the media option does not provide you with new or additional information. The output is the same as when the media option is not used.

statistics—(Optional) (EX Series) Display static interface statistics. For 10-Gigabit Ethernet interfaces, using the statistics option does not provide you with new or additional information. The output is the same as when the statistics option is not used.

Required Privilege Level

view

Related Documentation

- Monitoring Interface Status and Traffic on page 381
- *Monitoring Interface Status and Traffic*
- Troubleshooting Network Interfaces on page 384
- Troubleshooting an Aggregated Ethernet Interface on page 394
- *Junos OS Network Interfaces Library for Routing Devices*
- Troubleshooting Network Interfaces on EX3200 Switches on page 384
- Troubleshooting Network Interfaces on EX4200 Switches on page 386
- Troubleshooting an Aggregated Ethernet Interface on page 395
- *Junos OS Ethernet Interfaces Configuration Guide*

List of Sample Output

show interfaces on page 1057
show interfaces (Asymmetric Flow Control) on page 1058
show interfaces brief on page 1058
show interfaces detail on page 1058
show interfaces detail (Asymmetric Flow Control) on page 1060

show interfaces extensive on page 1061
show interfaces extensive (Asymmetric Flow Control) on page 1063
show interfaces terse on page 1065
show interfaces (QFabric System) on page 1065

Output Fields Table 69 on page 924 lists the output fields for the **show interfaces xe** command. Output fields are listed in the approximate order in which they appear.

Table 79: 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 79: 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 79: 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 79: 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 79: 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 79: 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 79: 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 79: 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 interfaces xle

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 381
- Troubleshooting Network Interfaces on page 384
- Troubleshooting an Aggregated Ethernet Interface on page 394

- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces on page 1075
show interfaces (Asymmetric Flow Control) on page 1076
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show interfaces extensive (Asymmetric Flow Control) on page 1081
show interfaces terse on page 1083
show interfaces (QFabric System) on page 1083

Output Fields

Table 69 on page 924 lists the output fields for the **show interfaces xe** command. Output fields are listed in the approximate order in which they appear.

Table 80: 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 80: 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 80: 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 80: 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 80: 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 80: 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 80: 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 80: 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 interfaces statistics fabric

Syntax

show interfaces statistics fabric
<brief | detail | terse>
<descriptions>
<*interface-name*>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>

Release Information

Command introduced in Junos OS Release 12.3 for the QFX Series.

Description

Display status information about the specified fabric interface.

Options

brief | detail | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

interface-name—(QFabric systems only) The interface name is either the serial number or the alias of the QFabric switch 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.

media—(Optional) Display media-specific information about network interfaces.

routing-instance (all | *instance-name*)—(Optional) Display all routing instances or the name of an individual routing instance.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

Required Privilege Level

view

Related Documentation

- Monitoring Interface Status and Traffic on page 381
- Troubleshooting Network Interfaces on page 384
- Troubleshooting an Aggregated Ethernet Interface on page 394

- *Junos OS Network Interfaces Library for Routing Devices*

List of Sample Output

show interfaces statistics fabric on page 1091
show interfaces statistics fabric brief on page 1098
show interfaces statistics fabric detail on page 1101
show interfaces statistics fabric terse on page 1102
show interfaces statistics fabric device-name on page 1103

Output Fields Table 81 on page 1086 lists the output fields for the **show interfaces statistics fabric** command. Output fields are listed in the approximate order in which they appear.

Table 81: show interfaces statistics fabric 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 none
SNMP ifIndex	SNMP index number for the physical interface.	detail none
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Clocking	Reference clock source.	detail
Speed	Speed at which the interface is running.	All levels
Duplex	Duplex mode of the interface, either Full-Duplex or Half-Duplex.	All levels
MAC-REWRITE Error	Specifies if the encapsulation of the packet has been changed.	none
BPDU Error	Specifies if a BPDU has been received on a blocked interface.	none
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. This field is only displayed if asymmetric flow control is not configured.	All levels
Device flags	Information about the physical device.	All levels
Interface flags	Information about the interface.	All levels
CoS queues	Number of CoS queues configured.	detail none
Hold-Times	Current interface hold-time up and hold-time down, in milliseconds.	detail
Current address	Configured MAC address.	detail none
Hardware address	Hardware MAC address.	detail none

Table 81: show interfaces statistics fabric Output Fields (continued)

Field Name	Field Description	Level of Output
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 none
Statistics last cleared	Date, time, and how long ago the statistics for the interface were cleared. The format is **Statistics last cleared:** ***year-month-day hour*:*minute*:*second*:*timezone*** **(*hour*:*minute*:*second* ago)**. For example, 2010-05-17 07:51:28 PDT (00:04:33 ago).	detail
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
IPv6 transit statistics	If IPv6 statistics tracking is enabled, number of IPv6 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. NOTE: The bandwidth bps counter is not enabled.	detail

Table 81: show interfaces statistics fabric 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 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.	detail none

Table 81: show interfaces statistics fabric 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 fabric interfaces. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of transmit drops.	detail none
Egress queues	Total number of egress queues supported on the specified interface.	detail
Queue counters	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
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
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Index number of the logical interface, which reflects its initialization sequence.	detail none
SNMP ifIndex	SNMP interface index number for the logical interface.	detail none

Table 81: show interfaces statistics fabric Output Fields (continued)

Field Name	Field Description	Level of Output
Flags	Information about the logical interface. 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.	All levels
Input packets	Number of packets received on the interface.	detail none
Output packets	Number of packets transmitted on the interface.	detail none
Input packets	Number of packets received on the interface.	detail none
Output packets	Number of packets transmitted on the interface.	detail none
Encapsulation	Encapsulation method used on the logical interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface.	All levels
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
Local statistics	• 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
Transit statistics	• 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
Addresses, Flags	Information about the address flags.	detail 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

Table 81: show interfaces statistics fabric Output Fields (continued)

Field Name	Field Description	Level of Output
MTU	Maximum transmission unit size on the physical interface.	All levels
Destination	IP address of the remote side of the connection.	detail none
Local	IP address of the logical interface.	detail none
Broadcast	Broadcast address of the logical interlace.	detail none
Generation	Unique number for use by Juniper Networks technical support only.	detail
Route table	Route table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	detail none

Sample Output

show interfaces statistics fabric

```
user@switch> show interfaces statistic fabric
Physical interface: IC-WS001:fte-0/0/0, Enabled, Physical link is Down
  Interface index: 49174, SNMP ifIndex: 1208484473
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:00, Hardware address: 00:00:00:00:00:00
  Last flapped   : 2012-11-27 20:30:30 UTC (01:55:19 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-0/0/0.32768 (Index 83) (SNMP ifIndex 1208484474)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:fte-0/0/4, Enabled, Physical link is Down
  Interface index: 49175, SNMP ifIndex: 1208484363
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:04, Hardware address: 00:00:00:00:00:04
  Last flapped   : 2012-11-27 20:30:30 UTC (01:55:20 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
```

```
    Input errors: 0, Output errors: 0

   Logical interface IC-WS001:fte-0/0/4.32768 (Index 84) (SNMP ifIndex 1208484364)

     Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
     Input packets : 0
     Output packets: 0
     Protocol eth-switch, MTU: 0

  Physical interface: IC-WS001:fte-0/0/6, Enabled, Physical link is Down
    Interface index: 49176, SNMP ifIndex: 1208484367
    Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
    CoS queues     : 12 supported, 12 maximum usable queues
    Current address: 00:00:00:00:00:06, Hardware address: 00:00:00:00:00:06
    Last flapped   : 2012-11-27 20:30:30 UTC (01:55:20 ago)
    Statistics last cleared: Never
    Input rate     : 0 bps (0 pps)
    Output rate    : 0 bps (0 pps)
    Input errors: 0, Output errors: 0

   Logical interface IC-WS001:fte-0/0/6.32768 (Index 85) (SNMP ifIndex 1208484368)

     Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
     Input packets : 0
     Output packets: 0
     Protocol eth-switch, MTU: 0

  Physical interface: IC-WS001:fte-0/0/13, Enabled, Physical link is Down
    Interface index: 49177, SNMP ifIndex: 1208484479
    Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
    CoS queues     : 12 supported, 12 maximum usable queues
    Current address: 00:00:00:00:00:0d, Hardware address: 00:00:00:00:00:0d
    Last flapped   : 2012-11-27 20:30:30 UTC (01:55:20 ago)
    Statistics last cleared: Never
    Input rate     : 0 bps (0 pps)
    Output rate    : 0 bps (0 pps)
    Input errors: 0, Output errors: 0

   Logical interface IC-WS001:fte-0/0/13.32768 (Index 86) (SNMP ifIndex 1208484480)

     Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
     Input packets : 0
     Output packets: 0
     Protocol eth-switch, MTU: 0

  Physical interface: IC-WS001:fte-0/0/15, Enabled, Physical link is Down
    Interface index: 49178, SNMP ifIndex: 1208484475
    Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
    CoS queues     : 12 supported, 12 maximum usable queues
```



```
  Current address: 00:00:00:00:00:0f, Hardware address: 00:00:00:00:00:0f
  Last flapped   : 2012-11-27 20:30:30 UTC (01:55:20 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-0/0/15.32768 (Index 87) (SNMP ifIndex 1208484476)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:fte-1/0/2, Enabled, Physical link is Down
  Interface index: 49211, SNMP ifIndex: 1208484377
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:02, Hardware address: 00:00:00:00:00:02
  Last flapped   : 2012-11-27 20:30:47 UTC (01:55:03 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-1/0/2.32768 (Index 120) (SNMP ifIndex 1208484378)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:fte-1/0/7, Enabled, Physical link is Down
  Interface index: 49212, SNMP ifIndex: 1208484365
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:07, Hardware address: 00:00:00:00:00:07
  Last flapped   : 2012-11-27 20:30:47 UTC (01:55:04 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-1/0/7.32768 (Index 121) (SNMP ifIndex 1208484366)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:fte-1/0/10, Enabled, Physical link is Down
  Interface index: 49213, SNMP ifIndex: 1208484625
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:0a, Hardware address: 00:00:00:00:00:0a
  Last flapped   : 2012-11-27 20:30:47 UTC (01:55:04 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-1/0/10.32768 (Index 122) (SNMP ifIndex 1208484626)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:bme0, Enabled, Physical link is Up
  Interface index: 64, SNMP ifIndex: 1208483877
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500
  Device flags   : Present Running
  Current address: 02:00:00:00:40:06, Hardware address: 02:00:00:00:40:01
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 26730
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:bme0.0 (Index 4) (SNMP ifIndex 1208484065)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 2715
    Output packets: 18
    Protocol inet, MTU: 1482
        Local: 128.0.32.0

  Logical interface IC-WS001:bme0.1 (Index 5) (SNMP ifIndex 1208484091)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 999
    Protocol inet, MTU: 1482
      Addresses
        Destination: 128/2, Local: 128.0.0.6, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.130.2, Broadcast: 191.255.255.255

  Logical interface IC-WS001:bme0.2 (Index 6) (SNMP ifIndex 1208484092)
    Flags: Encapsulation: ENET2
    Input packets : 180408
    Output packets: 23051
    Protocol inet, MTU: 1486
        Destination: 128/8, Local: 128.0.0.6, Broadcast: 128.255.255.255
        Destination: 128/8, Local: 128.0.130.2, Broadcast: 128.255.255.255
       Destination: 169.254/16, Local: 169.254.128.6, Broadcast: 169.254.255.255

       Destination: 169.254/16, Local: 169.254.193.1, Broadcast: 169.254.255.255

Physical interface: IC-WS001:bme1, Enabled, Physical link is Up
  Interface index: 49156, SNMP ifIndex: 1208483949
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps
  Device flags   : Present Running
```



```
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:0d:0c:0f:00:03, Hardware address: 00:0d:0c:0f:00:03
  Last flapped   : 1970-01-01 00:00:01 UTC (2238w5d 22:25 ago)
  Statistics last cleared: Never
    Input packets : 168885
    Output packets: 184712
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:bme1.0 (Index 3) (SNMP ifIndex 1208483950)
    Flags: Encapsulation: ENET2
    Input packets : 168885
    Output packets: 184712
    Protocol inet, MTU: 1500
        Destination: 128/2, Local: 128.0.0.1, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.5, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.16, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.17, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.24, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.25, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.26, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.28, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.29, Broadcast: 191.255.255.255
        Destination: 128/2, Local: 128.0.0.31, Broadcast: 191.255.255.255
    Protocol tnp, MTU: 1500
        Local: 0x5

Physical interface: IC-WS001:dcfabric, Enabled, Physical link is Up
  Interface index: 27, SNMP ifIndex: 1208484093
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Current address: 00:0b:ca:fe:00:01, Hardware address: 00:0b:ca:fe:00:01
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:dcfabric.0 (Index 64) (SNMP ifIndex 1208484094)
    Flags: SNMP-Traps Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol inet, MTU: 1558
    Protocol mpls, MTU: 1546, Maximum labels: 3
    Protocol eth-switch, MTU: 0

Physical interface: IC-WS001:pme0, Enabled, Physical link is Up
  Interface index: 66, SNMP ifIndex: 1208484104
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e6, Hardware address: 00:23:9c:f1:a2:e6
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 1007238
    Output packets: 63383
  Input errors: 0, Output errors: 0

Physical interface: IC-WS001:pme1, Enabled, Physical link is Up
```

```
  Interface index: 67, SNMP ifIndex: 1208484105
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e7, Hardware address: 00:23:9c:f1:a2:e7
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 1007118
    Output packets: 55381
  Input errors: 0, Output errors: 0

Physical interface: IC-WS001:pme2, Enabled, Physical link is Down
  Interface index: 68, SNMP ifIndex: 1208484106
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e8, Hardware address: 00:23:9c:f1:a2:e8
  Last flapped   : 2012-11-27 02:52:03 UTC (19:33:54 ago)
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

Physical interface: IC-WS001:pme3, Enabled, Physical link is Down
  Interface index: 69, SNMP ifIndex: 1208484107
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e9, Hardware address: 00:23:9c:f1:a2:e9
  Last flapped   : 2012-11-27 02:52:03 UTC (19:33:54 ago)
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

Physical interface: IC-WS001:vcp0, Enabled, Physical link is Up
  Interface index: 74, SNMP ifIndex: 1208484372
  Type: Ethernet, Link-level type: 70, MTU: 1514, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e3, Hardware address: 00:23:9c:f1:a2:e3
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 121842
    Output packets: 3548
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:vcp0.32769 (Index 11) (SNMP ifIndex 1208484376)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 13044
    Output packets: 3548

Physical interface: IC-WS001:vcp1, Enabled, Physical link is Up
  Interface index: 70, SNMP ifIndex: 1208484108
  Type: Ethernet, Link-level type: 70, MTU: 1492, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e6, Hardware address: 00:23:9c:f1:a2:e6
```



```
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 767413
    Output packets: 46503
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:vcp1.32768 (Index 7) (SNMP ifIndex 1208484109)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 735889
    Output packets: 46503

Physical interface: IC-WS001:vcp2, Enabled, Physical link is Up
  Interface index: 71, SNMP ifIndex: 1208484369
  Type: Ethernet, Link-level type: 70, MTU: 1492, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e7, Hardware address: 00:23:9c:f1:a2:e7
  Last flapped   : Never
  Statistics last cleared: Never
    Input packets : 831710
    Output packets: 44548
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:vcp2.32768 (Index 8) (SNMP ifIndex 1208484373)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 737844
    Output packets: 44548

Physical interface: IC-WS001:vcp3, Enabled, Physical link is Down
  Interface index: 72, SNMP ifIndex: 1208484370
  Type: Ethernet, Link-level type: 70, MTU: 1492, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e8, Hardware address: 00:23:9c:f1:a2:e8
  Last flapped   : 2012-11-27 20:31:36 UTC (01:54:21 ago)
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:vcp3.32768 (Index 9) (SNMP ifIndex 1208484374)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0

Physical interface: IC-WS001:vcp4, Enabled, Physical link is Down
  Interface index: 73, SNMP ifIndex: 1208484371
  Type: Ethernet, Link-level type: 70, MTU: 1492, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Current address: 00:23:9c:f1:a2:e9, Hardware address: 00:23:9c:f1:a2:e9
  Last flapped   : 2012-11-27 20:31:36 UTC (01:54:21 ago)
  Statistics last cleared: Never
    Input packets : 0
    Output packets: 0
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:vcp4.32768 (Index 10) (SNMP ifIndex 1208484375)
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
```

show interfaces statistics fabric brief

```
user@switch> show interfaces statistics fabric brief
Physical interface: IC-WS001:fte-0/0/0, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/0.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/4, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/4.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/6, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/6.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/13, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/13.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-0/0/15, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-0/0/15.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-1/0/2, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/2.32768
```



```
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-1/0/7, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/7.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:fte-1/0/10, Enabled, Physical link is Down
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, Duplex: Full-Duplex,
Loopback: Disabled, Source filtering: Disabled, Flow control: Disabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x0

  Logical interface IC-WS001:fte-1/0/10.32768
    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    eth-switch

Physical interface: IC-WS001:bme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1500, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running

  Logical interface IC-WS001:bme0.0
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.32.0       --> 0/0

  Logical interface IC-WS001:bme0.1
    Flags: LinkAddress 0-0 Encapsulation: ENET2
    inet  128.0.0.6/2
          128.0.130.2/2

  Logical interface IC-WS001:bme0.2
    Flags: Encapsulation: ENET2
    inet  128.0.0.6/8
          128.0.130.2/8
          169.254.128.6/16
          169.254.193.1/16

Physical interface: IC-WS001:bme1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface IC-WS001:bme1.0
    Flags: Encapsulation: ENET2
    inet  128.0.0.1/2
          128.0.0.5/2
          128.0.0.16/2
          128.0.0.17/2
          128.0.0.24/2
          128.0.0.25/2
          128.0.0.26/2
          128.0.0.28/2
          128.0.0.29/2
```

```
          128.0.0.31/2
    tnp   0x5

Physical interface: IC-WS001:dcfabric, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1572, Clocking: Unspecified,
Speed: Unspecified
  Device flags   : Present Running
  Interface flags: SNMP-Traps

  Logical interface IC-WS001:dcfabric.0
    Flags: SNMP-Traps Encapsulation: ENET2
    inet
    mpls
    eth-switch

Physical interface: IC-WS001:pme0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

Physical interface: IC-WS001:pme1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

Physical interface: IC-WS001:pme2, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

Physical interface: IC-WS001:pme3, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: Ethernet, MTU: 1510, Clocking: Unspecified,
Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps

Physical interface: IC-WS001:vcp0, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1514, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp0.32769
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp1, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp1.32768
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp2, Enabled, Physical link is Up
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp2.32768
```



```
    Flags: LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp3, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp3.32768
    Flags: Device-Down LinkAddress 0-0 Encapsulation: ENET2

Physical interface: IC-WS001:vcp4, Enabled, Physical link is Down
  Type: Ethernet, Link-level type: 70, MTU: 1492, Clocking: Unspecified, Speed:
1000mbps
  Device flags   : Present Running

  Logical interface IC-WS001:vcp4.32768
    Flags: Device-Down LinkAddress 0-0 Encapsulation: ENET2
```

show interfaces statistics fabric detail

```
user@switch> show interfaces statistics fabric detail
 show interfaces statistics fabric detail
Physical interface: IC-WS001:fte-0/0/0, Enabled, Physical link is Down
  Interface index: 49174, SNMP ifIndex: 1208484473, Generation: 153
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:00:00:00:00:00, Hardware address: 00:00:00:00:00:00
  Last flapped   : 2012-11-27 20:30:30 UTC (02:04:59 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: 12 supported, 5 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 fabric_fcset                   0                    0                    0

    1 fabric_fcset                   0                    0                    0

    2 fabric_fcset                   0                    0                    0

    3 fabric_fcset                   0                    0                    0
```

```
    4 fabric_fcset                   0                    0                    0

    5 fabric_fcset                   0                    0                    0

    6 fabric_fcset                   0                    0                    0

    7 fabric_fcset                   0                    0                    0

    8 fabric_fcset                   0                    0                    0

    9 fabric_fcset                   0                    0                    0

    10 fabric_fcset                   0                    0
0
    11 fabric_fcset                   0                    0
0

  Logical interface IC-WS001:fte-0/0/0.32768 (Index 83) (SNMP ifIndex 1208484474)
 (Generation 148)
    Flags: Device-Down 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: 176, Route table: 0
```

show interfaces statistics fabric terse

```
user@switch> show interfaces statistics fabric terse
Interface               Admin Link Proto    Local                 Remote
IC-WS001:fte-0/0/0      up    down
IC-WS001:fte-0/0/0.32768 up   down eth-switch
IC-WS001:fte-0/0/4      up    down
IC-WS001:fte-0/0/4.32768 up   down eth-switch
IC-WS001:fte-0/0/6      up    down
IC-WS001:fte-0/0/6.32768 up   down eth-switch
IC-WS001:fte-0/0/13     up    down
IC-WS001:fte-0/0/13.32768 up  down eth-switch
IC-WS001:fte-0/0/15     up    down
IC-WS001:fte-0/0/15.32768 up  down eth-switch
IC-WS001:fte-1/0/2      up    down
IC-WS001:fte-1/0/2.32768 up   down eth-switch
IC-WS001:fte-1/0/7      up    down
IC-WS001:fte-1/0/7.32768 up   down eth-switch
IC-WS001:fte-1/0/10     up    down
IC-WS001:fte-1/0/10.32768 up  down eth-switch
IC-WS001:bme0           up    up
IC-WS001:bme0.0         up    up   inet     128.0.32.0          --> 0/0
IC-WS001:bme0.1         up    up   inet     128.0.0.6/2
```



```
                                               128.0.130.2/2
IC-WS001:bme0.2         up    up   inet        128.0.0.6/8
                                               128.0.130.2/8
                                               169.254.128.6/16
                                               169.254.193.1/16
IC-WS001:bme1           up    up
IC-WS001:bme1.0         up    up   inet        128.0.0.1/2
                                               128.0.0.5/2
                                               128.0.0.16/2
                                               128.0.0.17/2
                                               128.0.0.24/2
                                               128.0.0.25/2
                                               128.0.0.26/2
                                               128.0.0.28/2
                                               128.0.0.29/2
                                               128.0.0.31/2
                                   tnp         0x5
IC-WS001:dcfabric       up    up
IC-WS001:dcfabric.0     up    up   inet
                                   mpls
                                   eth-switch
IC-WS001:pme0           up    up
IC-WS001:pme1           up    up
IC-WS001:pme2           up    down
IC-WS001:pme3           up    down
IC-WS001:vcp0           up    up
IC-WS001:vcp0.32769     up    up
IC-WS001:vcp1           up    up
IC-WS001:vcp1.32768     up    up
IC-WS001:vcp2           up    up
IC-WS001:vcp2.32768     up    up
IC-WS001:vcp3           up    down
IC-WS001:vcp3.32768     up    down
IC-WS001:vcp4           up    down
IC-WS001:vcp4.32768     up    down
```

show interfaces statistics fabric device-name

```
user@switch> show interfaces statistics fabric IC-WS001:fte-0/0/13
Physical interface: IC-WS001:fte-0/0/13, Enabled, Physical link is Down
  Interface index: 49177, SNMP ifIndex: 1208484479
  Link-level type: Ethernet, MTU: 9232, Speed: 40Gbps, 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
  CoS queues     : 12 supported, 12 maximum usable queues
  Current address: 00:00:00:00:00:0d, Hardware address: 00:00:00:00:00:0d
  Last flapped   : 2012-11-27 20:30:30 UTC (02:09:53 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

  Logical interface IC-WS001:fte-0/0/13.32768 (Index 86) (SNMP ifIndex 1208484480)

    Flags: Device-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Protocol eth-switch, MTU: 0
```


show interfaces vlan

Syntax

show interfaces (vlan | vlan.*vlan-id*)
<brief | detail | extensive | terse>
<descriptions>
<media>
<routing-instance (all | *instance-name*)>
<snmp-index *snmp-index*>
<statistics>

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.

Description

Display status information about routed VLAN interfaces (RVIs).

Options

vlan | vlan.*vlan-id*—Display status information for the specified RVI.

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) Associate this RVI with the named routing instance.

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

- *show ethernet-switching table*
- *show vlans*
- *Monitoring Interface Status and Traffic*
- Troubleshooting Network Interfaces on EX3200 Switches on page 384
- Troubleshooting Network Interfaces on EX4200 Switches on page 386
- *Verifying Routed VLAN Interface Status and Statistics on EX Series Switches*

List of Sample Output

show interfaces vlan on page 1113
show interfaces vlan terse on page 1113
show interfaces vlan extensive on page 1114
show interfaces vlan detail on page 1115

Output Fields Table 82 on page 1106 lists the output fields for the **show interfaces vlan** command. Output fields are listed in the approximate order in which they appear. The level of output *none* means the basic command with no optional options—that is, either just **show interfaces vlan** or **show interfaces vlan.*vlan-id*.**

Table 82: show interfaces vlan Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface, which is always **vlan**.	All levels
Enabled	State of the interface: **Enabled** or **Disabled**, followed by the statement **Physical link is <Up/Down>**	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**
Type	Because this is routed VLAN interface information, this entry is always **VLAN**.	**detail** **extensive** none
Link-level type	Encapsulation (added control information) being used on the physical interface. Because this is routed VLAN interface information, this entry is always **VLAN**.	All levels
MTU	Maximum transmission unit (MTU) size on the physical interface. The default MTU size depends on the switch platform. Changing either the media MTU or protocol MTU causes an interface to be deleted and added again.	All levels
Clocking	Value is always **Unspecified**—not applicable on switches.	**detail** **extensive**
Speed	Speed of the interface, either **Auto** if autonegotiation of speed is enabled or a number representing the configured speed in megabits per second.	**detail** **extensive** none

Table 82: show interfaces vlan Output Fields (continued)

Field Name	Field Description	Level of Output
Device flags	Information about the physical device such as: **Dest-route-down**—The routing process detected that the link was not operational and changed the interface routes to nonforwarding status. **Down**—Device has been administratively disabled. **Hear-Own-Xmit**—Device receives its own transmissions. **Is-Default**—This address is the default address of the switch. The default address is used as the source address by SNMP, ping, traceroute, and other network utilities. **Is-Preferred**—This address is the default local address for packets originating from the local switch and sent to destinations on the subnet. **Is-Primary**—This address is the default local address for broadcast and multicast packets originated locally and sent out the interface. **Link-Layer-Down**—The link-layer protocol has failed to connect with the remote endpoint. **Loopback**—Switch is in physical loopback. **Loop-Detected**—The link layer has received frames that it sent, thereby detecting a physical loopback. **No-Carrier**—On media that support carrier recognition, no carrier is currently detected. **No-Multicast**—Device does not support multicast traffic. **Preferred**—This address is a candidate to become the preferred address. **Present**—Device is physically present and recognized. **Promiscuous**—Device is in promiscuous mode and recognizes frames addressed to all physical addresses on the media. **Primary**—This address is a candidate to become the primary address. **Quench**—Transmission on the device is quenched, because the output buffer is overflowing **Recv-All-Multicasts**—Device is in multicast promiscuous mode and therefore provides no multicast filtering. **Running**—Device is active and enabled.	**detail** **extensive** none
Link type	Link mode of the interface—**Auto** if autonegotiation is enabled, or the configured **Full-Duplex** or **Half-Duplex**.	**detail** **extensive** none
Link flags	Value is always **None**—not applicable on switches.	**detail** **extensive** none
Physical Info	Value is always **Unspecified**—not applicable on switches.	**detail** **extensive**
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	**detail** **extensive**
Current address	MAC address of the hardware.	**detail** **extensive** none
Hardware address	MAC address of the switch.	**detail** **extensive** none

Table 82: show interfaces vlan Output Fields (continued)

Field Name	Field Description	Level of Output
Alternate link address	Value is always **Unspecified**—not applicable on switches.	**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 hour:minute:second timezone*** **(*hour:minute:second* ago)**. For example, **Last flapped: 2008–01–16 10:52:40 UTC (3d 22:58 ago).** The entry can also be **Never**.	**detail** **extensive** none
Statistics last cleared	Time when the statistics for the interface were last set to zero.	**detail** **extensive** none
Traffic statistics	Number and rate of bytes and packets transmitted or received on the physical interface for supported switches. • **Input bytes**—Number of bytes received on the interface for this switch. This value reflects the information gathered by the automatic ingress counter on EX3200 switches and EX4200 switches. EX8200 switches can also be configured to collect this information with the command *l3-interface-ingress-counting*. • **Output bytes**—Number of bytes sent on the interface. This value reflects the information gathered by the automatic egress counter for EX8200 switches. • **Input packets**—Number of packets received on the interface for this switch. This value reflects the information gathered by the automatic ingress counter for EX3200 and EX4200 switches. EX8200 switches can also be configured to collect this information with the command *l3-interface-ingress-counting*. • **Output packets**—Number of packets sent on the interface. This value reflects the information gathered by the automatic egress counter for EX8200 switches.	**detail** **extensive**
IPv6 transit statistics	Number and rate of bytes and packets transmitted and/or received on the IPv6 interface for supported switches. • **Input bytes**—Number of bytes received on the interface. This value reflects the information gathered by the automatic ingress counter for EX3200 and EX4200 switches. EX8200 switches can also be configured to collect this information with the command *l3-interface-ingress-counting*. • **Output bytes**—Number of bytes sent on the IPv6 interface. This value reflects the information gathered by the automatic egress counter for EX8200 switches. • **Input packets**—Number of packets received on the interface. This value reflects the information gathered by the automatic ingress counter for EX3200 and EX4200 switches. EX8200 switches can also be configured to collect this information with the command *l3-interface-ingress-counting*. • **Output packets**—Number of packets sent on the IPv6 interface. This value reflects the information gathered by the automatic egress counter for and EX8200 switches.	**detail** **extensive**

Table 82: show interfaces vlan Output Fields (continued)

Field Name	Field Description	Level of Output
Input Errors	Input errors on the interface. The following paragraphs explain some of the counters whose meaning may 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 value 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. If this value is ever nonzero, the interface is probably malfunctioning. • **Resource errors**—Sum of transmit drops.	**extensive**

Table 82: show interfaces vlan 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 value 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 interface 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. Both Gigabit Ethernet interfaces and 10 Gigabit Ethernet interfaces support only full-duplex operation, so for those two interfaces, this value should always be zero. If the value is nonzero for either Gigabit Ethernet or 10 Gigabit Ethernet, 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 interface. If this value is ever nonzero, the interface 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**
Logical Interface		
vlan.*vlan-id*, Index, SNMP ifIndex	VLAN ID, index, and SNMP index number for the logical interface. The logical interface index values reflect the item's initialization sequence.	**detail** **extensive** none
Generation	Unique number for Juniper Networks Technical support use only.	**detail** **extensive** none
Flags	Errors that have occurred on this interface, such as **Link Layer Down**. Other possible flags include: • **Device-down**—Device has been administratively disabled. • **Disabled**—Interface is administratively disabled. • **Down**—A hardware failure has occurred. • **Hardware-Down**—Interface protocol initialization failed to complete successfully. • **SNMP-Traps**—SNMP trap notifications are enabled. • **Up**—Interface is enabled and operational.	**detail** **extensive** none

Table 82: show interfaces vlan Output Fields (continued)

<table>
<tr><th>Field Name</th><th>Field Description</th><th>Level of Output</th></tr>
<tr><td>SNMP-Traps</td><td>Each configured SNMP trap has a number that appears here—0x0 is always displayed for logical interface SNMP traps.</td><td>detail
extensive
none</td></tr>
<tr><td>Encapsulation</td><td>Encapsulation method, which is the process of adding control information. The value is always Ethernet 2 (ENET2) for logical encapsulation.</td><td>detail
extensive
none</td></tr>
<tr><td>Traffic statistics</td><td>Number and rate of bytes and packets received and transmitted on the logical interface of supported switches. Traffic statistics represent the sum of the next two fields, Local statistics and Transit statistics. Note that these are not the values for the RVI ingress or egress counters—for that value, see Transit statistics below.
Input bytes—Number of bytes received on the interface. Same value as the physical interface.
Output bytes—Number of bytes sent on the interface. Same value as the physical interface.
Input packets—Number of packets received on the interface. Same value as the physical interface.
Output packets—Number of bytes sent on the interface. Same value as the physical interface.
NOTE: The bandwidth bps counter is not enabled on the switches.</td><td>detail
extensive</td></tr>
<tr><td>Local statistics</td><td>Number and rate of bytes and packets received and transmitted locally by the Routing Engine on the logical interface of supported switches. All packets for protocols and process statistics are counted here.
Input bytes—Number of bytes received on the interface. Same value as for the physical interface.
Output bytes—Number of bytes sent on the interface. Same value as for the physical interface.
Input packets—Number of packets received on the interface. Same value as for the physical interface.
Output packets—Number of bytes sent on the interface. Same value as for the physical interface.</td><td>detail
extensive
none</td></tr>
<tr><td>Transit statistics</td><td>Number and rate of bytes and packets received and transmitted on the RVI logical interface of supported switches. Look at this value to see the RVI ingress and egress count.
Input bytes—Number of bytes received on the interface. This ingress counter is automatic for EX3200 and EX4200 switches and configurable for EX8200 switches.
Output bytes—Number of bytes sent on the interface. This egress counter is automatic for EX8200.
Input packets—Number of packets received on the interface. This ingress counter is automatic for EX3200 and EX4200 switches and configurable for EX8200 switches.
Output packets—Number of packets sent on the interface. This egress counter is automatic for EX8200 switches.</td><td>detail
extensive</td></tr>
</table>

Table 82: show interfaces vlan Output Fields (continued)

Field Name	Field Description	Level of Output
IPv6 transit statistics	Number and rate of IPv6 bytes and packets received and transmitted on the RVI logical interface of supported switches. Transit values are unique to the logical interface and do not appear in physical interface output. Look at the values listed below to see the RVI ingress and egress count for IPv6 traffic. • **Input bytes**—Number of bytes received on the interface. This ingress counter is automatic for EX3200 and EX4200 switches and configurable for EX8200 switches. • **Output bytes**—Number of bytes sent by the interface. This egress counter is automatic for EX8200 switches. • **Input packets**—Number of packets received on the interface. This ingress counter is automatic for EX3200 and EX4200 and configurable for EX8200 switches. • **Output packets**—Number of packets sent by the interface. This egress counter is automatic for EX8200 switches. NOTE: The bandwidth bps counter is not enabled on the switches.	**detail** **extensive**
Protocol	Protocol used for the logical interface—this value is **inet** for IPv4 traffic and **inet6** for IPv6 traffic.	All levels
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
Protocol flags	Information about the protocol such as **Targeted-broadcast**.	**detail** **extensive** none
Protocol addresses and Address flags	Protocol address values here can be: **Dest-route-down**—The routing process detected that the link was not operational and changed the interface routes to nonforwarding status **Device-down**—Device has been administratively disabled. **Disabled**—Interface is administratively disabled. **Down**—A hardware failure has occurred. **Hardware-Down**—Interface protocol initialization failed to complete successfully. **Is-Default**—This address is the default address of the switch. The default address is used as the source address by SNMP, ping, traceroute, and other network utilities. **Is-Preferred**—This address is the default local address for packets originating from the local switch and sent to destinations on the subnet. **Is-Primary**—This address is the default local address for broadcast and multicast packets originated locally and sent out the interface. **Preferred**—This address is a candidate to become the preferred address. **Primary**—This address is a candidate to become the primary address. **SNMP-Traps**—SNMP trap notifications are enabled. **Up**—Interface is enabled and operational.	**detail** **extensive** none

Table 82: show interfaces vlan Output Fields (continued)

Field Name	Field Description	Level of Output
Address destination	Logical destination's network address.	**detail** **extensive** none
Local address	IP address of the logical interface.	**detail** **extensive** none
Broadcast address	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 vlan

```
user@switch> show interfaces vlan
Physical interface: vlan, Enabled, Physical link is Up
  Interface index: 150, SNMP ifIndex: 556
  Type: VLAN, Link-level type: VLAN, MTU: 1518, Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Link flags     : None
  Current address: 00:21:59:c5:f0:40, Hardware address: 00:21:59:c5:f0:40
  Last flapped   : Never
    Input packets : 0
    Output packets: 0

  Logical interface vlan.0 (Index 82) (SNMP ifIndex 557)
    Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 1
    Protocol inet
      Flags: Targeted-broadcast
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.1, Broadcast: 10.1.1.255

  Logical interface vlan.1 (Index 83) (SNMP ifIndex 558)
    Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Input packets : 0
    Output packets: 1
    Protocol inet
      Flags: Targeted-broadcast
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.2/24, Local: 10.1.2.1, Broadcast: 10.1.2.255
```

show interfaces vlan terse

```
user@switch> show interfaces vlan terse
```



```
Interface               Admin Link Proto    Local                 Remote
vlan                    up    up
vlan.0                  up    down inet     10.1.1.1/24
vlan.1                  up    down inet     10.1.2.1/24
```

show interfaces vlan extensive

```
user@switch> show interfaces vlan extensive
Physical interface: vlan, Enabled, Physical link is Up
  Interface index: 150, SNMP ifIndex: 556, Generation: 153
  Type: VLAN, Link-level type: VLAN, MTU: 1518, Clocking: Unspecified,
  Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Link flags     : None
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:21:59:c5:f0:40, Hardware address: 00:21:59:c5:f0:40
  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 vlan.0 (Index 82) (SNMP ifIndex 557) (Generation 147)
    Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                    0
     Output bytes  :                   42
     Input  packets:                    0
     Output packets:                    1
    Local statistics:
     Input  bytes  :                    0
     Output bytes  :                   42
     Input  packets:                    0
     Output packets:                    1
    Transit statistics:
     Input  bytes  :                    0                    0 bps
     Output bytes  :                    0                    0 bps
     Input  packets:                    0                    0 pps
     Output packets:                    0                    0 pps
    Protocol inet, Generation: 159, Route table: 0
      Flags: Targeted-broadcast
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.1, Broadcast: 10.1.1.255,
        Generation: 138
```



```
Logical interface vlan.1 (Index 83) (SNMP ifIndex 558) (Generation 148)
  Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
  Traffic statistics:
   Input  bytes  :                     0
   Output bytes  :                    42
   Input  packets:                     0
   Output packets:                     1
  Local statistics:
   Input  bytes  :                     0
   Output bytes  :                    42
   Input  packets:                     0
   Output packets:                     1
  Transit statistics:
   Input  bytes  :                     0                    0 bps
   Output bytes  :                     0                    0 bps
   Input  packets:                     0                    0 pps
  Output packets:                      0                    0 pps
 Protocol inet, Generation: 160, Route table: 0
   Flags: Targeted-broadcast
   Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
     Destination: 10.1.2/24, Local: 10.1.2.1, Broadcast: 10.1.2.255,
     Generation: 140
```

show interfaces vlan detail

```
user@switch> show interfaces vlan detail
Physical interface: vlan, Enabled, Physical link is Up
  Interface index: 150, SNMP ifIndex: 556, Generation: 153
  Type: VLAN, Link-level type: VLAN, MTU: 1518, Clocking: Unspecified,
  Speed: 1000mbps
  Device flags   : Present Running
  Link type      : Full-Duplex
  Link flags     : None
  Physical info  : Unspecified
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:21:59:c5:f0:40, Hardware address: 00:21:59:c5:f0:40
  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

  Logical interface vlan.0 (Index 82) (SNMP ifIndex 557) (Generation 147)
    Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                     0
     Output bytes  :                    42
     Input  packets:                     0
     Output packets:                     1
    Local statistics:
     Input  bytes  :                     0
     Output bytes  :                    42
```



```
     Input  packets:                   0
     Output packets:                   1
    Transit statistics:
     Input  bytes  :                   0                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                   0                    0 pps
     Output packets:                   0                    0 pps
    Protocol inet, Generation: 159, Route table: 0
      Flags: Targeted-broadcast
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.1, Broadcast: 10.1.1.255,
        Generation: 138

  Logical interface vlan.1 (Index 83) (SNMP ifIndex 558) (Generation 148)
    Flags: Link-Layer-Down SNMP-Traps 0x0 Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                  42
     Input  packets:                   0
     Output packets:                   1
    Local statistics:
     Input  bytes  :                   0
     Output bytes  :                  42
     Input  packets:                   0
     Output packets:                   1
    Transit statistics:
     Input  bytes  :                   0                    0 bps
     Output bytes  :                   0                    0 bps
     Input  packets:                   0                    0 pps
     Output packets:                   0                    0 pps
    Protocol inet, Generation: 160, Route table: 0
      Flags: Targeted-broadcast
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.2/24, Local: 10.1.2.1, Broadcast: 10.1.2.255,
        Generation: 140
```

show lacp interfaces

Syntax

show lacp interfaces
<*interface-name*>
extensive

Release Information

Command introduced in Junos OS Release 7.6.
extensive statement introduced in Junos OS Release 16.1R1
Command introduced in Junos OS Release 10.0 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Command introduced in Junos OS Release 14.2R3

Description

Display Link Aggregation Control Protocol (LACP) information about the specified aggregated Ethernet, Fast 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*number***
- Fast Ethernet—**fe-*fpc/pic/port***
- Gigabit Ethernet—**ge-*fpc/pic/port***
- 10 Gigabit Ethernet—**xe-*fpc/pic/port***

extensive—Display LACP information for the interface in detail.

NOTE: The show lacp interfaces command returns the following error message if your system is not configured in either active or passive LACP mode:

"Warning: lacp subsystem not running – not needed by configuration"

Required Privilege Level

view

Related Documentation

- Configuring Aggregated Ethernet Links (CLI Procedure) on page 96
- Configuring Link Aggregation on page 153
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Configuring Aggregated Ethernet LACP (CLI Procedure) on page 98
- Configuring LACP Link Protection of Aggregated Ethernet Interfaces for Switches on page 99

- *Understanding Aggregated Ethernet Interfaces and LACP*
- Understanding Aggregated Ethernet Interfaces and LACP for Switches on page 92
- *Junos OS Interfaces Fundamentals Configuration Guide*

List of Sample Output

show lacp interfaces (Aggregated Ethernet) on page 1120
show lacp interfaces (Gigabit Ethernet) on page 1120
show lacp interfaces (10 Gigabit Ethernet) on page 1121

Output Fields

Table 83 on page 1118 lists the output fields for the **show lacp interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 83: show lacp interfaces Output Fields

Field Name	Field Description	Level of Output
LACP State	For a child interface configured with the force-up statement, LACP state displays FUP along with the interface name.	All Levels
Aggregated interface	Aggregated interface value.	All Levels

LACP State	LACP state information for each aggregated interface:
	• **Role**—Role played by the interface. It can be one of the following:
	  ◦ **Actor**—Local device participating in LACP negotiation.
	  ◦ **Partner**—Remote device participating in LACP negotiation.
	• **Exp**—Expired state. **Yes** indicates the actor or partner is in an expired state. **No** indicates 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, administratively configured for the partner. **No** indicates the operational partner information in use has been received in an LACP PDU.
	• **Dist**—Distribution of outgoing frames. **No** indicates 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 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 synchronized. It 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. It is currently not in the right aggregation.
	• **Aggr**—Ability of 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 fast transmission rate, depending upon the expressed LACP timeout preference (**Long Timeout** or **Short Timeout**).
	• **Activity**—Actor 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.
		All Levels

Table 83: show lacp interfaces Output Fields (continued)

Field Name	Field Description	Level of Output

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 state machine. 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**—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 may be passed down from the aggregator's distribution function for transmission. **No** indicates the transmit function of this link is not enabled.
	  ◦ **Waiting**—Multiplexer state machine is in a holding process, awaiting an outcome.
		All Levels

Table 83: show lacp interfaces Output Fields (continued)

Field Name	Field Description	Level of Output

LACP info	• **Role** can be one of the following:
	  ◦ **Actor**—Local device participating in LACP negotiation.
	  ◦ **Partner**—Remote device participating in LACP negotiation.
	• **System priority**—Priority assigned to the system (by management or administrative policy), encoded as an unsigned integer.
	• **System identifier**—Actor or partner system ID, encoded as a MAC address.
	• **Port priority**—Priority assigned to the port by the actor or partner (by management or administrative policy), encoded as an unsigned integer.
	• **Port number**—Port number assigned to the port by the actor or partner, encoded as an unsigned integer.
	• **Port key**—Operational key value assigned to the port by the actor or partner, encoded as an unsigned integer.
		Extensive

Sample Output

show lacp interfaces (Aggregated Ethernet)

```
user@host> show lacp interfaces ae0 extensive
 LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-0/0/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/2       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/2     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/3       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/3     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-0/0/1                  Current   Fast periodic Collecting distributing
      ge-0/0/2                  Current   Fast periodic Collecting distributing
      ge-0/0/3                  Current   Fast periodic Collecting distributing
    LACP info:        Role     System             System       Port      Port
Port
                            priority         identifier   priority    number
 key
      ge-0/0/1       Actor        127   00:05:86:4e:b6:c0        127         1
   1
      ge-0/0/1     Partner        127   00:05:86:7e:d3:c0        127         1
   1
      ge-0/0/2       Actor        127   00:05:86:4e:b6:c0        127         2
   1
      ge-0/0/2     Partner        127   00:05:86:7e:d3:c0        127         2
   1
      ge-0/0/3       Actor        127   00:05:86:4e:b6:c0        127         3
   1
      ge-0/0/3     Partner        127   00:05:86:7e:d3:c0        127         3
   1
```

show lacp interfaces (Gigabit Ethernet)

```
user@host> show lacp interfaces ge-0/3/0
Aggregated interface: ae0
    LACP State:        Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-0/3/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
```



```
  ge-0/3/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
LACP Protocol:   Receive State    Transmit State          Mux State
  ge-0/3/0            Current     Fast periodic  Collecting distributing
```

show lacp interfaces (10 Gigabit Ethernet)

```
user@host> show lacp interfaces xe-1/0/2
Aggregated interface: ae0
    LACP State:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      xe-1/0/2       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-1/0/2     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP Protocol:   Receive State    Transmit State          Mux State
      xe-1/0/2            Current     Fast periodic  Collecting distributing
```

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.
Command introduced in Junos OS Release 14.1X53-D20 for the OCX 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

- *Verifying LACP on Redundant Ethernet Interfaces*
- Verifying the Status of a LAG Interface on page 157
- Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets on page 158
- Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch on page 179
- Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch on page 184

List of Sample Output

show lacp statistics interfaces on page 1123

Output Fields

Table 84 on page 1122 lists the output fields for the **show lacp statistics interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 84: 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 oam ethernet link-fault-management

Syntax

show oam ethernet link-fault-management
<brief | detail>
<*interface-name*>

Release Information

Command introduced in Junos OS Release 9.4 for EX Series switches.

Description

Displays Operation, Administration, and Maintenance (OAM) link fault management (LFM) information for Ethernet interfaces.

Options

brief | detail—(Optional) Display the specified level of output.

interface-name —(Optional) Display link fault management information for the specified Ethernet interface only.

Required Privilege Level

view

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 285
- Configuring Ethernet OAM Link Fault Management (CLI Procedure) on page 282

List of Sample Output

show oam ethernet link-fault-management brief on page 1128
show oam ethernet link-fault-management detail on page 1128

Output Fields

Table 85 on page 1124 lists the output fields for the **show oam ethernet link-fault-management** command. Output fields are listed in the approximate order in which they appear.

Table 85: show oam ethernet link-fault-management Output Fields

Field Name	Field Description	Level of Output
Status	Indicates the status of the established link. • **Fail**—A link fault condition exists. • **Running**—A link fault condition does not exist.	All levels
Discovery state	State of the discovery mechanism: • **Passive Wait** • **Send Any** • **Send Local Remote** • **Send Local Remote Ok**	All levels
Peer address	Address of the OAM peer.	All levels

Table 85: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Flags	Information about the interface. • **Remote-Stable**—Indicates remote OAM client acknowledgment of, and satisfaction with local OAM state information. **False** indicates that remote DTE has either not seen or is unsatisfied with local state information. **True** indicates that remote DTE has seen and is satisfied with local state information. • **Local-Stable**—Indicates local OAM client acknowledgment of, and satisfaction with remote OAM state information. **False** indicates that local DTE either has not seen or is unsatisfied with remote state information. **True** indicates that local DTE has seen and is satisfied with remote state information. • **Remote-State-Valid**—Indicates the OAM client has received remote state information found within Local Information TLVs of received Information OAM PDUs. **False** indicates that OAM client has not seen remote state information. **True** indicates that the OAM client has seen remote state information.	All levels
Remote loopback status	Indicates the remote loopback status. An OAM entity can put its remote peer into loopback mode using the Loopback control OAM PDU. In loopback mode, every frame received is transmitted back on the same port (except for OAM PDUs, which are needed to maintain the OAM session).	All levels
Remote entity information	Remote entity information. • **Remote MUX action**—Indicates the state of the multiplexer functions of the OAM sublayer. Device is forwarding non-OAM PDUs to the lower sublayer or discarding non-OAM PDUs. • **Remote parser action**—Indicates the state of the parser function of the OAM sublayer. Device is forwarding non-OAM PDUs to higher sublayer, looping back non-OAM PDUs to the lower sublayer, or discarding non-OAM PDUs. • **Discovery mode**—Indicates whether discovery mode is active or inactive. • **Unidirectional mode**—Indicates the ability to operate a link in a unidirectional mode for diagnostic purposes. • **Remote loopback mode**—Indicates whether remote loopback is supported or not supported. • **Link events**—Indicates whether interpreting link events is supported or not supported on the remote peer. • **Variable requests**—Indicates whether variable requests are supported or not supported. The Variable Request OAM PDU, is used to request one or more MIB variables from the remote peer.	All levels
OAM Receive Statistics		
Information	The number of information PDUs received.	**detail**
Event	The number of loopback control PDUs received.	**detail**
Variable request	The number of variable request PDUs received.	**detail**
Variable response	The number of variable response PDUs received.	**detail**
Loopback control	The number of loopback control PDUs received.	**detail**

Table 85: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Organization specific	The number of vendor organization specific PDUs received.	**detail**
OAM Transmit Statistics		
Information	The number of information PDUs transmitted.	**detail**
Event	The number of event notification PDUs transmitted.	**detail**
Variable request	The number of variable request PDUs transmitted.	**detail**
Variable response	The number of variable response PDUs transmitted.	**detail**
Loopback control	The number of loopback control PDUs transmitted.	**detail**
Organization specific	The number of vendor organization specific PDUs transmitted.	**detail**
OAM Received Symbol Error Event information		
Events	The number of symbol error event TLVs that have been received after the OAM sublayer was reset.	**detail**
Window	The symbol error event window in the received PDU. The protocol default value is the number of symbols that can be received in one second on the underlying physical layer.	**detail**
Threshold	The number of errored symbols in the period required for the event to be generated.	**detail**
Errors in period	The number of symbol errors in the period reported in the received event PDU.	**detail**
Total errors	The number of errored symbols that have been reported in received event TLVs after the OAM sublayer was reset. Symbol errors are coding symbol errors.	**detail**
OAM Received Frame Error Event Information		
Events	The number of errored frame event TLVs that have been received after the OAM sublayer was reset.	**detail**
Window	The duration of the window in terms of the number of 100 ms period intervals.	**detail**
Threshold	The number of detected errored frames required for the event to be generated.	**detail**
Errors in period	The number of detected errored frames in the period.	**detail**

Table 85: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Total errors	The number of errored frames that have been reported in received event TLVs after the OAM sublayer was reset. A frame error is any frame error on the underlying physical layer.	**detail**
OAM Received Frame Period Error Event Information		
Events	The number of frame seconds errors event TLVs that have been received after the OAM sublayer was reset.	**detail**
Window	The duration of the frame seconds window.	**detail**
Threshold	The number of frame seconds errors in the period.	**detail**
Errors in period	The number of frame seconds errors in the period.	**detail**
Total errors	The number of frame seconds errors that have been reported in received event TLVs after the OAM sublayer was reset.	**detail**
OAM Transmitted Symbol Error Event Information		
Events	The number of symbol error event TLVs that have been transmitted after the OAM sublayer was reset.	**detail**
Window	The symbol error event window in the transmitted PDU.	**detail**
Threshold	The number of errored symbols in the period required for the event to be generated.	**detail**
Errors in period	The number of symbol errors in the period reported in the transmitted event PDU.	**detail**
Total errors	The number of errored symbols reported in event TLVs that have been transmitted after the OAM sublayer was reset.	**detail**
OAM Transmitted Frame Error Event Information		
Events	The number of errored frame event TLVs that have been transmitted after the OAM sublayer was reset.	**detail**
Window	The duration of the window in terms of the number of 100 ms period intervals.	**detail**
Threshold	The number of detected errored frames required for the event to be generated.	**detail**
Errors in period	The number of detected errored frames in the period.	**detail**
Total errors	The number of errored frames that have been detected after the OAM sublayer was reset.	**detail**

Sample Output

show oam ethernet link-fault-management brief

```
user@host> show oam ethernet link-fault-management brief
Interface: ge-0/0/1
  Status: Running, Discovery state: Send Any
  Peer address: 00:90:69:72:2c:83
  Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
  Remote loopback status: Disabled on local port, Enabled on peer port
  Remote entity information:
    Remote MUX action: discarding, Remote parser action: loopback
    Discovery mode: active, Unidirectional mode: unsupported
    Remote loopback mode: supported, Link events: supported
    Variable requests: unsupported
```

show oam ethernet link-fault-management detail

```
user@host> show oam ethernet link-fault-management detail
  Interface: ge-0/0/1
    Status: Running, Discovery state: Send Any
    Peer address: 00:90:69:0a:07:14
    Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
    OAM receive statistics:
      Information: 186365, Event: 0, Variable request: 0, Variable response: 0
      Loopback control: 0, Organization specific: 0
    OAM transmit statistics:
      Information: 186347, Event: 0, Variable request: 0, Variable response: 0
      Loopback control: 0, Organization specific: 0
    OAM received symbol error event information:
      Events: 0, Window: 0, Threshold: 0
      Errors in period: 0, Total errors: 0
    OAM received frame error event information:
      Events: 0, Window: 0, Threshold: 0
      Errors in period: 0, Total errors: 0
    OAM received frame period error event information:
      Events: 0, Window: 0, Threshold: 0
      Errors in period: 0, Total errors: 0
    OAM transmitted symbol error event information:
      Events: 0, Window: 0, Threshold: 1
      Errors in period: 0, Total errors: 0
    OAM transmitted frame error event information:
      Events: 0, Window: 0, Threshold: 1
      Errors in period: 0, Total errors: 0
    Remote entity information:
      Remote MUX action: forwarding, Remote parser action: forwarding
      Discovery mode: active, Unidirectional mode: unsupported
      Remote loopback mode: supported, Link events: supported
      Variable requests: unsupported
```

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 on EX Series Switches*
- *Example: Configuring Redundant Trunk Links for Faster Recovery on Devices with ELS Support*
- *Understanding Redundant Trunk Links (Legacy RTG Configuration)*

List of Sample Output show redundant-trunk-group group-name Group1 on page 1130

Output Fields Table 86 on page 1129 lists the output fields for the **show redundant-trunk-group** command. Output fields are listed in the approximate order in which they appear.

Table 86: 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 289
- Configuring Interfaces for Uplink Failure Detection on page 291
- Example: Configuring Interfaces for Uplink Failure Detection on page 292

List of Sample Output

show uplink-failure-detection on page 1132

Output Fields

Table 87 on page 1131 lists the output fields for the **show uplink-failure-detection** command. Output fields are listed in the approximate order in which they appear.

Table 87: 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
```

show virtual-chassis vc-port diagnostics optics

Syntax

show virtual-chassis vc-port diagnostics optics
<all-members>
<*interface-name*>
<local>
<member *member-id*>

Release Information

Command introduced in Junos OS Release 12.2 for EX Series switches.
Command introduced in Junos OS Release 13.2X51-D20 for Virtual Chassis Fabric (VCF).

Description

Display diagnostics data and alarms for Ethernet optical transceivers installed in ports configured as Virtual Chassis Ports (VCPs) in an EX Series switches. The information provided by this command is known as digital optical monitoring (DOM) information.

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 a transceiver is not operating properly. DOM information can be used to diagnose why a transceiver is not working.

On some EX Series switches, the **request virtual-chassis vc-port diagnostics optics** command must be entered to run a diagnostic scan before you can gather the **show virtual-chassis vc-port diagnostics optics** output.

Options

none—Display diagnostics information for transceivers installed in VCPs of all members of a Virtual Chassis or VCF.

all-members—(Optional) Display diagnostics information for transceivers installed in VCPs of all members of a Virtual Chassis or VCF.

interface-name—(Optional) Display diagnostics information for the transceiver installed in a specified VCP.

local—(Optional) Display diagnostics information for transceivers installed in VCPs on the switch or external Routing Engine on which this command is entered.

member *member-id*—(Optional) Display diagnostics information for transceivers installed in VCPs on a specified member of a Virtual Chassis or VCF.

Required Privilege Level

view

Related Documentation

- *show virtual-chassis vc-port*
- *Installing a Transceiver*
- *Removing a Transceiver*
- *Junos OS Ethernet Interfaces Configuration Guide*

List of Sample Output

show virtual-chassis vc-port diagnostics optics on page 1136
show virtual-chassis vc-port diagnostics optics (interface-name) on page 1141
show virtual-chassis vc-port diagnostics optics local on page 1143
show virtual-chassis vc-port diagnostics optics (member member-id) on page 1145

Output Fields

Table 88 on page 1134 lists the output fields for the **show virtual-chassis vc-port diagnostics optics** command. Output fields are listed in the approximate order in which they appear.

Table 88: show virtual-chassis vc-port diagnostics optics Output Fields

Field Name	Field Description
FPC	Displays the FPC slot number.
Virtual chassis port	Displays the name of the VCP.
Laser bias current	Displays the magnitude of the laser bias power setting current, in milliamperes (mA). The laser bias provides direct modulation of laser diodes and modulates currents.
Laser output power	Displays the laser output power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).
Module temperature	Displays the temperature, in Celsius and Fahrenheit.
Module voltage	Displays the voltage, in Volts.
Receiver signal average optical power	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	Displays whether the laser output power high alarm is *On* or *Off*.
Laser output power low alarm	Displays whether the laser output power low alarm is *On* or *Off*.
Laser output power high warning	Displays whether the laser output power high warning is *On* or *Off*.
Laser output power low warning	Displays whether the laser output power low warning is *On* or *Off*.
Module temperature high alarm	Displays whether the module temperature high alarm is *On* or *Off*.
Module temperature low alarm	Displays whether the module temperature low alarm is *On* or *Off*.
Module temperature high warning	Displays whether the module temperature high warning is *On* or *Off*.

Table 88: show virtual-chassis vc-port diagnostics optics Output Fields (continued)

Field Name	Field Description
Module temperature low warning	Displays whether the module temperature low warning is *On* or *Off*.
Module voltage high alarm	Displays whether the module voltage high alarm is *On* or *Off*.
Module voltage low alarm	Displays whether the module voltage low alarm is *On* or *Off*.
Module voltage high warning	Displays whether the module voltage high warning is *On* or *Off*.
Module voltage low warning	Displays whether the module voltage low warning is *On* or *Off*.
Laser rx power high alarm	Displays whether the receive laser power high alarm is *On* or *Off*.
Laser rx power low alarm	Displays whether the receive laser power low alarm is *On* or *Off*.
Laser rx power high warning	Displays whether the receive laser power high warning is *On* or *Off*.
Laser rx power low warning	Displays whether the receive laser power low warning is *On* or *Off*.
Laser bias current high alarm threshold	Displays the vendor-specified threshold for the laser bias current high alarm.
Laser bias current low alarm threshold	Displays the vendor-specified threshold for the laser bias current low alarm.
Laser bias current high warning threshold	Displays the vendor-specified threshold for the laser bias current high warning.
Laser bias current low warning threshold	Displays the vendor-specified threshold for the laser bias current low warning.
Laser output power high alarm threshold	Displays the vendor-specified threshold for the laser output power high alarm.
Laser output power low alarm threshold	Displays the vendor-specified threshold for the laser output power low alarm.
Laser output power high warning threshold	Displays the vendor-specified threshold for the laser output power high warning.
Laser output power low warning threshold	Displays the vendor-specified threshold for the laser output power low warning.
Module temperature high alarm threshold	Displays the vendor-specified threshold for the module temperature high alarm.
Module temperature low alarm threshold	Displays the vendor-specified threshold for the module temperature low alarm.
Module temperature high warning threshold	Displays the vendor-specified threshold for the module temperature high warning.

Table 88: show virtual-chassis vc-port diagnostics optics Output Fields (continued)

Field Name	Field Description
Module temperature low warning threshold	Displays the vendor-specified threshold for the module temperature low warning.
Module voltage high alarm threshold	Displays the vendor-specified threshold for the module voltage high alarm.
Module voltage low alarm threshold	Displays the vendor-specified threshold for the module voltage low alarm.
Module voltage high warning threshold	Displays the vendor-specified threshold for the module voltage high warning.
Module voltage low warning threshold	Displays the vendor-specified threshold for the module voltage low warning.
Laser rx power high alarm threshold	Displays the vendor-specified threshold for the laser rx power high alarm.
Laser rx power low alarm threshold	Displays the vendor-specified threshold for the laser rx power low alarm.
Laser rx power high warning threshold	Displays the vendor-specified threshold for the laser rx power high warning.
Laser rx power low warning threshold	Displays the vendor-specified threshold for the laser rx power low warning.

Sample Output

show virtual-chassis vc-port diagnostics optics

```
user@switch> show virtual-chassis vc-port diagnostics optics
fpc0:
--------------------------------------------------------------------------
Virtual chassis port: vcp-0
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-1
    Optical diagnostics                        :  N/A

fpc1:
--------------------------------------------------------------------------
Virtual chassis port: vcp-0
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-1
    Optical diagnostics                        :  N/A

fpc2:
--------------------------------------------------------------------------
Virtual chassis port: vcp-2/0
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-2/1
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-255/0/14
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-255/0/15
    Optical diagnostics                        :  N/A
Virtual chassis port: vcp-255/0/24
    Laser bias current                         :  4.130 mA
    Laser output power                         :  0.2450 mW / -6.11 dBm
    Module temperature                         :  32 degrees C / 90 degrees F
```



```
    Module voltage                            :  3.3530 V
    Receiver signal average optical power     :  0.0971 mW / -10.13 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   :  14.998 mA
    Laser bias current low alarm threshold    :  0.998 mA
    Laser bias current high warning threshold :  14.000 mA
    Laser bias current low warning threshold  :  1.198 mA
    Laser output power high alarm threshold   :  0.7940 mW / -1.00 dBm
    Laser output power low alarm threshold    :  0.0790 mW / -11.02 dBm
    Laser output power high warning threshold :  0.6300 mW / -2.01 dBm
    Laser output power low warning threshold  :  0.0990 mW / -10.04 dBm
    Module temperature high alarm threshold   :  85 degrees C / 185 degrees F
    Module temperature low alarm threshold    :  -10 degrees C / 14 degrees F
    Module temperature high warning threshold :  80 degrees C / 176 degrees F
    Module temperature low warning threshold  :  -5 degrees C / 23 degrees F
    Module voltage high alarm threshold       :  3.600 V
    Module voltage low alarm threshold        :  3.000 V
    Module voltage high warning threshold     :  3.499 V
    Module voltage low warning threshold      :  3.099 V
    Laser rx power high alarm threshold       :  1.5848 mW / 2.00 dBm
    Laser rx power low alarm threshold        :  0.0100 mW / -20.00 dBm
    Laser rx power high warning threshold     :  1.2589 mW / 1.00 dBm
    Laser rx power low warning threshold      :  0.0125 mW / -19.03 dBm
Virtual chassis port: vcp-255/0/3
    Laser bias current                        :  5.428 mA
    Laser output power                        :  0.4760 mW / -3.22 dBm
    Module temperature                        :  28 degrees C / 83 degrees F
    Module voltage                            :  3.3440 V
    Receiver signal average optical power     :  0.4002 mW / -3.98 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   :  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

fpc3:
--------------------------------------------------------------------------
Virtual chassis port: vcp-255/0/2
    Laser bias current                        :  7.876 mA
    Laser output power                        :  0.5330 mW / -2.73 dBm
    Module temperature                        :  26 degrees C / 78 degrees F
    Module voltage                            :  3.3060 V
    Receiver signal average optical power     :  0.4885 mW / -3.11 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   :  14.500 mA
    Laser bias current low alarm threshold    :  3.500 mA
    Laser bias current high warning threshold :  14.500 mA
    Laser bias current low warning threshold  :  3.500 mA
    Laser output power high alarm threshold   :  1.8620 mW / 2.70 dBm
```

```
    Laser output power low alarm threshold    :  0.0740 mW / -11.31 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   :  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       :  1.9952 mW / 3.00 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
Virtual chassis port: vcp-255/0/3
    Laser bias current                        :  5.052 mA
    Laser output power                        :  0.5030 mW / -2.98 dBm
    Module temperature                        :  24 degrees C / 75 degrees F
    Module voltage                            :  3.2890 V
    Receiver signal average optical power     :  0.5028 mW / -2.99 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   :  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
```

```
Virtual chassis port: vcp-255/0/4
    Laser bias current                       :  7.978 mA
    Laser output power                       :  0.5460 mW / -2.63 dBm
    Module temperature                       :  24 degrees C / 76 degrees F
    Module voltage                           :  3.3060 V
    Receiver signal average optical power    :  0.6305 mW / -2.00 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   :  14.500 mA
    Laser bias current low alarm threshold    :  3.500 mA
    Laser bias current high warning threshold :  14.500 mA
    Laser bias current low warning threshold  :  3.500 mA
    Laser output power high alarm threshold   :  1.8620 mW / 2.70 dBm
    Laser output power low alarm threshold    :  0.0740 mW / -11.31 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   :  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      :  1.9952 mW / 3.00 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
fpc4:
--------------------------------------------------------------------------
Virtual chassis port: vcp-0
    Optical diagnostics                      :  N/A
Virtual chassis port: vcp-1
    Optical diagnostics                      :  N/A
Virtual chassis port: vcp-255/0/4
    Laser bias current                       :  7.860 mA
    Laser output power                       :  0.5370 mW / -2.70 dBm
    Module temperature                       :  24 degrees C / 75 degrees F
    Module voltage                           :  3.2920 V
    Receiver signal average optical power    :  0.6271 mW / -2.03 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
    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   :  14.500 mA
    Laser bias current low alarm threshold    :  3.500 mA
    Laser bias current high warning threshold :  14.500 mA
    Laser bias current low warning threshold  :  3.500 mA
    Laser output power high alarm threshold   :  1.8620 mW / 2.70 dBm
    Laser output power low alarm threshold    :  0.0740 mW / -11.31 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   :  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       :  1.9952 mW / 3.00 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
```

show virtual-chassis vc-port diagnostics optics (interface-name)

```
user@external-routing-engine> show virtual-chassis vc-port diagnostics optics vcp-255/0/3
fpc0:
--------------------------------------------------------------------------

fpc1:
--------------------------------------------------------------------------

fpc2:
--------------------------------------------------------------------------
Virtual chassis port: vcp-255/0/3
    Laser bias current                        :  5.448 mA
    Laser output power                        :  0.4770 mW / -3.21 dBm
    Module temperature                        :  28 degrees C / 82 degrees F
    Module voltage                            :  3.3450 V
    Receiver signal average optical power     :  0.3973 mW / -4.01 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   :  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

fpc3:
--------------------------------------------------------------------------
Virtual chassis port: vcp-255/0/3
    Laser bias current                       :  5.040 mA
    Laser output power                       :  0.5020 mW / -2.99 dBm
    Module temperature                       :  24 degrees C / 74 degrees F
    Module voltage                           :  3.2870 V
    Receiver signal average optical power    :  0.5073 mW / -2.95 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   :  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

fpc4:
--------------------------------------------------------------------------
```

show virtual-chassis vc-port diagnostics optics local

```
user@switch> show virtual-chassis vc-port diagnostics optics local
Virtual chassis port: vcp-2/0
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-2/1
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/14
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/15
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/24
    Laser bias current                        :  4.130 mA
    Laser output power                        :  0.2450 mW / -6.11 dBm
    Module temperature                        :  32 degrees C / 90 degrees F
    Module voltage                            :  3.3530 V
    Receiver signal average optical power     :  0.0961 mW / -10.17 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   :  14.998 mA
    Laser bias current low alarm threshold    :  0.998 mA
    Laser bias current high warning threshold :  14.000 mA
    Laser bias current low warning threshold  :  1.198 mA
    Laser output power high alarm threshold   :  0.7940 mW / -1.00 dBm
    Laser output power low alarm threshold    :  0.0790 mW / -11.02 dBm
    Laser output power high warning threshold :  0.6300 mW / -2.01 dBm
    Laser output power low warning threshold  :  0.0990 mW / -10.04 dBm
    Module temperature high alarm threshold   :  85 degrees C / 185 degrees F
    Module temperature low alarm threshold    :  -10 degrees C / 14 degrees F
    Module temperature high warning threshold :  80 degrees C / 176 degrees F
    Module temperature low warning threshold  :  -5 degrees C / 23 degrees F
    Module voltage high alarm threshold       :  3.600 V
    Module voltage low alarm threshold        :  3.000 V
    Module voltage high warning threshold     :  3.499 V
    Module voltage low warning threshold      :  3.099 V
    Laser rx power high alarm threshold       :  1.5848 mW / 2.00 dBm
    Laser rx power low alarm threshold        :  0.0100 mW / -20.00 dBm
    Laser rx power high warning threshold     :  1.2589 mW / 1.00 dBm
    Laser rx power low warning threshold      :  0.0125 mW / -19.03 dBm
Virtual chassis port: vcp-255/0/3
    Laser bias current                        :  5.426 mA
    Laser output power                        :  0.4760 mW / -3.22 dBm
    Module temperature                        :  28 degrees C / 83 degrees F
    Module voltage                            :  3.3450 V
    Receiver signal average optical power     :  0.3955 mW / -4.03 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
    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   :  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
```

show virtual-chassis vc-port diagnostics optics (member member-id)

```
user@switch> show virtual-chassis vc-port diagnostics optics member 2
fpc2:
--------------------------------------------------------------------------
Virtual chassis port: vcp-2/0
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-2/1
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/14
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/15
    Optical diagnostics                       :  N/A
Virtual chassis port: vcp-255/0/24
    Laser bias current                        :  4.130 mA
    Laser output power                        :  0.2450 mW / -6.11 dBm
    Module temperature                        :  31 degrees C / 88 degrees F
    Module voltage                            :  3.3530 V
    Receiver signal average optical power     :  0.0961 mW / -10.17 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   :  14.998 mA
    Laser bias current low alarm threshold    :  0.998 mA
    Laser bias current high warning threshold :  14.000 mA
    Laser bias current low warning threshold  :  1.198 mA
    Laser output power high alarm threshold   :  0.7940 mW / -1.00 dBm
    Laser output power low alarm threshold    :  0.0790 mW / -11.02 dBm
    Laser output power high warning threshold :  0.6300 mW / -2.01 dBm
    Laser output power low warning threshold  :  0.0990 mW / -10.04 dBm
    Module temperature high alarm threshold   :  85 degrees C / 185 degrees F
    Module temperature low alarm threshold    :  -10 degrees C / 14 degrees F
    Module temperature high warning threshold :  80 degrees C / 176 degrees F
    Module temperature low warning threshold  :  -5 degrees C / 23 degrees F
    Module voltage high alarm threshold       :  3.600 V
```

```
    Module voltage low alarm threshold       :  3.000 V
    Module voltage high warning threshold    :  3.499 V
    Module voltage low warning threshold     :  3.099 V
    Laser rx power high alarm threshold      :  1.5848 mW / 2.00 dBm
    Laser rx power low alarm threshold       :  0.0100 mW / -20.00 dBm
    Laser rx power high warning threshold    :  1.2589 mW / 1.00 dBm
    Laser rx power low warning threshold     :  0.0125 mW / -19.03 dBm
Virtual chassis port: vcp-255/0/3
    Laser bias current                       :  5.418 mA
    Laser output power                       :  0.4770 mW / -3.21 dBm
    Module temperature                       :  28 degrees C / 83 degrees F
    Module voltage                           :  3.3450 V
    Receiver signal average optical power    :  0.3964 mW / -4.02 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   :  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
```


test interface restart-auto-negotiation

Syntax test interface restart-auto-negotiation *interface-name*

Release Information Command introduced in Junos OS Release 7.6.
Command introduced in Junos OS Release 9.0 for EX Series switches.

Description Restarts auto-negotiation on a Fast Ethernet or Gigabit Ethernet interface.

Options ***interface-name***—Interface name: **fe-*fpc/pic/port*** or **ge-*fpc/pic/port***.

Required Privilege Level view

List of Sample Output test interface restart-auto-negotiation on page 1147

Output Fields Use the **show interfaces extensive** command to see the state for auto-negotiation.

Sample Output

test interface restart-auto-negotiation

```
user@host> test interface restart-auto-negotiation fe-1/0/0
```